LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : *PROSIDING*

Judul Artikel : A Response Surface Methodology for Optimizing the Non-Gluten Over Ripe Canistel Powder Formulation
Nama Pengusul : Aminullah, S.TP., M.Si
Jumlah Penulis : 4 Orang
Status Pengusul : Penulis Kedua
Identitas *Prosiding* : a. Judul *Prosiding* : The 3rd International Conference on Green Agroindustry and Bioeconomy (ICGAB)
b. ISBN/ISSN : 978-623-93942-2-6
c. Thn. Terbit, Tempat : 2019, Malang
d. Web Prosiding : https://ifory.id/abstract/UzrJjaPv7Lbg
e. Terindex di : -

Kategori Publikasi *Prosiding* (beri √ pada kategori yang tepat) :
- [ ] *Prosiding* Internasional
- [ ] *Prosiding* Nasional
- [ ] *Prosiding* Terindex Scopus

I. Hasil Penilaian Validasi :

No	Aspek	Uraian/Komentar Penilaian
1	Indikasi Plagiasi	Tidak ada
2	Linieritas	linear

II. Hasil Penilaian Peer Review:

Komponen Yang Dinilai	Nilai Maksimal *Prosiding* (isi kolom yang sesuai)			Nilai Akhir Yang Diperoleh
	Prosiding Internasional	*Prosiding* Nasional	*Prosiding* Terindex	
Kelengkapan dan kesesuaian unsur isi *prosiding* (10%)	1.5			1.5
Ruang lingkup dan kedalaman pembahasan (30%)	4.5			4.5
Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	4.5			4.5
Kelengkapan unsur dan kualitas Penerbit (30%)	4.5			4.5
Total = (100%)	15			15
Kontribusi pengusul: 13,33%				

Komentar/ Ulasan *Peer Review* :	
Kelengkapan kesesuaian unsur	lengkap
Ruang lingkup dan kedalaman pembahasan	Cukup mendalam
Kecukupan dan kemutakhiran data/informasi dan metodologi	Cukup mutakhir
Kelengkapan unsur dan kualitas Penerbit	Lengkap dan berkualitas

Bogor, 29 Maret 2022

Reviewer I,

Dr. Ir. Mardiah, M.Si

NIDN	: 0008106801
Unit kerja	: Universitas Djuanda
Bidang Ilmu	: Teknologi Pangan
Jabatan Akademik (KUM)	: Lektor Kepala (400)
Pendidikan Terakhir	: S3

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1	Indikasi Plagiasi	Tidak terindikasi adanya plagiasi
2	Linieritas	Sesuai bidang ilmu Teknologi Pangan

II.Hasil Penilaian Peer Review:

Komponen Yang Dinilai	Nilai Maksimal *Prosiding* (isi kolom yang sesuai)			Nilai Akhir Yang Diperoleh
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Ruang lingkup dan kedalaman pembahasan (30%)	4.5			4.5
Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	4.5			4.5
Kelengkapan unsur dan kualitas Penerbit (30%)	4.5			4.5
Total = (100%)	15			15
Kontribusi pengusul: Penulis kedua ; 0.4 x 15 = 6/3 = 2				2

Komentar/ Ulasan *Peer Review* :	
Kelengkapan kesesuaian unsur	Unsur isi prosiding sesuai dan lengkap
Ruang lingkup dan kedalaman pembahasan	Ruang lingkup dan pembahasan lengkap dan mendalam
Kecukupan dan kemutakhiran data/informasi dan metodologi	Data dan metodologi lengkap dan mutakhir
Kelengkapan unsur dan kualitas Penerbit	Unsur dan kualitas penerbit lengkap dan bagus

Bogor, 16 Maret 2022

Reviewer 2,

Ir. Sri Rejeki Retna Pertiwi, M.Sc

NIDN	: 0419086201
Unit kerja	: Universitas Djuanda
Bidang Ilmu	: Teknologi Pangan
Jabatan Akademik (KUM)	: Lektor Kepala (550)
Pendidikan Terakhir	: S2

LEMBAR
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Hasil Penilaian *Peer Review* :

Nilai Jurnal Ilmiah		
Peer Review 1	**Peer Review 2**	**Nilai Rata-Rata**
15	15	15

KESIMPULAN :
Nilai Karya Ilmiah Yang Diusulkan Ke Kopertis Wilayah IV Adalah : 15

PROCEEDING

International Conference on
Green Agro-Industry and Bioeconomy

3rd ICGAB 2019

26th AUGUST 2019

Indonesian Biotechnology Consortium

ICGAB 2019

PROCEEDING

The 3rd INTERNATIONAL CONFERENCE ON GREEN AGROINDUSTRY AND BIOECONOMY (ICGAB)

"Striving a Green Economy through Innovation in Agroindustry 4.0 Era to Strengthen Sustainable Development"

26th August 2019

Ijen Suites Resort and Convention
Malang, East Java, Indonesia

FACULTY OF AGRICULTURAL TECHNOLOGY
UNIVERSITAS BRAWIJAYA

PROCEEDING

THE INTERNATIONAL CONFERENCE ON GREEN AGRO-INDUSTRY AND BIOECONOMY
Faculty of Agricultural Technology
Universitas Brawijaya, Malang, Indonesia

ISBN : 978-623-93942-2-6

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E-mail: ftp.brawijaya@gmail.com / ftp_ub@ub.ac.id

WELCOME SPEECH FROM CHAIRMAN OF ICGAB 2019

Assalamu'alaikum Wr.Wb.

Dear ICGAB 2019 participants,

It is a true pleasure for me to welcome you to this 3rd International Conference on Green Agroindustry and Bio-economy (ICGAB). I wish to express my most sincere thanks for being part of this inspiring forum of knowledge exchange, especially those who have travelled for many hours to participate in this conference. It is a great pleasure for Faculty of Agricultural Technology to present a varied program in ICGAB with a wide range of sessions covering all aspects of innovations and technology advances in food, energy and environment.

For 3 years, ICGAB has brought together nearly 750 delegates coming from national and international universities. I do believe that ICGAB will provides a platform and opportunity for academic staff, students, industry expert, researchers, NGOs, policy makers and others from all over the world to converge an intellectual discussion and explore new ideas and solutions to tackle the sustainable development challenges. I sincerely hope that presentations, contributions and deliberations of our distinguished speakers and delegates will create the interaction with other colleagues with the same aim to meet, learn and share ideas for a better quality of life.

ICGAB 2019 follows the success of the previous ICGAB which started in 2017 with various themes related to green agroindustry and bio-economy. The theme for this year's conference, striving a Green Economy through Innovation Technology in Agroindustry 4.0 Era to Strengthen Sustainable Development, is definitely right on time to thought-provoking issues for those who have a substantive interest in sustainable development.

To all participants, I wish you an enlightening experience in Malang and we hope the end of ICGAB 2019 will be further tightened and developed into much wider global network of cooperation and collaboration to strengthen the sustainable agroindustry.

Lastly, I would like to deeply appreciate Universitas Brawijaya for the excellent support for making this year's event a success.

Wassalamu'alaikum Wr.Wb.

Dr. Agustin Krisna Wardani
Chair of ICGAB 2019

WELCOME SPEECH FROM DEAN FACULTY OF AGRICULTURAL TECHNOLOGY, UNIVERSITAS BRAWIJAYA

Assalamu'alaikum Wr. Wb.

Dear distinguished guests, delegates and ICGAB participants,

I would like to gratefully welcome you all in our campus, Universitas Brawijaya, Malang, Indonesia. This is the third International Conference on Green Agro-Industry and Bioeconomy (ICGAB) organized by our Faculty of Agricultural Technology and we thank the Rector of Universitas Brawijaya for his continuous support.

In the last two years, the International Conference on Green Agro-Industry and Bioeconomy (ICGAB) was successfully held and attended by international participants. In this third year, we cover broader topics to give more opportunities to participants to share and further contribute to a wider issues on Green Agro-Industry and Bioeconomy.

ICGAB is very relevant with the vision, mission and strategic planning of our faculty. The Faculty aims to become a centre of excellence in the field of Agricultural Technology both in the national and International level. We aim to give a significant contribution towards sustainable development for strengthening the national welfare in Indonesia. However, we understand that it is not only Indonesia but the world has also been challenged by food and nutrition security as well as energy security issues. It is our obligation as scientists, researchers and innovators to contribute towards addressing those issues. Therefore, advancements in agricultural technology for sustainable food productions while considering environmental issues, is of great importance.

As part of the local, national and global communities, our faculty has continuously been making significant contribution in finding solutions towards national problems through research, developing technology, machinery, and conducting community service to educate people outside university. We take very seriously national problems such food security and food safety, developing renewable energy resources, waste management, and environmental degradation. Our faculty has also contributed in participating and winning the international research and scientific competition aiming to tackling the global problems. Therefore, it is an honour for our faculty to host ICGAB conference to disseminate knowledge, research results and technology advances, as well as to exchange ideas and share success stories among all of you. It is our hope that this conference will be inspiring and deliver fresh inspiration and motivation to all participants. Thus, we can contribute to foster our national welfare by developing and implementing green-agroindustry and bioeconomy based on local and tropical commodities, while sustaining the environmental sustainability.

Finally, we would like to sincerely thank all of our speakers for their great contributing to this conference program. We would also like to express our gratitude and appreciation to all contributing organisations and to the conference organising

committees who have been working hard and with full dedication to make this conference possible.

We wish you all to have a fruitful conference to allow us to contribute in creating a safe, healthy and eco-friendly world for our future generation.

Wassalamu'alaikum wr.wb.

Prof. Imam Santoso
Dean, Faculty of Agricultural Technology

WELCOME SPEECH FROM RECTOR UNIVERSITAS BRAWIJAYA

Assalamu'alaikum Wr. Wb.

Excellency's, Distinguished Delegates, Ladies and Gentlemen,

On behalf of the University members, it is a great honour for me, to extend to you all, a very warm welcome to Universitas Brawijaya, to Malang – East Java, and to Indonesia.

I would also to take this opportunity to express my sincere gratitude to the Conference Committee and Faculty of Agricultural Technology for organizing The Third International Conference on Green Agro-Industry and Bio-economy.

This year, the ICGAB conference emphasise on Striving a Green Economy through Innovation Tehcnology in Agroindustry 4.0 Era to Strengthen Sustainable Development.

Globally, Indonesia has been well acknowledge as tropical countries with high potential of agricultural commodities and biomass resources. Such potential has beneficially support the creation and expansion of agroindustries at all scales. Some agroindustries still face challenges of better improving the sustainability of their business. The implementation of green economy contributes in trigerring the agroindustries to harness biotechnology and bioscience as well as the information system to be able compete in today agroindsutry 4.0 era. Therefore, transdiciplinary collaboration among relevant stakeholders are critical to ensure that green agroindustry 4.0 and sustainable development goals can be both sucessfully achieved.
Universitas Brawijaya, as one of the best universities in Indonesia, is committed to support the innovation and research development in finding solutions for major problems faced by the nation today. We have experiences in collaboration nationally and internationally through various research and community enggagement programs, hoping to make positive impact on the society. We have also supporting the expansion of green agroindustry 4.0 by providing training, technical supports and further assisstance. Yet, more collaboration with various concerned stakeholders are important to us for bringing more and better innovative values to industry and society.

Therefore, it is an honour for Universitas Brawijaya to host the third ICGAB conference to disseminate research experiences, technology innovation, research and technology advances, as well as to exchange ideas, share success stories and create research collaboration among participants in this conference.
Finally, I wish you all have a fruitful experience and networking from the conference, as well as having an enjoyable experience in Malang, Indonesia.

Wassalamu'alaikum Wr. Wb.

Prof. Nuhfil Hanani
Rector of Universitas Brawijaya

TABLE OF CONTENTS

CONFERENCE COMMITTEES

Scientific Committees

Prof. Masahiro Ikeda (Pharmacology - University of Miyazaki - Japan)
Prof. Hiroyuki Sakakibara (Food Science and Nutrition - University of Miyazaki - Japan)
Prof. Jenshin Linn (Department of Food Science, National Pingtung University of Science and Technology-NPUST, Taiwan)
Prof. Jong Hoon Chung (Seoul National University, South Korea) - Biomaterial
Prof. Tsair Wang Chung (Chung Yuan Christian University, Taiwan) - Bioprocess Engineering
Prof. Taufiq Yap (University Putra Malaysia – Malaysia)
Prof. Irwandi Jaswir (International Islamic University Malaysia)
Assoc. Prof. Dogan Karagan (Yilditz Technical University, Turkey)
Assoc. Prof. Lynsey Melville (Birmingham City University, UK)
Dr. Sarika Jain (World Biogas Association-UK)
Dr. Antoine Kemperman (Univ Twente, Belanda) - Water Treatment/Membrane
Dr. M. Roil Bilad (Universiti Teknologi Petronas, Malaysia) - Membrane Technology
Dr. Syazwani Idrus (University of Putra Malaysia, Putrajaya Malaysia)
Dr. Chan Weng Howe (Department of Software Engineering, Faculty of Computing - Universiti Teknologi Malaysia)
Dr. Mohd. Saberi Mohamad (Department of Software Engineering, Faculty of Computing - Universiti Teknologi Malaysia)
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Dr. M. Sintorini [Universitas Trisakti - Indonesian Society of Sanitary and Environmental Engineers (IATPI)]

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Prof. Imam Santoso (Dean - Faculty of Agricultural Technology)
Prof. Sri Kumalaningsih (Agroindustrial Technology - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Simon Bambang Widjanarko (Agricultural Product Technology - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Bambang Suharto (Agricultural Engineering - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Harijono (Agricultural Product Technology - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Sumardi HS. (Agricultural Engineering - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Wignyanto (Agroindustrial Technology - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Yunianta (Agricultural Product Technology - Faculty of Agricultural Technology, Universitas Brawijaya)
Prof. Teti Estiasih (Agricultural Product Technology - Faculty of Agricultural Technology,

Universitas Brawijaya)
Prof. Elok Zubaidah (Faculty of Agricultural Technology)
Prof. Tri Dewanti (Faculty of Agricultural Technology)
Prof. Sutiman (Biology - Faculty of Mathematics and Natural Sciences)
Dr. Sudarminto Setyo Yuwono (Faculty of Agricultural Technology)

Organizing Committees
Agustin Krisna Wardani, Ph.D (Chairman)
Sri Suhartini, Ph.D
Yusuf Hendrawan, Ph.D
Hendrix Yulis Setyawan, Ph.D
Kiki Fibrianto, Ph.D
Irnia Nurika, Ph.D
Wenny Bekti Sunarharum, Ph.D
Dr. Dodyk Pranowo
Wike Agustin Prima Dania, Ph.D
Suprayogi, Ph.D
Elok Waziiroh, M.Si
Joko Prasetyo, M.Si
Danang Triagus S., MT
Dyah Sushanty

CONFERENCE PROGRAMME (PLENARY SESSION)

Day/Date: Monday/26 August 2019
Venue: Ijen Suites Resort and Convention
Room: Grand Ballroom

TIME	PROGRAMME
07:00-08:00	Registration + Preparing Poster session
08.00-08.10	Opening MC
08:10-08.22	Opening Speech
08.22-08.25	Invocation
	PLENARY SESSION 1 **Chair/Moderator: Joni Kusnadi** **Notulen: M. Bagus Hermanto**
08:25-08:45	**Dr. Seong Gu Hwang:** Pre-Adipocyte Determination and Adipocyte Differentiation of Stromal Vascular Cells Isolated from Intramuscular Tissue of Hanwoo Beef Cattle Treated by Acetate and Propionate
08:45-09:05	**Dr. Phung Le Thi Kim:** Nutrient Enrichment and Value-Added Products Of Pineapple Waste
09.05-09.25	**Dr. Julianne H. Grose:** Microbial biotechnology in the face of industrial revolution 4.0
09.25-09.45	**Dr. Hens Saputra:** Biorefinery Technology for Bioeconomy Development
09:45-10.05	*Panel Discussion* (20')
10.05-11:00	Coffee break
	PLENARY SESSION 2 **Chair/Moderator: Harijono** **Notulen: Ika Atsari Dewi**
10:10-10:30	**Dr. Kongkiti Phusavat:** Education and Green Economy: Pedagogical Development for Underprivileged Students at Bangkok Metropolitan Administration Schools
10:30-10.50	**Yusuf Hendrawan, Ph.D**: The Role of Artificial Intelligence (AI) in The Development of a Sustainable Smart Plant Factory
10.50-11.10	**Prof. Joong-Ho Kwon, Ph.D:** Research & Business Development and Technical Supports for Promoting Agricultural and Food Industries in Korea
11.10-11.30	*Panel Discussion* (20')
11:30-13:00	Lunch and Pray + Poster session
13.00-17.30	**PARALLEL SESSION**
17.30-18.30	Pray
	GALA DINNER
18.30-18.35	Conditioning MC
18.30-18.45	Cutural dance: Tari topeng
18.45-18.50	Dean's report
18.50-19.00	Photo session all participant
19.00-20.30	Dinner
20.30-21.00	**Closing by MC**

CONFERENCE PROGRAMME (PARALLEL SESSION)

Day/Date: Tuesday/ 26 August 2019
Venue: Ijen Suites

Moderator: **Dr. Sucipto (Afb 5; Bbi 1; Ibb 9; Reb 10)**
Topic: **Agroforestry And Biodiversity; Bioeconomy And Biobussiness; Industrial Biotechnology And Bioprocessing; Renewable Energy And Biorefinery**
Venue: **Football Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**REB-19-001**	Himsar Ambarita	The potency of implementation cleaner production in a Palm Oil Mill with capacity 30 ton per hour
2	13.07-13.14	**REB-19-002**	Hendrix Yulis Setyawan	Progress on Bio-oil development as a fuel in Indonesia
3	13.14-13.21	**REB-19-003**	Sri Suhartini	Anaerobic co-digestion of batik wastewater with macroalgae
4	13.21-13.28	**REB-19-005**	Sumaya Yulia Putri	The effect of addition calcium nanoparticles on increase biogas production of palm oil mill effluent
	13.28-13.38	**Discussion Panel**		
5	13.38-13.45	**REB-19-004**	Sri Suhartini	Effect of pre-treatment on anaerobic biodegradability of *Gracilaria verrucosa*
6	13.45-13.52	**REB-19-006**	Ningsi Lick Sangadji	Production of bio-succinic acid from oil palm empty fruit bunches using immobilized bacteria through semi simultaneous saccharification and fermentation
7	13.52-13.59	**REB-19-008**	Irnia Nurika	The Effect of $MnSO_4$ and unrefined sea salt on bioethanol production by the degradation of lignocellulose from oil palm empty fruit bunches (OPEFB) using Phlebia sp. MG-60
	13.59-14.06	**Discussion Panel**		
8	14.06-14.13	**REB-19-007**	Thutug Rahardiant Primadi	Synthesis of nanocomposit SrO@CoFe2O4 and its application as catalyst for production of biodiesel from frying cooking oil (Jelantah)Synthesis of nanocomposit SrO@CoFe2O4 and its application as catalyst for production of biodiesel from frying cooking oil (Jelantah)
9	14.13-14.20	**REB-19-009**	Irnia Nurika	The effect of malt extract and time of incubation on lignocellulose degradation of Oil Palm Empty Fruit Bunches (OPEFB) and ethanol production by Phlebia sp. MG-60
10	14.20-14.27	**IBB-19-001**	Tunjung Mahatmanto	Screening cellulase-producing microbes from sugarcane bagasse and filter cake for industrial applications

NO.	TIME	CODE	PRESENTER	TITLE
11	14.27-14.34	**IBB-19-002**	Masood A G Ali	Assessed the potential of UASB reactors operated at very low up flow velocities to treatment of low strength wastewater at mesophilic temperature 35 ^{o} C
	14.34-14.44	**Discussion Panel**		
12	14.44-14.51	**IBB-19-003**	Pauline Nathania Novitasari	Isolation and identification of cellulose-degrading microorganism from oil palm trunk waste and sugarcane bagasse
13	14.51-14.58	**IBB-19-004**	Nicholle C. Tanaka	Conversion of lignocellulosic biomass to bioethanol: comparison of pretreatment technologies
14	14.58-15.05	**IBB-19-005**	Ajeng Astrini Brahmanti	The effect of calcium and pH on the flocculation ability of *Saccharomyces Cerevisiae* Ncyc 1195
	15.05-15.12	**IBB-19-006**	Netty Kusumawati	Isolation, screening and identification of potential cellulolytic and xylanolytic mold from oil palm waste
15	**15.12-15.22**	**Discussion Panel**		
16	15.22-15.29	**IBB-19-007**	Aji Sutrisno	Alkaline thermostable mannanase characteristics isolated from limestone microorganism
17	15.29-15.36	**IBB-19-008**	Sudarma Dita Wijayanti	Characterization of crude cellulase enzyme produced by *Bacillus licheniformis* p12 isolate
18	15.36-15.43	**BBI-19-001**	Yudhi Prasetya Mada	The influence of store image on purchase decision (case study on Adi Jaya store)
	15.43-15.53	**Discussion Panel**		
19	15.53-16.00	**AFB-19-001**	Martina A. Langi	Local knowledge conservation for biodiversity conservation (a case of Sulawesi, Indonesia)
20	16.00-16.07	**AFB-19-002**	Indra Saputra Kurniawan	Aqueous extraction of galactomannan from various palmae as alternative materials: a review
21	16.07-16.14	**AFB-19-003**	Shierel F. Vallesteros	Tree traits that define timber ideotypes of *Gmelina arborea* roxb
22	16.14-16.21	**AFB-19-004**	Ika Atsari Dewi	Optimization of bleaching process in handmade papermaking from *Areca catechu* L. fiber using response surface method (study of process bleaching time and H_2O_2 content)
	16.21-16.31	**Discussion Panel**		

Moderator: **Dr. Panji Deoranto (APS 25)**
Topic: **Agroindustrial Production System**
Venue: **Fairplay Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**APS-19-001**	Wike Agustin Prima Dania	The optimization of fresh apple inventory by using multi-supplier basnet-leung model (case study in X Supermarket, Indonesia)
2	13.07-13.14	**APS-19-002**	Endah Rahayu Lestari	Drivers of innovation and business performance on small industries
3	13.14-13.21	**APS-19-003**	Uke Prajogo	Evaluation of post-harvest coffee to conform with GMP (Good Manufacturer Practices) to develop entrepreneurship
4	13.21-13.28	**APS-19-004**	Kusubakti Andajani	Identification of characteristics of language and community information needs on processing of agricultural results based on local potential
	13.28-13.38	**Discussion Panel**		
5	13.38-13.45	**APS-19-005**	Uke Prajogo	Entrepreneurship development to upgrade value added of Mas Kirana banana as local potential
6	13.45-13.52	**APS-19-006**	Kusubakti Andajani	Persuasive communication strategy for establishment of Pick Guava tourism area
7	13.52-13.59	**APS-19-007**	Riska Septifani	Green productivity analysis of tempeh chips production (case study on SME Putra Ridhlo Sanan, Malang)
8	13.57-14.04	**APS-19-008**	Muhammad Arif Kamal	Performance analysis and traceability system in the orange fruit supply chain of Keprok Batu 55 (case study in Batu City, East Java)
	14.04-14.14	**Discussion Panel**		
9	14.14-14.21	**APS-19-009**	Imam Santoso	Institutional risk identification of SMEs supply chains with fuzzy failure mode and effect analysis method
10	14.21-14.28	**APS-19-010**	Annisa'u Choirun	Sustainability risk management in the agri-food supply chain: a literature review
11	14.28-14.35	**APS-19-011**	Neza Fadia Rayesa	What affects customer to make online vegetables purchasing in Malang?
12	14.35-14.42	**APS-19-012**	Siti Asmaul Mustaniroh	The development strategy for cluster gadung chips SMEs in Tulungagung Regency, East Java
	14.42-14.52	**Discussion Panel**		
13	14.52-14.59	**APS-19-013**	Fenti Nur Addina	Concept of halal food development for halal tourism: a review

NO.	TIME	CODE	PRESENTER	TITLE
14	14.59-15.06	**APS-19-014**	Azimmatul Ihwah	Forecasting of raw material purchasing quantity for apple juice drink production in PT XYZ Malang
15	15.06-15.13	**APS-19-015**	Miftakhurrizal Kurniawan	Designing traceability information systems for processed apple products chain
16	15.13-15.20	**APS-19-016**	Sukardi	Extraction of phenolic compounds from basil (*Ocimum americanum* l.) leaves with pre-treatment using pulsed electric field (PEF)
	15.20-15.30	**Discussion Panel**		
17	15.30-15.37	**APS-19-017**	Ayman Nazzal	Green marketing mix: the influences on purchasing decision of mozzarella cheese consumers
18	15.37-15.44	**APS-19-018**	Heptari Elita Dewi	Redesigning agro-industry layout by occupational health and safety analysis at tempe chips small and medium enterprise in East Java Indonesia
19	15.44-15.51	**APS-19-019**	Ahmad Syihab Fahmi	The calculation of material handling cost in the ice cream production in PT XYZ
	15.51-16.01	**Discussion Panel**		
20	16.01-16.08	**APS-19-020**	Ardaneswari Dyah Pitaloka Citraresmi	Risk measurement of supply chain for soy sauce products
21	16.08-16.15	**APS-19-021**	Usman Effendi	Company performance measurement using system dynamics approach
22	16.15-16.22	**APS-19-022**	Andan Linggar Rucitra	Demand forecasting for crude palm oil (CPO) using the time series method at PT X
	16.22-16.29	**Discussion Panel**		
23	16.29-16.36	**APS-19-023**	Retno Astuti	Productivity analysis of production process flour with approach green productivity (case study at PT Indofood Sukses Makmur Tbk Bogasari Flour Mills, Jakarta)
24	16.36-16.43	**APS-19-024**	Panji Deoranto	Institutional supply chain analysis of gadung chips (case study in SME Tulungagung regency)
25	16.43-16.50	**APS-19-025**	Danang T. Setiyawan	Design of lean production system with simulation model approach at agar powder production
	16.50-16.57	**Discussion Panel**		

Moderator: **Dr. Yusuf Wibisono (AEN 18; APS 7)**
Topic: **Agricultural Engineering; Agroindustrial Production System Management and Regulation**
Venue: **Defender Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**AEN-19-001**	Dina W Indriani	Silica extraction from rice husk as slow release fertilizer using microwave assisted extraction (MAE)
2	13.07-13.14	**AEN-19-002**	Aprilia Nur Komariyah	Feasibility study on the use of UV/Vis spectroscopy to measure total phenolic compound (TPC) and pH in apple (*Malus sylvestris* L.) combined with chemomectrics analysis
3	13.14-13.21	**AEN-19-003**	Ilham Putra Adiyaksa	Developing partial least square (PLS) model of apple (*Malus sylvestris* L.) internal parameters by means of UV/Vis spectroscopy
4	13.21-13.28	**AEN-19-004**	Arif Faisol	An application of MODIS global terrestrial evapotranspiration for drought assessment and monitoring on agriculture area (case study on East Java – Indonesia)
	13.28-13.38	**Discussion Panel**		
5	13.38-13.43	**AEN-19-005**	Rhoshandhayani Koesiyanto Taslim	Analysis of land use effect on erosion rate (case study: 16 watersheds in Tapal kuda area – East Java)
6	13.43-13.50	**AEN-19-006**	Darmanto	Compression test for candle nut shell to obtain minimum fracture strength
7	13.50-13.57	**AEN-19-007**	Yusuf Wibisono	Hybridization of nitrogen compounds and hydroxyapatite: a slowly released fertilizer for water sustainability
8	13.57-14.04	**AEN-19-008**	Eka Mustika Diniardi	Antibacterial activity of cocoa pod husk phenolic extract againts escherichia coli for food processing
	14.04-14.14	**Discussion Panel**		
9	14.14-14.21	**AEN-19-009**	La Choviya Hawa	Drying kinetics and physical changes of osmotically pretreated potato (*Solanum tuberosum* L.) slice
10	14.21-14.28	**AEN-19-010**	La Choviya Hawa	Some physical and mechanical properties of fermented *Pangium edule* Reinw. seed
11	14.28-14.35	**AEN-19-011**	Yusuf Wibisono	On the development of mini membrane module (mMm) for mass transport assessment of mixed matrix membrane
12	14.35-14.42	**AEN-19-012**	Siti Asmaniyah Mardiyani	Determination of effective moisture diffusivity and activation energy on fixed bed drying of red pepper: a comparison between conventional convective drying and convective solar drying
	14.42-14.52	**Discussion Panel**		

NO.	TIME	CODE	PRESENTER	TITLE
13	14.52-14.59	**AEN-19-013**	Istifar Yogi Prayogi	Design of prediction tools for banana maturity based on image processing
14	14.59-15.06	**AEN-19-014**	Shafiq Nurdin	Design of multifunction paddy harvesting machines and harrow machines
15	15.06-15.13	**AEN-19-015**	Sandra Malin Sutan	Vitamin C prediction of tomatoes based on image processing using TCS3200 color sensor
	15.13-15.20	**Discussion Panel**		
16	15.20-15.27	**AEN-19-016**	Retno Damayanti	Artificial neural network to predict chlorophyll content of cassava (Manihot esculenta) leaf
17	15.27-15.34	**AEN-19-017**	Cahya Sriwulandari	The effect of giving cow livestock's liquid waste as fertilizer for coffee plant (Coffea canephora var. Robusta) growth
18	15.34-15.41	**AEN-19-018**	Nur Ida Winny Yosika	Application of electro-osmosis methods in *Brassica juncea* .l with soil and voltage variations
	15.41-15.48	**Discussion Panel**		
19	15.48-15.55	**APS-19-026**	Danang T. Setiyawan	Analysis implementation of reliability centered maintenance at XX sugarcane industry
20	15.55-16.02	**APS-19-027**	Muhammad Arif Kamal	Good manufacturing practice (GMP) implementation assessment of tea beverage production
21	16.02-16.09	**APS-19-028**	Wendra G Rohmah	Analysis of financial feasibility and value-added enhancement of corn milk product development
22	16.09-16.16	**APS-19-029**	I Gusti Bagus Udayana	Application model development of Bangli arabica coffee
	16.16-16.26	**Discussion Panel**		
23	16.26-16.33	**APS-19-030**	Masud Effendi	Peppermint hard candy packaging design with kansei engineering
24	16.33-16.40	**APS-19-031**	Yuli Wibowo	Risk management of fermented cassava agroindustry in Jember Regency, East Java Province, Indonesia
25	16.40-16.47	**APS-19-032**	Samsul Hidayat	Air pressure distribution analysis of multirotor agricultural drone
	16.47-16.54	**Discussion Panel**		

Moderator: **Dr. Aji Sutrisno (FMI 5; FSS 11; HNM 7)**
Topic: **Food Microbiology; Food Safety and Security; Health, Nutrition and Medical**
Venue: **Striker Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**FSS-19-001**	Tunjung Mahatmanto	Development of a low-cost corn starch-based edible coating with active lactic acid bacteria for fresh produce protection
2	13.07-13.14	**FSS-19-002**	Ihsan Wira Senjaya	Policy model on the production and availability of rice in Magelang Regency
3	13.14-13.21	**FSS-19-003**	Ihsan Wira Senjaya	System dynamic models of the value of environmental losses from conversion of paddy fields
4	13.21-13.28	**FSS-19-004**	Rosalina Anindita Ayuningtyas	Preliminary study: the use of neera (sugarcane juice) to replace white sugar in an effort to overcome diabetes mellitus
	13.28-13.38	**Discussion Panel**		
5	13.38-13.45	**FSS-19-005**	Rakhmawati	Analysis of vitamin C content and physical quality (overrun & melt speed) cashew ice cream (*Anacardium occidentale* L)
6	13.45-13.52	**FSS-19-006**	Irfan Zikri	Trends analysis and determinant factors to import of soybean 2003-2022 in Indonesia
7	13.52-13.59	**FSS-19-007**	Nikmatul Khoiriyah	An econometric analysis of household animal food demand in East Nusa Tenggara, Indonesia
	13.59-14.06	**Discussion Panel**		
9	14.06-14.13	**FSS-19-008**	Novi Haryati	The effect of training and agricultural innovations on farmer performance (case study on paddy farmers in Malang-Indonesia)
10	14.13-14.20	**FSS-19-009**	Alia Fibrianingtyas	Role of community forest area in utilization of forest commodities to support household food security in UB forest
11	14.20-14.27	**FSS-19-010**	Sucipto	Analysis of lean six sigma in reducing waste on wheat flour packing process
	14.27-14.34	**Discussion Panel**		
13	14.34-14.41	**HNM-19-001**	Sarah Devi Silvian	The effect of TetM gene instability on antibiotic resistance expression in *Lactobacillus casei* FNCC 0090
14	14.41-14.48	**HNM-19-002**	Sogandi	Bioactive compound analysis and antioxidant activity of endophytic bacterial extract from noni fruits (*Morinda citrifolia* l.)
15	14.48-14.55	**HNM-19-003**	Ruri Siti Resmisari	Potential analysis of plants as a raw material of herbs by society of Grati, district of Pasuruan

NO.	TIME	CODE	PRESENTER	TITLE
16	14.55-15.02	**HNM-19-004**	Maria Matoetina Suprijono	ADME toxicity evaluation of papua red fruit flavonoids through computational study
	15.02-15.12	**Discussion Panel**		
17	15.12-15.19	**HNM-19-005**	Nabeel Ahmed R.	*Garcinia mangostana* Linn. pericarp extract reduced malondialdehyde (MDA) level in cigarette smoke exposed rats
18	15.19-15.26	**HNM-19-006**	Vita Purnamasari	Computational study of the potential of phenolic acid berries as inhibitor of aldose reductase for diabetes mellitus treatment
19	15.26-15.33	**HNM-19-007**	Mieke Alvionita	In vitro and in silico analysis of xanthine oxidase inhibitory activity of peanut (*Arachis hypogaea* L.) shell ethanol extract
	15.33-15.40	**Discussion Panel**		
20	15.40-15.47	**FMI-19-001**	Nur Latifatul Qodriyah	Isolation of lytic bacteriofhage and its potency to control cronobacter spp. – opportunistic food-borne pathogens
21	15.47-15.54	**FMI-19-002**	Vitta Rizky Permatasari	Analysis of probiotic characteristics and BAL viability of seaweed hydrolysis (*Eucheuma cottoni*)
22	15.54-16.01	**FMI-19-003**	Suprayogi	Optimization of alcohol fermentation on subgrade red dragon fruit (*Hylocereus polyrhizus*) vinegar using response surface methodology (research of sugar addition and yeast concentration)
23	16.01-16.08	**FMI-19-004**	Yoga A. Handoko	Current status: the diversity of *Bacillus subtilis* phage morphology and their genome characterization
	16.08-16.18	**Discussion Panel**		

Moderator: **Dr. Akhmad Adi Sulianto (WEM 25)**
Topic: **Wasye And Environmental Management**
Venue: **Champion Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**WEM-19-001**	Novia Lusiana	Determination load pollution capacity of Ngrowo River As wastewater receiver from hospital activities in Tulungagung Regency
2	13.07-13.14	**WEM-19-002**	Putri Setiani	Production of biodegradable package material from tofu industry byproduct
3	13.14-13.21	**WEM-19-003**	Tri Rahayuningsih	Exploration source of natural dyes for batik from fresh and fallen leaves
4	13.21-13.28	**WEM-19-004**	Amelia Ika Puspitasari	Environmental risk analysis of the Bedadung Watershed using DPSIR
	13.28-13.38	**Discussion Panel**		
5	13.38-13.45	**WEM-19-005**	Archie B. Lauderes	Energy bill and CO_2 emissions of corn (*Zea mays*) under present production systems of Samar, Philippines
6	13.45-13.52	**WEM-19-006**	Millatul Ulya	Life cycle assessment of cassava-based food products
7	13.52-13.59	**WEM-19-007**	Dodyk Pranowo	Optimization process of spent bleaching earth regeneration using nitric acid concentration and heating temperature
8	13.59-14.06	**WEM-19-008**	Aulia Nur Mustaqiman	Mapping of fire hazard as early mitigation by using ArcGIS 4.0 in Malang City
	14.06-14.16	**Discussion Panel**		
9	14.16-14.23	**WEM-19-009**	Elviliana	Sterilisation technology for disposable diapers wastes using double jacket and centrifugal speed principles
10	14.23-14.30	**WEM-19-010**	Mohamad Amin	Activity of indigen bacteria consortium for improving biologycal aspect of waste from Hospitals dr Darsono Pacitan
11	14.30-14.37	**WEM-19-011**	Dwi Novanda Sari	Effects of sonication temperature and time on protein degradation of fish feed industrial waste as raw material of organic nanofertilizer
12	14.37-14.44	**WEM-19-012**	Hotnida Nainggolan	Driving factors for the success of the green industrial estate
	14.44-14.54	**Discussion Panel**		

NO.	TIME	CODE	PRESENTER	TITLE
13	14.54-15.01	**WEM-19-013**	Rihastiwi Setiya Murti	The tanning of barramundi fish skin for shoe upper
14	15.01-15.08	**WEM-19-014**	Abraheem Omar Maetouq	Air pollution control Indoor emission
15	15.08-15.15	**WEM-19-015**	Aulia Firda Alfiana	The potential of reusable water in soy sauce production process (a case study: Grobogan Regency)
	15.22-15.29	**Discussion Panel**		
16	15.29-15.36	**WEM-19-016**	Leo-Paul Vaurs	Investigation of several surfactant use strategies to improve newspaper glucan conversion
17	15.36-15.43	**WEM-19-017**	Uswatun Nurkhasanah	Keratin biofilm from chicken feathers
18	15.43-15.50	**WEM-19-018**	Yusuf Wahyu Adi	Synthesis and characterization of carboxymethyl cellulose-keratin based biofilm
	15.50-15.57	**Discussion Panel**		
19	15.57-16.04	**WEM-19-019**	Seli Ekatiwi	Synthesis and chicken feather-keratin/polyethylene composite
20	16.04-16.11	**WEM-19-020**	Luhur Akbar Devianto	Biosurfactants production using glucose and molasses as carbon sources by *Azotobacter vinelandii* and soil washing application in hydrocarbon-contaminated soil
21	16.11-16.18	**WEM-19-021**	Luhur Akbar Devianto	GIS based multicriteria analysis for fecal sludge treatment facilities site selection (case study: Bogor Regency)
	16.18-16.25	**Discussion Panel**		

Moderator: **Dr. Erni Sofia Murtini (APT 22; AWT 1; FMR 2)**
Topic: **Agricultural Product Technology; Animal Welfare and Technology**
Venue: **Schudetto Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**AWT-19-001**	Dewi Ratih Ayu Daning	Animal welfare assessment of dairy cows in Indonesia
2	13.07-13.14	**FMR-19-001**	Iffan Maflahah	Benefit-cost for selecting technolgy in salt production
3	13.14-13.21	**FMR-19-002**	Cita Mahardika Hariyono	Black soldier fly (*Hermetia illucens*) larvae-based fish feed Production Fermented by *Rhizopus oryzae*
	13.28-13.35	**Discussion Panel**		
5	13.35-13.42	**APT-19-001**	Yusuf Hendrawan	Effect of amplitude variation and exposure time of ultrasonic assisted extraction (UAE) on dayak onion powder extraction (*Eleutherine palmifolia*) with purified water solvents
6	13.42-13.49	**APT-19-002**	Sri Rejeki Retna Pertiwi	A response surface methodology for optimizing the non-gluten over ripe canistel powder formulation
7	13.49-13.56	**APT-19-003**	Jaya Mahar Maligan	The role of pulsed electric field (PEF) with thermocontrol modification as an elicitor to increase bioactive compound in local soybean
8	13.56-14.03	**APT-19-004**	Marchella Karnesia Kinsky	Sensory profilling optimisation of lemongrass (*Cymbopogon citratus*) and pandan (*Pandanus amarylifolius roxb.*,) herbal tea on several brewing techniques
	14.03-14.13	**Discussion Panel**		
9	14.13-14.20	**APT-19-005**	Musthofa Lutfi	Appropriate technology application of traditional clove oil production in East Java, an effort to up-grade quality
10	14.20-14.27	**APT-19-006**	Kiki Fibrianto	Effect of brewing time and duration of listening to mozart's symphony on emotions and sensory perception of Wonosari green tea
11	14.27-14.34	**APT-19-007**	Eka Shinta Wulandari	The effect of sucrose and citric acid concentration of candi banana peels jam on physico-chemical and sensory characteristics
12	14.34-14.41	**APT-19-008**	Rambu Abigail Deanira Kapita	Process optimisation on the production of biodegradable plastic from starch and cassava peel flour using response surface methodology
	14.41-14.51	**Discussion Panel**		
13	14.51-14.58	**APT-19-009**	Nauas Domu Marihot	Assessment of drying method on characteristic of dried temper chilli producing abon cabe

NO.	TIME	CODE	PRESENTER	TITLE
			Romauli	
14	14.58-15.05	**APT-19-010**	Wenny Bekti Sunarharum	Effect of different manual brewing methods on the sensory profile of the indonesian robusta "natural coffee"
15	15.05-15.12	**APT-19-011**	Alphiano Diza Kambodji	Effect of sodium alginate concentration and calcium source on the physical properties of coffee caviar
	15.12-15.19	**APT-19-012**	Satria Bhirawa Anoraga	Effect of packaging and storage method on snake fruit (*Salacca edulis*) quality
	15.19-15.29	**Discussion Panel**		
16	15.19-15.26	**APT-19-013**	Nadhira S. Adawiyah	Effect of carrier agents on the physical properties of probiotics microencapsulated by spray drying
17	15.26-15.33	**APT-19-014**	Dodyk Pranowo	Optimization of polyphenol extraction process of green coffee beans using maceration method (study of ethanol concenration and solvent ratio)
18	15.33-15.40	**APT-19-015**	Rosalina Ariesta Laeliocattleya	The effect of temperature and drying time on total phenolics, flavonoids and antioxidant activity of corn silk (Zea mays L.) herbal drinks tea with vacuum drying method
	15.40-15.47	**APT-19-016**	Dego Yusa Ali	Effect of extraction method and solvent ratio on bioactive compounds of dayak bulb extract (*Eleutherine palmifolia* L. Merr)
	15.47-15.57	**Discussion Panel**		
19	15.57-16.04	**APT-19-017**	Claudia Gadizza Perdani	Formulation of mashed potatoes (*Solanum tuberosum* L.) as Tengger culinary product
20	16.04-16.11	**APT-19-018**	Jatmiko Eko Witoyo	Polishing effect on the physicochemical properties of porang flour using centrifugal grinder
21	16.11-16.18	**APT-19-019**	Mahayu Woro Lestari	Viability of *Crassocephalum crepidioides* seeds due to boron application
	16.18-16.25	**Discussion Panel**		
22	16.25-16.32	**APT-19-020**	Nimatus Sholihah	Sensory optimization of robusta and liberica coffee leaves functional tea by modifying brewing temperatures
23	16.32-16.39	**APT-19-021**	Septi Darlia Putri	Fermentation time optimization of young robusta coffee leaf kombucha
24	16.39-16.46	**APT-19-022**	Hyldegardis Naisali	Sensory characteristics of kacang nasi and soya beans tempeh
	16.46-16.53	**Discussion Panel**		

Moderator: **Dr. Joni Kusnadi (APT 23)**
Topic: **Agricultural Product Technology**
Venue: **Winner Room**

NO.	TIME	CODE	PRESENTER	TITLE
1	13.00-13.07	**APT-19-023**	Tiara Kumala	Utilization of glucomannan as an anti-staling agent to improve the texture value of whole wheat Bread
2	13.07-13.14	**APT-19-024**	Ariza Budi Tunjung Sari	Complete valorization of whole parts of cocoa fruit towards sustainable production system in cocoa agroindustry
3	13.14-13.21	**APT-19-025**	Nur Lailatul Rahmah	Analysis of PEF (*Pulsed Electric Field*) input energy and its effect to the tannin content of areca (*Areca catechu* L.) seed powder extract
4	13.21-13.28	**APT-19-026**	Nissa Clara Firsta	The effect of saponification crude palm oil using sodium hydroxide and potassium hydroxide on unsaponifiable fractions containing multi-component bioactive compounds: a review
	13.28-13.38	**Discussion Panel**		
5	13.38-13.45	**APT-19-027**	Anjar Kistia Purwaditya	Better sweet mahkota dewa (*Phaleria macrocarpa*) functional drink
6	13.45-13.52	**APT-19-028**	Firman Jaya	Antioxidant and antimicrobial activities of beebread harvested from different species honeybee
7	13.52-13.59	**APT-19-029**	Shreef Mahmood	Effect of postharvest treatments on shelf life and quality of BARI Strawberry-1
8	13.59-14.06	**APT-19-030**	Luluk Sulistiyo Budi	The effect of heating temperature on several varieties on the production and quality of sesame oil
	14.06-14.16	**Discussion Panel**		
9	14.16-14.23	**APT-19-031**	Ahmad Zaki Mubarok	The rheological properties of tomato ketchup as a function of different concentrations of porang flour and temperature
10	14.23-14.30	**APT-19-032**	Susinggih Wijana	Formulation of vegetable seasoning made from raw material of protein hydrolyzate of coconut blondo

NO.	TIME	CODE	PRESENTER	TITLE
11	14.30-14.37	**APT-19-033**	Grace Maria Ulfa	The influence of temperature in swelling power, solubility, and water binding capacity of pregelatinized sweet potato starch
12	14.37-14.44	**APT-19-034**	Shindy Mega Ammelia	The changing profiles of chemical content during black garlic processes
	14.44-14.54	**Discussion Panel**		
13	14.54-15.01	**APT-19-035**	Mahmuddin Ridlo	Process of microwave assisted extraction (MAE) for rhodomyrtus tomentosa fruit and its bioactive compounds
14	15.01-15.08	**APT-19-036**	Eko Budi Minarno	Utilization of emprit ginger (*Zingiber officinale* var. amarum) by the community of duwet krajan, Tumpang district, Malang regency
15	15.08-15.15	**APT-19-037**	Angky Wahyu Putranto	The cyclone separator application on physicochemical characterization of coconut shell-liquid smoke grade c
	15.15-15.22	**Discussion Panel**		
16	15.22-15.29	**APT-19-038**	Angky Wahyu Putranto	Coconut shell liquid smoke production based on the redistillation technology and its characterization
17	15.29-15.36	**APT-19-039**	Susinggih Wijana	Hand sanitizer formulation using orange essential oil
18	15.36-15.43	**APT-19-040**	Fitrian Aulia	The effect of addition of red beetroot (*Beta vulgaris* l. var. rubra l.) powder on physicochemical properties of beetroot cookies
	15.43-15.50	**Discussion Panel**		
19	15.50-15.47	**APT-19-041**	Mokhamad Nur	Functionality and recent application of tragacanth in foods
20	15.57-16.04	**APT-19-042**	Erni Sofia Murtini	Pandan leaf powder, characteristics and its application in pandan sponge cake making
21	16.04-16.11	**APT-19-043**	Mokhamad Nur	Effect of drying techniques on microstructure and functional properties of tragacanth-insulin microparticles
22	16.11-16.18	**APT-19-044**	Sudarminto Setyo Yuwono	Shelf life model of frozen button mushroom (*Agaricus bisporus*) using arrhenius approach
	16.18-16.25	**Discussion Panel**		

KEYNOTE SPEAKERS

Biorefinery technology for bioeconomy development

H Saputra

Center of Technology Energy Resources and Chemical Industry, Agency for The Assessment and Application of Technology, Jakarta, Indonesia

E-mail : hens.saputra@bppt.go.id

Abstract. The biomass can be transformed in several products such as fuels, power, chemicals and materials using biorefinery technology. The advantages of this technology is reduction the environmental impact while producing the valuable materials. In fine chemicals production from biomass, there are several processing method categories which are using some technology such as chemical and biological processing, thermochemical and separation processes. The future biorefinery will have a major impact on society while fossil-derived resources become limited and more expensive. BPPT was developing some technology of fuels, petrochemicals production and the equipment such as biogas, biomass gasification, slow release fertilizer (SRF), bioethylene, etc. Palm oil mild effluent and EFB was able to use as raw material to produce biogas and electricity. The pilot plant with capacity of 1 MW was built in Riau, Sumatera which could be controlled online from Jakarta. The organic wastes could be used as the matrix for slow release fertilizer. According to the demplot test for paddy and corn showed the increasing efficiency of fertilizer ca.30% and increasing the productivity ca.10%. The frequency of fertilization could be reduced only once for seasoning crops.

Pre-adipocyte determination and adipocyte differentiation of stromal vascular cells isolated from intramuscular tissue of Hanwoo beef cattle treated by acetate and propionate

SG Hwang

Department of Animal Life and Environmental Science, Hankyong National University, South Korea

Abstract. The effects of acetate and propionate in enhancing intramuscular fat (marbling) deposition in beef cattle are poorly understood. This study aimed to evaluate the effects of acetate and propionate on preadipocyte determination and adipocyte differentiation in stromal vascular cells (SVC) isolated from the intramuscular tissue of Hanwoo beef cattle. SVC were isolated and treated with different concentrations of acetate and propionate (0.125 to 1 mM). Pre-adipocyte determination was observed through the Zfp423 (Zinc finger protein 423) and Pref-1 (Pre-adipocyte factor-1) genes expressions, which were important transcription factors used to identify committed pre-adipocytes. Adipocyte differentiation was determined based on the lipid accumulation, triglyceride contents, and their molecular activities related to adipogenic markers. The results suggest that acetate supports pre-adipocyte determination in SVC which is observed to increase the expression of Zfp423 and Pref-1 along with the increasing acetate concentration. Propionate treatment was seen to significantly affect lipid accumulation as well as triglyceride content in SVC, compared to acetate treatment. Furthermore, propionate treatment very significantly increased the expressions of PPARγ, C/EBPα, SREBP-1c, and FABP4. In conclusion, acetate likely enhances pre-adipocyte determination, while propionate effectively promotes adipogenesis in SVC isolated from the intramuscular tissue of Hanwoo beef cattle.

Research & business development and technical supports for promoting agricultural and food industries in Korea

JH Kwon

School of Food Science and Biotechnology, College of Agriculture and Life Sciences, Kyungpook National University, Daegu, Republic of Korea (South)

Abstract. The Korean government first established the Central Fishers Experimental Station (now National Institute of Fisheries Science/NIFS) in 1949 and the Rural Development Administration (RDA) in 1962, respectively. At that time there were 12 National Universities with Agricultural and Fisheries Colleges in 9 local provinces in the Republic of Korea, but no academic societies were existed in the field of agriculture and food science sectors. Since then RDA has founded 4 different National Institutes of Agricultural Sciences (NAS), of Crop Science (NICS), Horticultural and Herbal Science (NIHHS), and of Animal Science (NIAS) along with the Korea National Agricultural and Fisheries College for both R & D of agricultural sciences & technologies and educational programs for training human resources. Subsequently in 2009, RDA finally established the Foundation of Agricultural Technology Commercialization & Transfer (FACT) in order to professionally support agricultural & food industries in Korea using the accumulated technologies and patents resulting from R & BD by the National Institutes and Universities' labs. The professional businesses of FACT include Technology Commercialization, Creative Technology Management, Analysis & Certification Service, and Seed & Seedling Business. FACT supports agricultural businesses in enhancing their competitiveness through its technology transfer and business incubation services along with providing initial funding for commercialization to tech-transfer beneficiaries. On the other hand, the Korea Food Research Institute (KFRI) was established in 1989 as one of the first government-supported Food Research Institutes. Rice Processing Complex invented by KFRI had led the Korea food industry. In particular, Korea's fermentation technology creates various fermented foods including Kimchi, and its technical competitiveness of producing amino acids is the best place in the world. The food industry plays a major role in the modern industrial development. It is understood that the global food market is 2.5 times larger than that of automobiles. The agri-food industry is also an important field of creating new global markets by fusing with other areas like national culture. Recently, most of Korean Universities have their own Industry-Academic Cooperation Foundation, which is in charge of creating the best environment for R & D based on the industry-academia cooperation and also managing the technology-related businesses in the campus.

Education and green economy: pedagogical development for underprivileged students at Bangkok metropolitan administration schools

K Phusavat

Department of Industrial Engineering, Faculty of Engineering, Katsersat University, Thailand

Abstract. One of the most critical success factors for transforming a country to Green Economy is education. Human capital is the product of education which includes early childhood, basic, vocational, and higher education. Inclusiveness and the ability to engage with the community for public awareness on environment and life style have become essential in contemporary education due to the need to strengthen the soft skills of young graduates. Further, science education has become the pre-requisite for this transformation. Bangkok, as the capital of Thailand, has been negatively impacted by the rapid growth in economic and social development. Its size has increased from 5 to 9 million residents over the past two decades, together with the popularity as the global destination for the tourists. In fact, Bangkok is the second most visited city in the world in 2018 in accordance to World Economic Forum. Bangkok welcomed more than 21 million visitors in 2018. Despite its recognition as the global city with GDP per capita value of almost $20,000 which is ranked in the top 5 cities in Asia; the environmental concern has become apparent among its residents and visitors. Science education has traditionally focused on preparing future students to continue their higher education in basic, engineering, and medical science. Recently, there has been a shift in the mindset among senior policy makers on the roles of science education. This shift has been influenced by the transformation to Digital and Green Economy in the country. In particular, Bangkok Metropolitan Administration or BMA has reexamined science education more actively because it provides educational services to the underprivileged students. It is important to note that the students from more well-to-do families attend international, university teacher training, private, and Ministry of Education schools. BMA schools are under the jurisdiction of Ministry of Interior. The pilot project has been conducted with two BMA schools since 2015 to help integrate environment and ecological consideration into science education. The findings have highlighted the importance of pedagogical practices and student's empathy. In this pilot project, instead of conducting science experiment to prove the theory/ concept, prototype and product development become an output from this experiment. Such products include fertilizer from waste and chemical-free detergents. Finally, creating the future citizens who understand the need to change the life style for better environment and appreciate their contributions to this cause helps sustain the Green Economy transformation.

Microbial biotechnology in the face of industrial revolution 4.0

JH Grose

Department of Microbiology and Molecular Biology, Brigham Young University, The United States of America

Abstract. Estimated at 1030, bacteria are the most abundant cellular lifeforms on the planet. Their diversity is equality astounding with over a million species that are capable of a wide diversity of lifestyles and cellular metabolism, shaping every ecological habitat on the planet. These natural metabolic abilities have been harvested for a wide range of industrial uses. However, bacteria are also industrial culprits, contaminating many industrial processes. Manipulation of microbiomes has, therefore, come to the forefront of many industrial processes. Microbiome manipulation therapies based solely on probiotic approaches are marginally successful treatments in part because the probiotic bacteria must compete with the residing microbiome. On the other hand, microbiome replacement therapies based solely on elimination of troublesome bacteria may also be ineffective in the long run due to invasion by damaging bacteria. Several studies have shown enhanced microbiome replacement when the residing microbiome is displaced in concert with administration of a probiotic. Here in we present a microbiome replacement therapy for apple trees that utilizes bacteriophages to displace bacterial pathogens combined with a probiotic of healthy competing bacteria. Bacteriophages, or viruses that infect bacteria, provide a natural antagonist to manipulate bacteria due to their ability to infect and kill their hosts. Over thirty bacteriophages that infect the pathogen *Erwinia amylovora* were isolated, sequenced and characterized and the best candidates were combined with a probiotic therapy for treating fire blight in apple trees. Data from field trials using bacteriophages alone or combined probiotic replacement will be presented, and the challenges to microbial manipulations will be discussed.

The role of artificial intelligence (AI) in the development of a sustainable smart plant factory

Y Hendrawan

Department of Agricultural Engineering, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia

E-mail: yusufhendrawan@gmail.com

Abstract. The biggest problem in agriculture is the adequacy of food to meet the food needs of nine billion people in 2050. The problem of adequacy of agricultural products is also influenced by the availability of less agricultural land, an environment that is not optimal due to global warming, plant pests and diseases, and less availability of natural resources and energy. Smart plant factory technology based on artificial intelligence (AI) is the solution to solving the food problem. The AI application is very important to build an optimal plant factory. The purpose of this study is to observe the effectiveness of using AI in developing a smart plant factory. The use of a combination of computer vision and artificial neural network (ANN) has shown optimal results in the development of intelligent irrigation system and intelligent lighting system based on the speaking plant approach (SPA). The application of nature-inspired algorithms based optimization techniques proved successful for increasing the accuracy of intelligent irrigation system modeling with a root mean square error (RMSE) value of 1.09 × 10-2, as well as intelligent lighting system (RMSE of 6.49 × 10-3). The computer vision method using ANN model which has been developed can predict nitrogen content of vegetables with R2 of testing set data of 0.99. The use of fuzzy controls can also improve plant growth performance. Temperature and humidity control based on fuzzy logic can increase vegetable by 10% and oyster mushrooms productivity by 59.4%. The use of sonic bloom technology i.e. traditional Javanese music (gamelan) at a frequency of 172 Hz - 15676 Hz with a 3-hour exposure time increases plant productivity to 170%.

Nutrient enrichment and value-added products of pineapple waste

PLT Kim, TTV Minh, HP Nhat, VT Tan

Faculty of Chemical Engineering, Ho Chi Minh City University of Technology-VNU, Ho Chi Minh, Vietnam

Abstract. Pineapple (*Ananas comosus*) is one of the most economically tropical fruits in the world production after banana and citrus. It has been widely used for food processing in the industry such as juice extraction, and dried fruit. However, there is a large number of residues including peel, pulp, stem, eye, and leaves, which constitutes more than 50% of the original weight. Processing residuals range between 45 to 65%, an indication of serious organic-side streams disposal challenges, which causes environmental pollution if not successfully utilized since it keeps increasing in agro-industrial plants without having any significant and commercial value. On the other hand, these residues not only contain various enzymes, proteins, fats, and carbohydrates but they also compose cellulose, hemicellulose, and multivitamins that are promising to produce medicine. There are adequately of articles that reported they are favorable to converse biology to produce biochemicals and biofuels. This study aims at presenting a detailed account of these gained achievements when taking advantage of pineapple waste source to produce value- added products such as Bromelain enzyme production technology, technology for sustainable pineapple leaf fiber (PALF) productions, production of bioethanol and animal feed from fermented pineapple waste. The reuse of pineapple waste from factories that produce juice and canned fruits contributes to minimizing environmental pollution and bringing about huge profits because the current demand for functional foods as well as natural origin products is significantly increased. In addition, their nutritional values and benefits are undisputed, optimizing the production process and production costs are still challenges for future researchers.

Dr. Hens Saputra

Dr. Hens Saputra is a director of Center for Energy Resource Technology and Chemical Industry Deputy for Information Technology, Energy and Materials that is located in South of Tangerang, Banten, Indonesia. His research interests are mainly on porous material, development and characterization, membranes and molecular sieves, synthesize and characterization, separation and purification, water and waste water treatment and battery. He has lots of professional experiences, such as a director of pilot project of integrated salt industry in 2018, as a leader of CRF fertilizer innovation for red onion, a leader for chemical fertilizer development in 2017. Dr. Ir. Hens Saputra published national and international papers and attending conferences, for the example an international seminar on biomass and biorefinery industry at Kuala Lumpur, Malaysia. He has many awards and patents. The patentsincludes Electrochemical Cell as Relative Humidity Sensor (2011) and A Metal-Air Battery Utilizing Phosphonium-Based Deep Eutectic Solvent, Malaysia Patent (2012). His newest achievement is Satyalancana Karya Satya 20th years from president of Republic of Indonesia (2017).

Prof. Seong Gu Hwang

Prof. Seong Gu Hwang is a lecturer at Konkuk University since 1987 – present, his teaching experiences are nutrition experimental animal, animal nutrition and feed, environmental toxicology, feed sanitation, immunology research, and etc. Seong Gu Hwang has completed his higher qualification from Hankyong National University, Korea and currently working in Department of Animal Life and Environmental Science, Hankyong National University, Korea. He received a full scholarship student awards in Kyoto University supported by Japanese Monbusho (Educational Department of Japanese Government). He published several journal articles, proceedings and deliver presentations in conferences. The publications could be foundsuch as in Tropical Animal Science Journal, Journal of Medical Food and etc. He has many patents, for example Novel *Geobacillus thermodenitrificance* SG-01 having Nitrates-eliminating function and method using the same microbes, Novel *Lactobacillus coryniformis* HD-02 with antimicrobial and probiotic activity and its use, Pharmaceutical Composite for the Suppression of Avian Influenza infection by using Korea Mistletoe, Feed Additive for the Suppression of Avian Influenza infection by using Korea Mistletoe and Composite of animal feed additive containing Angelica gigas Nakai Root Hot Water Extract to reduce the heat stress.

Prof. Jong Ho Kwon

Prof. Jong Ho Kwon is a full Professor in School of Food Science and Biotechnology, Kyungpook National University (KNU). He is also Director Food and Bio-industry Research Institute & BK21Plus Creative Innovation Group for Future Functional Food Industry in KNU. His expertise include food irradiation, control of irradiated food, as well as on developing the detection methods for irradiated food. He has owned several patents include patents for extraction method for ginseng saponins, patents for preservation methods for fresh mushrooms, and patents for hygienization methods for dried food and its ingredient. He has also been working on the alternative green technology to improve food safety and quality in the food industries in connection with climate change.

Prof. Kongkiti Phusavat

Dr. Kongkiti Phusavat is a Professor at Department of Industrial Engineering, Kasetsart University in Bangkok, Thailand. Dr. Phusavat earned his master and doctoral degrees from Department of Industrial and Systems Engineering, Virginia Polytechnic Institute and Sate University or Virginia Tech in the U.S. Dr. Phusavat attended Texas Tech University in the U.S for his undergraduate study in Industrial Engineering. His research and work interests include productivity measurement, quality improvement, performance management, acquisition logistics, design process and systems engineering, value chain management, pedagogical development for basic education, and networked government. Dr. Phusavat is the author of the book-the title of "Productivity Management in an Organization: Measurement and Analysis" and has contributed the chapters to several texts in the areas of process management and improvement. Dr. Phusavat has published over 100 referred journal articles for the past fifteen years. He is currently the Editor in Chief of International Journal of Innovation and Learning (Scopus-indexed journal) and serves several leading international journals and publisher as Senior Advisor, Associate Editor, Editor, Editorial Board Member, and Reviewer. He again received the recognition of 2015 Emerald Literati Award-Highly Recommended Paper. Currently, Dr. Phusavat is working with Thailand's Board of Trade in two capacities- the Chairman of Education and Skills Committee of Joint Foreign Chamber of Commerce in Thailand and a committee in Thai Chamber of Commerce's Education Committee. Dr. Phusavat has been actively working in the areas of education, especially pedagogical research and development in the past five years. Dr. Phusavat was granted the title of Honorary Professor in 2017 from Maria Curie-Skłodowska University, Poland due to his efforts on research and academic collaboration with Kasetsart University. Dr. Phusavat is a regular examiner for the universities in Australia, Finland, Malaysia, and United Arab Emirates. He has been frequently asked to evaluate research and project proposals from the funding agencies in Asia and Europe such as Austrian Science Fund. Finally, he has given the lectures and has conducted the workshops at several universities in Australia, Finland, Hong Kong SAR, India, Indonesia, Malaysia, Poland, South Korea, Taiwan ROC, Slovenia, and the U.S.

Julianne H. Grose, Ph.D.

Julianne H. Grose, Ph.D is Associate Professor in the Department of Microbiology and Molecular Biology at Brigham Young University. Her teaching is dedicated to bringing novel research experiences into the classroom through an international program, Phage Hunters (HHMI SEAPHAGES program). Research in her laboratory is dedicated to two main projects: 1) the study of glucose allocation, and 2) the study of bacteriophages that infect the Enterobacteriaceae family of bacteria. She obtained her PhD at University of Utah in 2003 and she had post doctorate in bioenergenix (pharmaceutical company) at University of Utah. She also active in professional organization such as president of the Intermountain Branch of the American Society for Microbiology (2017-2018), member of the Science Education Alliance (SEA), American Heart Association (AHA), American Society for Microbiology (ASM), American Society for Cell Biology (ASCB), Genetics Society of America (GSA).

Yusuf Hendrawan, Ph.D

Yusuf Hendrawan, Ph.D is Associate Professor in Agricultural Engineering Department, Faculty of Agricultural Technology, Universitas Brawijaya. In 2003, he graduated from Agriculture Bogor Institute and in 2007 – 2012 he obtained his Master and Doctoral degree at Applied Science in Osaka Prefecture University. In 2015 until present, he become deputy dean for students and alumni affairs in Faculty of Agricultural Technology. He also active as member in American Society of Agricultural and Biological Engineers, International Federation of Automatic Control. He was also active as author of journal, for example he has an article in international food research journal (2018), international journal on advanced science, engineering and information (2015). He was publishing 5 text books supporting his teaching activity, those are digital image application and artificial neural networks for agriculture, electronical and instrumentation, technical model and optimization.

Dr. Phung Kim Le

Dr. Phung Kim Le is Associate Professor in Department of Chemical Process and Equipment, Faculty of Chemical Engineering at Ho Chi Minh City University of Technology (HCMUT). She also as Director of Refinery and Petrochemicals Technology Research Center (2017-present). She obtained her M.S in department of chemical Engineering at Ho Chi Minh City University of Technology and for her PhD at department of chemical process Engineering at The University of Sheffield, UK in 2008. Since then, she has expanded her research interests in science and technology development and appli- cations in chemical, pharmaceutical and energy process fields. She was the principal investigator and took part in several international projects. She was awarded various research fellowships at laboratories at: University of Sheffield, UK; University of Hawaii, USA; University of Kumamoto, Japan; and University Technology, Malaysia. Currently, as an associate professor at HCMUT, she has been awarded various global research grants from the USA, Japan and Asia for her research interests including a number of emerging fields such as renewable energy, biomass and bio recovery. She has a book chapter and over 100 journal papers and conference proceedings published. In 2016, she was recognized as one of finalists for the second ASEAN-U.S. Science Prize for Women, which focused on sustainable energy research. Recently, she has been named among Asia's top 100 scientists in 2017 by Asian Scientist Magazine for her work in the field of agricultural sciences.

ORAL PRESENTATION

Silaica extraction from rice husk as slow release fertilizer using microwave assisted extraction (MAE)

D W Indriani[1], N Barunawati[2], S H Sumarlan[1] and L Teresia[1]

[1] Departement of Agricultural Engineering, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia
[2] Department of of Agricultural Cultivation Faculty of Agricultural, Universitas Brawijaya, Malang, Indonesia

E-mail: dina_awam@yahoo.com

Abstract. The use of raw materials from waste is one of the alternatives in the "zero waste" effort, rice husk is one of the wastes of rice plant. Rice husk has a very high silica content of around 80-90%. Extraction of silica from rice husk can be used to make slow release fertilizer. Slow release fertilizer is a fertilizer with a nutrient release mechanism that periodically follows the pattern of nutrient absorption by plants. This study aims to determine the optimization of rice husk tablets formulation by extraction using Microwave Assisted Extraction (MAE) and determine the physical and chemical properties of the results of rice husk tablet extracts. This study used a Completely Randomized Design (CRD) with two factors, namely the concentration of KOH with variations in solvents 2.5%, 5%, and 7.5% and a comparison of warm-up times of 5 minutes, 7.5 minutes and 10 minutes. The data obtained from the hardness test obtained the the largest was 3,356 kgf in 7.5% KOH with 10 minutes in microwave. The largest yield of silica was 7.5% KOH with the longest heating time of 10 minutes of 5.30%. XRF analysis, it was found that the largest silica value was 6.51% at 5% KOH with a heating time of 5 minutes. Based on comparison with the heating conventional method, yied of extraction had not reached optimum results of silica extract which is 21.8% and in this research yield obtain 6.51% where based on these results heating using microwave did not produce optimal silica results.

1. Introduction

Rice husk is one of the skins that wrap rice seeds, where rice husks or often called husks will separate and become waste which is rarely used. Rice husk has the main content, silica. Silica rice husk has a high water resistance to chemicals compound of fertilizer [1]. Silica has a role to increase productivity and strengthen plant growth so that it is resistant to pest attacks. Silica contained in the soil is depleted every year because there is no return of silica (Si) into the soil. The potential for silica loss from tropical soil reaches 54.2 kg per ha every year [2]. These problems can be overcome by making a slow release fertilizer. The application of the silica pellet method is closely related to the method of slow adsorption of nutrients on the soil, not all fertilizers given to plants can be absorbed by plants, and some will be carried away by groundwater or degraded, so fertilization is inefficient. The tablet fertilizer application allows plants to absorb nutrients throughout the period of growth by minimizing the risk of nutrient loss due to leaching during irigation, and avoiding the risk of excess dissolved salt.

2. Materials and Methods

The research was conducted in January 2018 until April 2018 at the Laboratory of Food and Agricultural Processing Technology of the Faculty of Agricultural Technology, University of Brawijaya, Brawijaya Central Laboratory of Living Sciences (LSIH), Advanced FMIPA Mineral and Materials Laboratory, State University of Malang, Biology Laboratory, University of Muhammadiyah Malang and Laboratory Chemical Engineering of Malang State Polytechnic

2.1. Materials

The materials used in the study were rice husk, hydrochloric acid (HCL) 1 M, Calium hydroxide (KOH) 1 M and distilled water.

2.2. Experimental design

The experimental design used in this experiment was factorial Completely Randomized Design. The first factor is the KOH concentration which consists of 3 levels 2.5%, 5% and 7.5% and the second factor is the comparison of time consisting of 3 levels such as 5 minutes, 7.5 minutes and 10 minutes. This study consisted of 9 combinations treatment, where each treatment was repeated 3 times so that 27 units were obtained

2.2.1. Sample Preparation Process

Rice husk was first washed. Clean rice husk is dried in an oven at 60˚C for 24 hours [3] Dry rice husks are then mashed using a blender, to obtain a uniform size, sieving with a mesh size of 35 or a 0.5 mm sieve hole.

2.2.2. Silica Extraction Process

Rice husk was weighed as much as 10 g and put into 250 mL beaker glass. Rice husk added 60 ml of potassium hydroxide (KOH) into a beaker glass. The concentration of Potassium hydroxide (KOH) used is 2.5%, 5% and 7.5% [3]. Mixture of rice husk with KOH was left for 1 hour. The next step was heating using a Microwave with 100 watts of power for 5 minutes, 7.5 minutes and 10 minutes. The sample was left to stand for 24 hours; the rice husk was then filtered using a filter cloth to separate the sediment from the filtrate. The remaining filtrate was pH adjusted using HCl to get a pH of 7. The filtrate which had reached pH 7 will form a fine powder. The fine powder formed was dried with an oven of 110˚C for 3 hours. The extraction will be in the form of tablet using tablet's machine.

2.2.3. Stage of Forming a Tablet

Formation of rice husk powder to tablets was using tablet's machine. The average weight of extracted powder is 0.5 g for one tablet [3]. Then extracted powder put into a tablet forming device, then pressed with a hammer, by this process make powder will harder and solidifier.

2.3 Data Analysis

The observation parameters about yield of extraction by using XRF, and the hardness test using penetrometer. The method that will be used in this study was the experimental research method by conducting experiments to see the effect of the variables KOH dan time of extraction using microwave to be studied. Data analysis was performed using Analysis of Variance (ANOVA).

2.3.1 Physical Analysis

The physical analysis using pressure test, yield analysis and SEM analysis:

(a) Pressure test

The cone attach to the tip of the penetrometer, this will straight up vertically on the material to be tested, press it into the material with a fixed compressive force [10]. At a certain depth, the magnitude of the vertical pressure is given to press the tool /the material is divided into a lower plate, almost the same principle as a tensile test but basically the method for this test is by pressing the material until the material is cracked. After those process will get the results on the parameters.

(b) Yield analysis

The recovery is a comparison between the mass of the product produced to the mass of the raw material used. Procedure for analysis of yields as [7]:

a) Weight of dry husk ingredients (grams)

b) Weight of fertilizer produced (gram)

(c) SEM analysis

The sample of rice husk powder placed on a holder measuring 10 mm. Non conductive samples need to be coated using Au-Pd, that the sample is more conductive. The sample then put into the SEM Chamber then pump (High Vacuum or Low Vacuum) and wait until vacuum.

2.3.2 Chemical analysis

The chemical analysis using XRD analysis, analysis of water solubility:

(a) XRD (x-rays diffraction) analysis

Samples in the form of powder and solids, the synthesis results are inserted into the tube and then measured using X-rays.

(b) Analysis of water solubility

The solubility of tablets is calculated based on the length of time the tablet dissolves into fine particles both in the soil and in water. The solubility value in water is calculated using a stopwatch. The solubility value in the soil is carried out by observing the soil that has been given rice husk tablets.

3. Results and Discussion

3.1 Hardness test result of rice husk

The results of the hardness test results of rice husk tablets obtained in the study ranged from 1,131-3,356 kgf. The average value of violence obtained can be seen in Figure 1

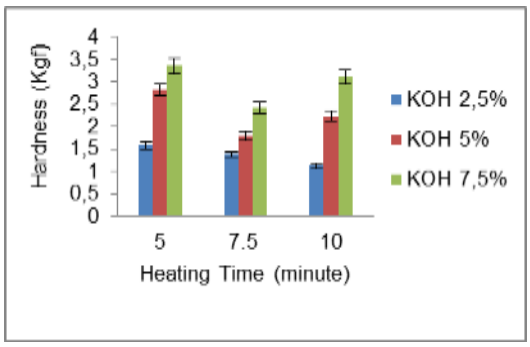

Figure 1 Relationship between Heating Time (minute) and Hardness Test Value (kgf)

Based on Figure 1 the trend tends to increase in each treatment. The highest hardness value of rice husk tablets increases to 3.356 kgf, at the treatment of 7.5% KOH concentration with a warm up time of 5 minutes, while the lowest value of hardness of rice husk tablets was 1.131 kgf, at the

treatment of 2.5% KOH concentration with a heating time of 10 minutes. Based on the analysis of variance ANOVA showed that the KOH concentration factor and heating time had a significant effect (P> 0.05) on the value of hardness. Hardness is the nature of a solid object in terms of its resistance to rupture due to the presence of compressive forces that are not deformed [8]. The smaller the compressive value, the greater the hardness, while the greater the compressive value, the less hardness of material because material should be weak [10]

3.2 Rice Husk Silica Extraction Yield

The results of the extraction of silica extract from rice husk obtained in the study ranged from 1.48 to 5.30%. The average yield obtained can be seen in Figure 2

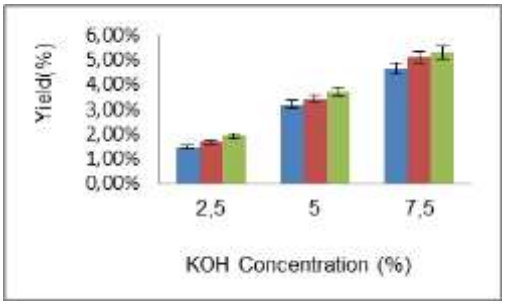

Figure 2 Rice Husk Silica Extraction Yield

Based on Figure 2 the resulting graph trends tend to increase in each treatment. The highest silica yield value of 5.3%, namely the treatment of 7.5% KOH concentration with a heating time of 10 minutes, while the lowest silica yield value of 1.48%, namely the treatment of 2.5% KOH concentration with a heating time of 5 minutes.

Table 1. Anova for Rice Husk Silica Extraction Yield

Source of Variation	SS	df	MS	F	P-value	F crit
KOH concentration	49.65816	2	24.82908	57.00942	1.63E-08	3.554557
Heating time	1.309919	2	0.654959	1.503835	0.248915	3.554557
Interaction	0.092593	4	0.023148	0.05315	0.994238	2.927744
Within / Error	7.839467	18	0.435526			
Total	58.90014	26				

*F = F value, F crit = F Table

Based on the analysis of variance ANOVA showed that the KOH concentration factor had a significant effect on the results (P> 0.05), while the heating time factor had no significant effect on the extraction value of silica (P> 0.05). According to Laksmono [6] the higher the concentration of KOH added, the more yields produced. The extraction time also gives an effect on the yield produced. Short extraction time will give a low yield because not all components are extracted properly, if longer of heating time the contact time between husk and KOH solution greater so that the yield will be even greater [4].

3.3 SEM (Scanning Electron Microscopy) of rice husk

Physical characteristics of rice husk tablets were observed by SEM (Scanning Electron Microscopy) testing can be seen in Figure 3.

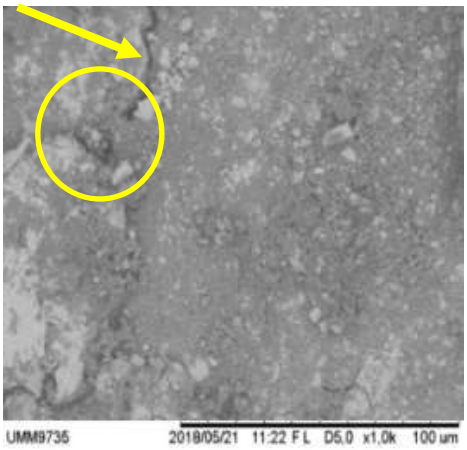

Figure 3. Characteristics of Composition of Organic Material Rice Husk Tablets Using Scanning Electron Microscopyin magnification 1000x

Samples with 2.5% KOH concentration and 5 minutes warm-up time, where the surface is too tenuous. Samples with 5% KOH concentration and 7.5 minutes warm-up time, had sufficient density but were not as comparable when compared to samples with 7.5% KOH concentration and 10 minutes warm-up time. Based on Figure 3, it can be seen in yellow arrow that the structure of the tablet more tight closed with longer the heating time, however the high concentration of KOH solution cause the bond formed make stronger and have a high density. In Figure 3 there are also three visible parts in the yellow circle. The brightest part of the part is inorganic material, for parts that are grey are organic material and for the darkest coloured parts are materials that have a slow density, so that they cannot be penetrated by waves.

3.4 XRD (X-ray Diffraction)

From the data obtained by the sample with the best results, namely the treatment of 7.5% KOH concentration with a heating time of 10 minutes, then the sample was carried out chemical analysis with using X- rays to find out the elements contained in Figure.4

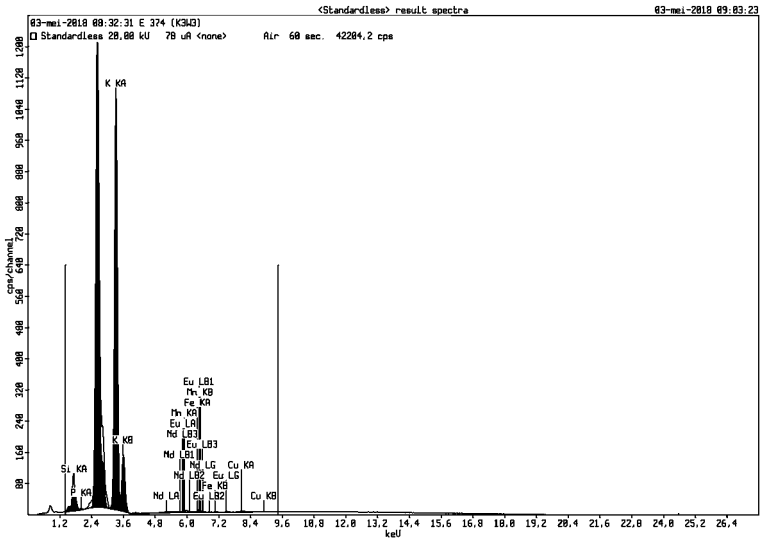

Figure 4. Grafic of XRD Rice Husk Powder with the treatment of 7.5 KOH

Table 2. XRD analysis result with the treatment of 7.5 KOH

Compound	Si	K	Mn	Fe	Cu	Nd	Eu
Concentration Unit (%)	6.22	51.0	0.03	0.027	0.01	0.14	0.12

Based on Figure 4, it can be seen that the most dominant element is kalium about 51%. The second most element is chlorine and the third most element is silica. Silica is the most element contained in rice husk, but in this study the silica obtained was only 6.22%, it causes the heating time of microwave, and KOH solvent is dilluted. So that at the time of operation the solubility of the KOH solvent to silica has been reduced [6]. According to Laksmono [6] the saturation of solvents is cause by the solubility of the solute decreases with increasing time, this is indicated by the decrease in solutes taken by the solvent. In addition, the length of operation allows the silica formed to degenerate and settle in rice husk, so that silica in the filtrate decreases according to Indriani et al. [3].

Table 3. Duration of Solubility in Water

Treatment	t_1 = 5 minutes (minutes)	t_2 = 7.5 minutes (minutes)	t_3 = 10 minutes (minutes)	Time in soil soluble (minutes)
KOH 2.5%	40	40	45	40
KOH 5%	100	105	110	100
KOH 7.5%	150	150	155	150

Table 4. Water Testing Results With Percolation Method (500 mL of water, 1 gram of rice husk tablets)

Parameter	Unit	Result
Calium	mg/L	74.89
Clorin	mg/L	0.11
Silica	mg/L	16.68

Based on Table 3, the concentration of 2.5% KOH with a warm up time of 5 minutes and 7.5 minutes has faster solubility, i.e for 40 minutes, while 7.5% KOH concentration with a warm up time of 10 minutes has solubility in longer absorption for 155 minutes. The pores formed on the tablet affect the solubility of the tablet in water (release). Spacing pores make it easier for water to enter the pores so that the tablet's release time is faster, while the tight pores cause water difficult to enter into the pores so that the tablet's release time becomes slower [3]. Based on Table 3 the results of solubility in the soil are obtained. The sample with 2.5% solubility dissolves in the soil for 14 days, while the solubility of 5% can dissolve in the soil for 25 days, while for the solubility 7.5% can dissolve in the soil for 37 days. Based on Table 4, results were obtained on percolation testing of water that had been included in rice husk tablets. Potassium obtained in 500 ml of water is 74.89 mg / L, for chlorine obtained as much as 0.11 mg / L, and the resulting silica is 16.68 mg / L.

4. Conclusion

The results showed that the extraction of silica from rice husks was found to range between 1.48% -5.3%. The results of the XRF analysis showed that the largest silica value was 6.51% where based on these results heating using microwave did not produce optimal silica results. The relationship between the concentration of KOH and hardness has a direct proportional result while the length of time of heating with hardness has the result of inversely reversed. The smallest results were obtained with a value of 1,131 Kgf and the largest was 3,356 Kgf.

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Some physical and mechanical properties of candlenut (*Aleurites moluccanus*) at different submerge of NaOH concentration

G Jowowasito, Darmanto, Z Iqbal, E Pudjiono, M Lutfi and A I Savira

Department of Agricultural Engineering, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia

E-mail: darmanto_sm@ub.ac.id

Abstract. This research aimed to analyse some physical and mechanical properties of candlenut at different submerge of naoh concentration. The sample was submerged by five different concentrations (3%, 3.5%, 4%, 4.5%, 5%) of NaOH with one liter of water as a solvent. After submersion, the samples dryed using oven machine and then tested using Brazilian testing machine. Physical and mechanical properties of these samples were then examined comprising compressive load, required energy to damage shell, kernel intactness, and MWD. The results showed that the NaOH concentration very affected the compressive load and the required energy to damage shell.In other hand, The NaOH concentration did not effect the kernel intactness and the MWD.

1. Introduction

Candlenut (*Aleurites moluccanus*) is one of spices commodity originating from Sout-East Asia and Middle-East Asia. The kernel of this plant is the main part containing oil and unique flavour; so that, in Indonesia it is used as ingredient for making traditional cuisines, baverages and essential oil. In order to obtain high quality kernel, post-harvest handling of the product need to be address. Harsh post-harvest handling may brake the kernel and increase the comtanimation process from fungi and bactery activity. Water content also play a role in this contamination. A low level of damage (lower than 3%) may be achieved when the candlenut's water content ranges from 4% db to 6% db [1].

Recent method in processing the candlenut is still conduted manually by using metal cracker which could damage the kernel easily. It is because, candlenut has a hard surface of exocarp but the kernel is softer. While cracking the product, force from the worker may be different to others; they use their own experience to do the process. So, there is no standard yield while processing the product. In order to address this issue pre-treatment process to softer the exsocarp need to be conducted and some physical and mechanical properties of candlenut under that treatment need to be studied. Therefore, the workers could only use a certain low level force to produce standard yield of product. The Previous study regarding the properties of candlenut showed that the product contained mostly lignin that tied fibers and responded to the shell strength. One study revealed that natural fiber could be degradated by adding alkali substance (NaOH). The NaOH solution will modify hydrogend bond in the lignin and its internal structure which change the structure to be more needle like-structure [2].

The decrease of lignin is equal to the increase of NaOH concentration added to the product. The NaOH particle could dilutes lignin structure [3]. Moreover, the change of pH because of alkali addition could ionize hidroxile bond into smaller particle as salt [4]. Therefore, the aim of this research is to study the physical and mechanical properties of candlenut under several

variations of NaOH concentration.

2. Material and Methods

2.1. Material

The research was conducted in Power and Agricultural Machinery Lab., Faculty of Agricultural Technology, Universitas Brawijaya, Indonesia. 20 sample of candlenut was obtained from Pasuruan City, East java, Indonesia.

2.2. Methods

The sample was submerged by five different concentrations (3%, 3.5%, 4%, 4.5%, 5%) of NaOH with one liter of water as a solvent. Complete Randomized Design (CRD) was applied for triplicate measurement. After submersion, the samples dryed using oven machine and then tested using Brazilian testing machine. Physical and mechanical properties from 15 measurements from CRD was then examined comprising intercept A (length), intercept B (width), intercept C (bidth), roundness, sphericity, ellipsoidal, compression strength, water content, MWD and energy which then explained the next.

2.3. Compressive test

Mechanical strength test of materials can be performed using Brazilian test [5]. This apparatus is used to determine the strength shell in holding a particular pressure load. Mechanical strength of the shell was determined using Equation 5.

$$\mathrm{Kt} = \frac{\mathrm{P}}{\mathrm{A}} \tag{5}$$

$$\text{with A} = \sqrt[3]{36\pi \; x \; V^2} \tag{6}$$

Where: Kt is compressive strength (Kgf/cm^2), P is pressure load (Kgf), A is cross sectional area (cm^2), and V is ellipsoidal volume (cm^3).

2.4. Required energy test

Required energy test determine amount of required energy to damage the shell [6]. The method was by dropping the candlenut from 4,5 meter high. Then, this energy was calculated using Equation 8.

$$\mathrm{E} = \mathrm{m.g.h} \tag{8}$$

Where: E is required energy (Nm), m is mass of material (kg), g is gravitastional acceleration (m/s^2), and h is height (m).

3. Results and Discussion

3.1. Effect of the NaOH concentration to the mechanical strength

The effect of NaOH concentration on mechanical strength is shown in Figure 1. The samples were compressed using Brazilian testing machine until the shell broke. The compressive load implies to a maximum load which could be held by the kernel, as well as maximum mechanical strength. All the treatment samples had lower mechanical strength than the controlled one. Lower NaOH concentration tended to result lower mechanical strength, for example the 3% NaOH submerged

samples had strength of 1.13 kgf/cm^2 and the 5% NaOH submerged samples had 1.09 kgf/cm^2 strength. Based on the F test, the F table had a smaller value than the calculated value, i.e. 3.48 and 3.8248, respectively. Therefore, it can be stated that the variation of NaOH concentration affected the strength of the shell.

Research showed that mechanical strength of the shell was determined by lignin degree which could be degraded by submersion of alkaline solution, NaOH solution for example. Degree of lignin could be decreased by increasing the NaOH concentration. NaOH particle would sever lignin structure so that it would dissolve more easily which resulted in decreasing levels of lignin [2, 3]. Therefore, all treatment samples had a lower value of load than the control one (non-treatment samples).

3.2. Effect of the NaOH concentration to the required energy to damage shell

The required energy to damage shell was tested by dropping the candlenut and using Formula 8. This calculating is presented in Figure 2. It shows decreasing energy to damage the shell when the NaOH concentration is increasing. The highest value of the damage energy was scored by the control that was 0.417 Nm. All the submersion samples scored lower values of the energy which were 0.417 Nm, 0.405 Nm, 0.404 Nm, 0.4014 Nm, and 0.401 Nm for 3%, 3.5%, 4%, 4.5%, and 5% NaOH concentration, respectively. These results were in conjunction with the effect of NaOH concentration to the compressive load where the value of load tended to decrease with increasing concentration.

Based on the F test calculation, F table was higher than calculated F, that were 0.387191736 and 3.48, respectively. Therefore, the NaOH concentration affected the damage energy of the shell. This effect was caused by a characteristic of the NaOH which could dissolve the lignin so that it reduced the shell mechanical strength as described in the previous [2, 3].

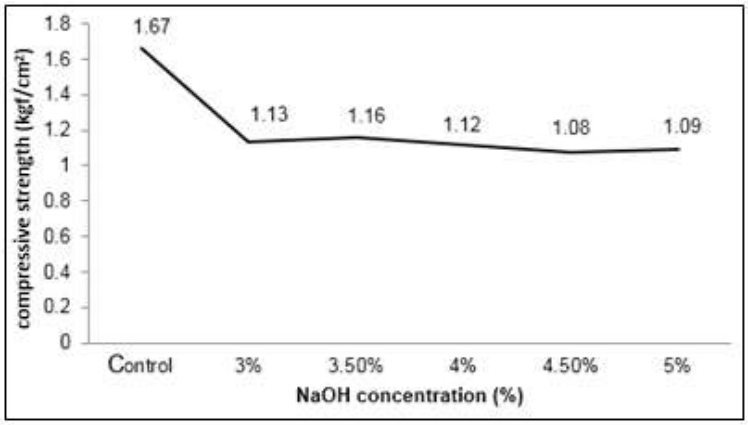

Figure 1. Relation between NaOH concentration and compressive strength

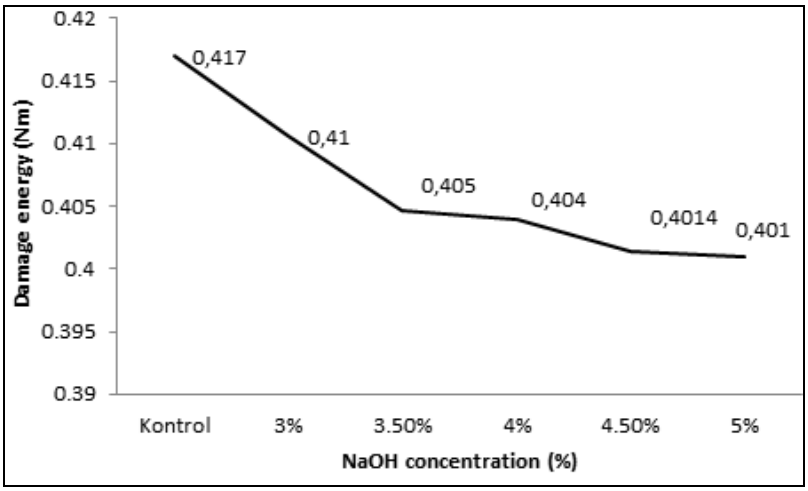

Figure 2. Relation between NaOH concentration and damage energy

3.3. Effect of the NaOH concentration to the kernel intactness

This effect was studied using Brasilian test and showed in Table 1. All the samples had variations of percentage of the kernel intactness, but the control had zero. The 4% NaOH submerged sample had a higher percentage than the others and the lowest percentage was 3.5% NaOH submerged sample. Based on the F test calculation, the calculated F was lower than F table, that was 2.744680851 and 3.48, respectively. Therefore, the NaOH concentration did not affect the kernel intactness. Figure 5 shows the damaged shell and kernel intactness for each treatment.

Table 1. Percentage of the kernel intactness

Control	NaOH Concentration				
	3%	3.5%	4%	4.5%	5%
0	40	26.67	70	46.67	60

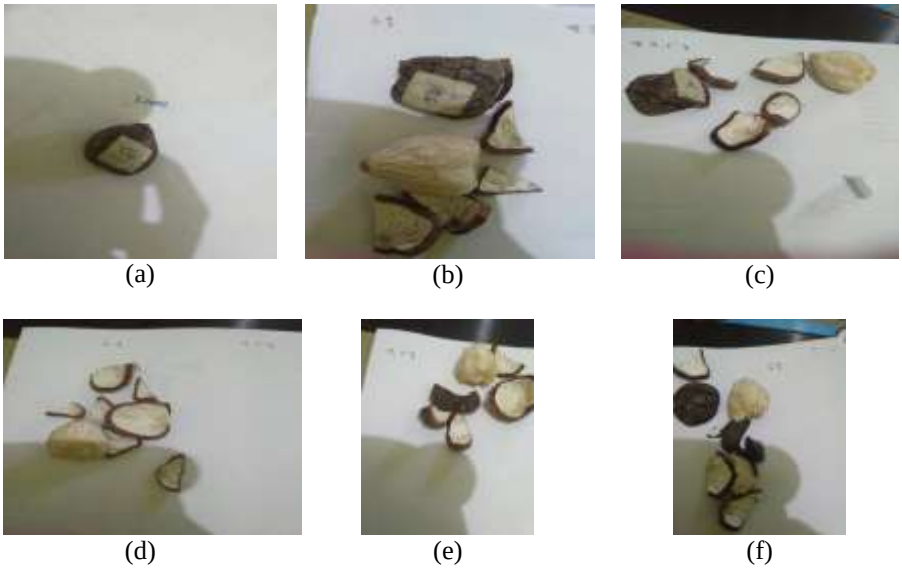

Figure 3. Damaged shell and kernel inteactness (a) the control, (b) The 3% NaOH submerged sample, (c) The 3.5% NaOH submerged sample, (d) The 4% NaOH submerged sample, (e) The 4.5% NaOH submerged sample, and (f) The 4.5% NaOH submerged sample

3.4. Effect of the NaOH concentration to MWD (Mean, Weighted, Diameter)

The effect of NaOH concentration to MWD is shown in Figure 4. The highest MWD was resulted by 3% NaOH submerged candlenut which it was 1.33. The lowest MWD was 5% NAOH submerged candlenut which was 1.26. Based on the comparation between F table and calculated F, F table had higher value than calculated F, which it were 3.48 and 0.064881129, respectively.

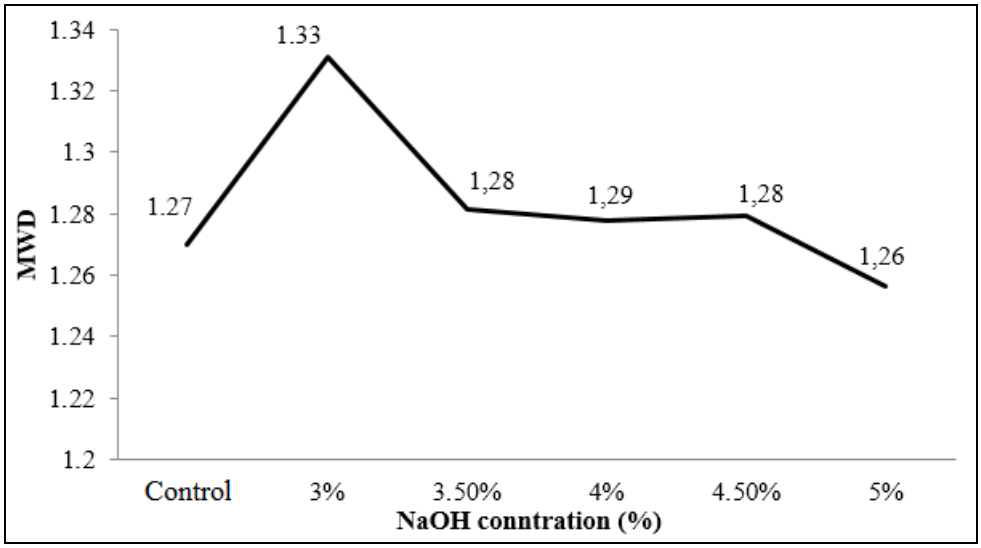

Figure 4. Effect of the NaOH concentration to MWD

4. Conclusion

Based on the experiments, the NaOH concentration very affected the compressive load and the required energy to damage shell. It was caused by lignin degree decreasing when NaOH concentration increased. The lignin degree decreasing resulted a lower mechanical strength of the shell, so the compressive load to break the shell was low. This also resulted a low the required energy to damage shell. In other hand, The NaOH concentration did not effect the kernel intactness and the MWD.

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Design of multifunction paddy harvester and harrow machine

S Nurdin[1], A Kusumawardhani[1], Sugiarto[2], M W Lestari[2] and K Hidayat[3]

[1]Department of Mechanical Engineering, Unisma Polytechnic of Malang, Malang, Indonesia [2]Department of Agro Technology, Islamic University of Malang, Malang, Indonesia
[3]Department of Agroindustrial Technology, Trunojoyo University, Madura, Indonesia

E-mail: irul_ie@yahoo.co.id

Abstract. The rice production of Malang Regency in 2017 reached 493.794 tons, so it was necessary to develop paddy harvester machine. This study aims to design paddy harvesting and harrow machines. This research method has three stages, i.e the process of making a design using AutoCAD software, the manufacturing process is carried out starting from the preparation of tools and materials, making the frame, modifying the blade, and testing the machine by testing on the farmland. The results of this study produce a multifunctional machine that is to harvest paddy and as a rake machine to cultivate the soil. This multifunctional paddy harvesting machine is capable of harvesting 11 m^2 / minute from 9 m^2 / minute or increasing by 22.2%. Another advantage of the paddy harvester and tillage machine is that it can ease the burden of workers because this machine has two wheels as frame support.

1. Introduction

Indonesia has great potential in the agricultural sector, because the influence of climate, soil fertility and forests as a source of water causes the majority of Indonesia's population depend on their livelihoods as farmers. The majority of the population of Malang Regency, also works in the agricultural sector. The agricultural sector is a mainstay sector in the economy of Malang Regency. According to the Office of Food Crops, Horticulture and Plantation, most of Malang Regency is agricultural land, which is around 14.31 % (45.888 ha) is paddy land, 37.82 % (121.286 ha) is gardens, 7.53 % (24.142 ha) ise plantation areas and 11.30 % (36.230 ha) is forests. In order to achieve the best objectives, the best method, the best place and the best time is needed [1]. Rice production in Malang Regency in 2017 reached 493.794 tons with a rice area of 70.181 ha of rice plantations with land typography that was difficult to reach by agricultural machinery.

Another problem faced is the lack of labor during the harvest season, because in Indonesia the harvest time is almost the same. So it is difficult to get workers. In Malaysia, to overcome this problem the farming community offers special operators provided by official farmer organizations for hire by farmers during the harvest season [2]. Besides the main problem in post-harvest rice is the high losses both quantitatively and qualitatively [3]. Chavan e.l conducted research on the design of reaper engines to be more efficient, focusing on ease of operational harvesting on small land in a shorter time and at a low cost by considering factors such as power requirements, equipment costs, ease of operation, field conditions, operating time and climatological conditions [4]. Dinesh e.l conducted research on the design of small-scale harvesting machines to harvest rice very efficiently. Focus on operational ease of harvesting rice

in less time and low cost by considering different factors such as equipment costs, ease of operation, operating time and climate conditions [5].

In addition, the use of land use facilities that are not optimal can be caused by many things. The limited funds of farmers in the supply of agricultural machinery are the main causes that must be tolerated. In order for activities to achieve the best goals, it requires the best method, the best place and the best time [6]. The ability of the government to provide agricultural equipment and machinery must also be improved. The agricultural equipment or machine is a means of processing agricultural land which absolutely must be owned by every farmer. In soil processing activities carried out manually, agricultural tools used are usually made by small industries, where the shape and size of the tools made are determined on the basis of the condition of agricultural land in the area and based on their body size, so that agricultural equipment on the market is very diverse in shape and its size. Furthermore, the diversity of agricultural equipment in circulation causes a system integration between agricultural machines and farmers, because the size of the body of farmers using the equipment used tends to be inappropriate. As a result, the actual work capacity produced by farmers using these tools is not optimal. So that the activities of farmers to achieve the best goals, it requires the best methods, the best places and the best time [7]. In general, agricultural land management activities are carried out in two stages, i.e primary processing (plowing) and secondary processing (harrowing). Depending on soil conditions and local customs, plowing and harrowing work can be done more than once until the land is ready for planting. In the process of growing plants, land requires a process of loose soil and weeding. After the plant grows big and is ready to be harvested, it needs a harvesting machine. Therefore it is necessary to develop a paddy harvester and a soil flouring machine. This study aims to design a paddy harvester and a soil mixer. Because product design is basically used to improve product quality for consumers [8].

2. Method

This research method consists of three stages, i.e the process of making a design using AutoCAD software, the manufacturing process is carried out starting from the preparation of tools and materials, making the framework, modification of the blade and soil tiller, testing the machine by testing on the farmland [9]. Data analysis, is a preliminary analysis to find out what needs to be done, ranging from layouts, work movements to existing facilities. This stage of the data is analyzed for the suitability of the design. Implementation of rice harvester and earth melting machines, namely testing the engine on the results of redesign by the operator as a substitute for the previous machine and then comparing the output with the previous machine so that the productivity ratio can be known.

3. Results and Discussion

The land after being process in the first tillage, in general, is still a large lump of soil. And for further destroy and level the surface of the land, the second tillage is processed. The tools and agricultural machinery used to do the second soil treatment are harrow type soil processing equipment (harrow). The use of rakes as a second soil processor, aside from aiming to further destroy and level the soil surface for better growth of seeds and plants, also aims to preserve soil moisture and increase nutrient content in the soil by further destroying crop residues and mixing it with soil . The various types of rakes used for processing second soil are: disk harrow; toothed rake spikes (spikes tooth harrow); springs toothed per (springs tooth harrow); and rakes for special work (special harrow).

Disk harrow, in principle, this tillage equipment is almost like a disc plow, especially a vertical disk plow. The difference only lies in the size, concavity and number of disks. Disc

rakes have smaller disc sizes and concavity compared to plows, this is because the second tillage is done more shallow and no effective land reversal is required as the first tillage. Like a disc plow, the main parts of a disc rake consist of: the disc; disk shaft; disk separator; framework. Sometimes it is also equipped with a supporting wheel, if the coupling system with the traction uses a trailing system. Disc rakes are usually not equipped with stabilizing grooves.

Toothed rake or commonly referred to as a comb rake, is a type of rake that is commonly used by farmers in Indonesia. Comb rakes that are pulled by animals, generally their teeth are made of wood and commonly used for tillage in wet conditions, as a follow-up work after the soil is processed with singkal plow. Toothed rake nails that are pulled by tractor power teeth made of metal, mounted on a rod (tooth bar) with a clamp or welding. The construction of nailed toothed rakes that are pulled by tractor power usually consists of one placement rod. Dental placement on the placement rods is arranged alternately between the placement rods with one another. The shape of nail teeth varies greatly, some are straight and pointy, and some are flat, some are in the form of diamonds. Thus the main parts of a toothed rake or comb rake is composed of; nail teeth, placement rods and reinforcing frames. Nail-toothed rakes are mainly used for leveling and smoothing the soil after plowing, more suitable for fragile soils. This tool is quite effective for eradicating pest plants especially those that are still small, or are just growing.

This toothed rake as a whole is almost like a toothed tooth rake, only its teeth are made of spring or spring. Also used to level and refine the land after plowing. This tool is also more suitable for use in soils that are easily destroyed. Suitable for eradicating weeds that have roots that are strong enough and deep. This is because a toothed rake has a greater penetration depth than a toothed rake. From its flexible and curved shape will be able to lift or uproot the roots of plants so that it is thrown out to the ground surface.

Special harrows are usually used to work on tillage with more specific purposes. For example, tillage with the specific purpose of destroying crops, destroying litter, or for intensive soil enrichment, or perhaps aiming to make seed beds more feasible. The use of special rakes is usually done after the first tillage and second tillage. Specific types of rakes include: weed mulcher; rotary cross harrow; soil surgeon.

The several types of rake engines, which allows to be modified with a rice harvester machine is a type of comb rake. Because the power possessed by the rice harvester is not too large and the type of terrain that becomes the object of the rake is the type of dry soil after the plowing process. Design is an activity or engineering design that starts from the ideas of design innovation, or the ability to produce works and inventions that can really describe the market demand because of the research and development of technology [10], [11]. Following are the steps in designing the modification of multifunctional paddy harvester and harrow machine.

3.1. Create designs using AutoCAD software

A multi-function paddy harvester machine is a machine designed to be used in two functions, which can be used to harvest paddy and can also be used to loosen soil [12], as seen in Figure 1. In this case, there is a part in the machine that can be replaced by a rice harvester and a land spinner. The following designs are modified designs of multifunctional rice harvester and harrow machines using AutoCAD software.

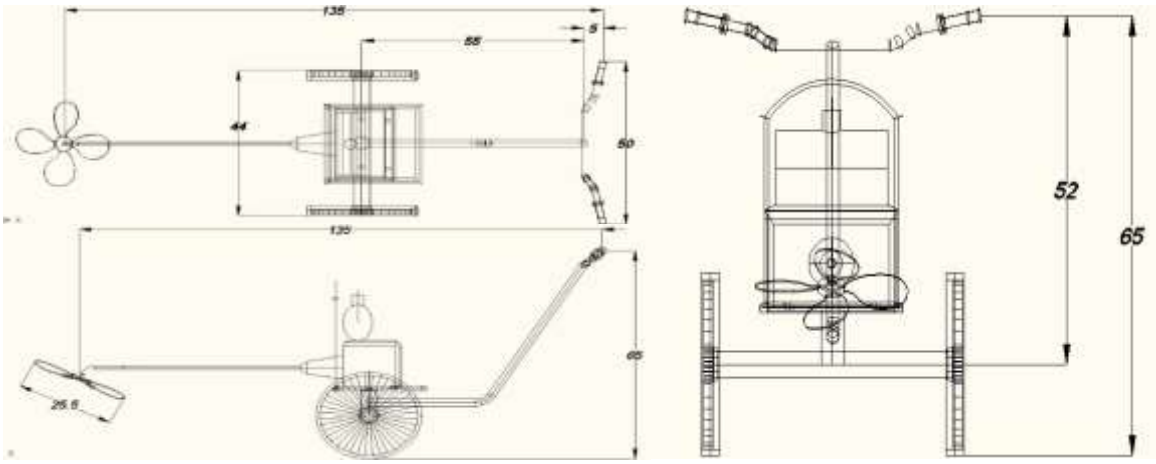

Figure 1. Design of paddy harvester and harrow machine

3.2. Manufacturing Process

The manufacturing process starts from the preparation of tools and materials. The manufacture of a multifunctional paddy harvester machine as described below :

a. Frame Manufacturing
   Making the framework for this machine that is using hollow iron with an iron size of 20×20 mm, which is then carried out the process of joining or forming with the welding process and in accordance with the design drawings.
b. Full Handle Manufacturing
   The control handle is made using iron pipe with a diameter of 2.5 cm and with a thickness of iron that is 2 mm, a length of 50 cm which is then welded at the back of the machine.
c. Wheel Axle Manufacturing
   In the axle section, the axle used is the axle that is sold on the market. In order to get a good holder and strength, then connected with concrete steel and with a diameter of 15 mm, by doing the welding process.
d. Machine Stand Manufacturing Process
   On the engine seat bench, the material used is the same as the main frame that is hollow iron with a size of 20×20 mm.
e. Making Rice Guidance
   The wipers are placed on the front side of the machine, the wipers are made using 2.5×2.5 cm elbow plates and iron thickness plates of 2 mm. Making rice directors that use iron plate material measuring 2 mm thick iron with an iron length of 100 cm.
f. Making Blade Replacement Slots
   Modify the blade and loose ground at the tip of the steering guide by using nuts and bolts.
g. Testing machines by testing on farmland.

The test is carried out to find out whether the engine that has been designed is able to work optimally and to find out the obstacles faced. The following is the process of testing rice harvesting machines and ground scrubbing machines (Figure 2 and 3).

Figure 2. The paddy harvester and harrow machine

Figure 2. Testing of paddy harvester and harrow machine

The results of testing the rice harvester machine and the earth melting machine were able to harvest is significant area of 11 m^2 / minute of 9 m^2 / minute or an increase of 22.2%. Another advantage of the rice harvester and earth melting machine is that it can ease the burden of workers, because this machine has two wheels as a pedestal frame.

4. Conclusion

The conclusion of this study resulted in one rice harvester machine and a soil mixing machine that is to harvest rice and as a rake machine to cultivate the soil. This multifunctional rice harvester is capable of harvesting 11 m^2 / minute of 9 m^2 / minute or experiencing an increase 22.2%. Another advantage of the paddy harvester and harrow machine is that it can ease the burden of workers, because this machine has two wheels as a support frame.

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Productivity analysis of wheat flour production process using *green productivity* approach (Case Study at PT. XYZ)

P Deoranto[1], R Astuti[1] and B SWidada[2]

[1] Department of Agro-industrial Technology, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia
[2] Alumni of Department of Agro-industrial Technology, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia

E-mail: deoranto@ub.ac.id

Abstract. This study focuses on green productivity analysis of the production process in PT. XYZ. The objectives of this study were to determine productivity level value and determined alternatives strategy to improve green productivity value by using Pairwise Comparison. We initiated by identifying waste type of production process by using Green Value Stream Mapping (GVSM) method. Green Productivity Index (GPI) was used to calculate the economy indicator ratio and its environmental impact or environmental indicator. Selection of improvement alternatives was based on brainstorming results with manager and section head. Improvement alternatives were prioritized by weight using Pairwise Comparison method. Based on study results, GPI value of K2 wheat flour production process was good with 1.1 and C1 wheat flour production process was low with 0.99. The implementation of selected alternatives to improve green productivity value was by production process optimization with weight 0.594.

1. Introduction

PT. XYZ is one of the largest companies which produce various kinds of wheat-based products. Mill E is a production area located in Region 2. Its products are K2 and C1. Improving production was done by paying attention to its economic aspect and firm productivity. Productivity is the important part of industrial activity to measure the success of an industry in production activity [1].

Production process in Mill E area also produces several wastes such as energy, water, material, and trash such as garbage iron, and stone. Green Productivity (GP) is a strategy directed to obtain profitability through improvement in productivity performance and environment [6]. Implementation of Green Productivity might be done by comparing each solution alternatives to a problem. Paired method (Pairwise Comparison), is a method used to compare elements in cluster/level of one to another.

Productivity analysis in wheat production process was using Green Productivity Index (GPI). The objectives of this study were to determine the GPI value of K2 and C1 also to suggest improving green productivity with the Pairwise Comparison method.

2. Materials and Methods

2.1. Waste determination using Green Value Stream Mapping (GVSM).

Steps in waste determination using GVSM were as follows:

a. Creating Process Flow Diagram
In Green Productivity, creating process flow diagram would be needed as the basis to draw material balance.
b. Creating Mass Scale
Relation between mass scales with green productivity would act as the initial measurement of green productivity, and to identify the amount of waste being disposed during a production process.
c. Creating GVSM
GVSM was used to found out about waste produced in PT. XYZ. Productivity analysis in wheat flour process was using Green Productivity Index (GPI) method. Emission was produced from the energy source used during production process.

2.2. Environmental Indicator Determination

The Environmental Sustainability Index (ESI) was used as the policy tool to identify 136 environmental problems [5]. One of the environmental indicators would be obtained from the result of seven source of waste generation. This result was processed by green productivity indicator to create environmental impact calculation. Environmental impact (EI) would depend on multiplication between the Green Productivity (GP) indicator weight with amount of waste produced in GVSM.

EI calculation can be showed with the equation 1 [7]:

$$EI = A\,(SWG) + B\,(GWG) + C\,(WC) \quad (1)$$

Notes:
EI: Environmental impacts
GWG: Gas waste generator
SWG: Solid waste generator
WC: Water consumption

2.3. Economy Indicator Determination

Components in production cost budgeting of this study consist of fix cost and variable cost. Economy indicator is the ratio between selling price and production price [2]. Total production cost was obtained from the sum of fix cost and varible cost.

2.4. Measurement of Green Productivity Index (GPI)

Calculation of Green Productivity Index in this study can be measured with the equation 2 [4].

$$GPI = \frac{SP/PC}{EI} \quad (2)$$

Notes:
GPI: Green productivity index
SP: Selling price
PC: Production cost
EI: Environmental impact

2.5. Questionnaire Design
Questionnaire in this study was completed by 2 experts, the manager and section head in Mill E.

2.6. Improvement Suggestion
Improvement suggestion to increase productivity was obtained from the result of processed data using Pairwise Comparison method in the form of Microsoft Excel. The Pairwise Comparison method is a method to compare elements and transforming it into matrices [8]. Pairwise comparison matrices can be said consistent by measuring them using Consistency Ratio (CR) CR ≤ 0.1 [5].

Consistency Ratio (CR) calculation in this study was using equation 3 [11]:

$$CR = CI / RC \quad (3)$$

Notes:
CR: Consistency ratio
CI: Consistency index
RC: Random consitency index

3. Results and Discussion

3.1. General Description of PT. XYZ
PT. XYZ is one of the company producing various flour and the first and largest producer in Indonesia. K2 and C1 wheat flour are products with high demand and produced in 2 areas, in Mill E. K2 wheat flour has production capacity of 266.6 ton/day while C1 wheat flour has production capacity of 222.8 ton/day.

3.2. Production Process
K2 and C1 wheat flour in Mill E has similar production process which categorized into chain production process since amount and type of produced flour would be adjusted toward Production Target Plan. Several differences in its treatment would be wheat type, water increment, and production process duration.

3.3. Mass Scale
3.3.1. K2 wheat flour
Soft wheat needed as its raw material to produce 11,102.76 kg K2 was 13,554.56 kg which consist of 100% *soft wheat*. Composition of raw material would consist of 60% Soft Whire Spring (SWS) and 40% Australian Standard White (ASW). About 13,554.56 kg wheat would be cleansed in the cleaning phase to separate wheat from *offal*, pebble, magnet mixed with wheat and produce 89.11 kg of solid *waste*.

Cleaned wheat would be mixed with 857 litres of water. 14.322,45 kg of escaped wheat would be ready to be milled in roll mill machine. Solid waste during milling process for K2 wheat flour was *bran* and *pollard*. Flour produced from this milling process would be mixed with 286.45 kg additive substance. About 14,608.9 kg in *waste handling* would produce 3,506.14 kg solid waste.

3.3.2. C1 wheat flour
C1 wheat flour compositions were 14,467.5 kg *hard wheat* to produce 9,465.6 kg C1 flour. Its main ingredients were 70% *Canada Western Red Spring* (CWRS) and 30% *North Spring* (NS). During *pre-cleaning* stage, 14,467.5 kg wheat would be contained.

During *cleaning* stage, 273.2 kg solid *waste* would be produced. Cleaned wheat would be added with 653.7 litres of water. About 14,848 kg escaped wheat would be milled in *roll mill* machine. Milled wheat would be added with 296.96 kg *additive* substances. Total 15,144.96 kg of wheat would go into waste *handling process* and produced 5,679.46 kg solid waste.

3.4. Green Value Stream Mapping (GVSM) current state

3.4.1. K2 wheat flour

1. Pre-Cleaning
   Energy used for this stage was 157.65 kWh. Emission waste was about 0.14 CO_2/hour. Other type of waste such as water, material and trash was none. This was due this stage mainly consist of containment process and the mixing process of wheat raw material.
2. Cleaning
   In cleaning stage, energy used was 73.26 kWh. Water waste obtained due to first and second dampening about 857 litres. Material waste was none. Waste in the form of separator machine trash, dry stoner, and magnetic separator was 89,11 kg. Emission waste was 0.06 CO_2/hour.
3. Milling
   During milling process, energy used was 243.09 kWh for 1 hour. Emission waste obtained about 0.21 CO_2/hour. In this stage, there was no use of water, material and trash, thus it was considered none.
4. Handling Waste
   In handling waste stage, they used 16.625 kWh energy from 1 hour electricity consumption. Trash waste was obtained from output of bran finisher machine and pollard about 3,506.14 kg. Emission waste was obtained by processing data and calculation of formula (1), about 0.01 CO_2/hour. Water and material waste was considered as none.

3.4.2. C1 wheat flour

1. Pre-Cleaning
   Energy obtained from 1 hour electricity consumption was 96 kWh. Emission waste was about 0.09 CO_2/hour. Other type of waste such as water, material and trash was none.
2. Cleaning
   In cleaning stage, energy used was 45 kWh. Water *waste* obtained due to first and second *dampening* about 653.7 litres. Material *waste* was none. Trash *waste* includes stone, pebble, offal and iron from separator machine, dry stoner and magnetic separator about 273.2 kg. Emission *waste* was 0.04 CO_2/hour.
3. Milling
   During milling process, energy used was 150 kWh for 1 hour electricity used. Emission *waste* was obtained by processing data and calculating it with formula (1) about 0.13 CO_2/hour. In this stage, there was no use of water, material and trash, thus it was considered none.
4. Handling Waste
   In handling waste stage, about 9 kWh energy was used for 1 hour electricity consumption. Trash *waste* in the form of *bran* and *pollard* was 5.679,36 kg. Emission *waste* was 0,008 CO_2/hour. Water and material *waste* was considered as none.

3.5. Environmental Indicator Measurement

Environmental Indicator Measurement was using 6 *Environmental Sustainability Index* (ESI) indicators 2005 [2]. Environmental impact was obtained from waste accumulation of production process. Emission waste can be calculated using formula [7].

3.5.1. K2 wheat flour
Below is environmental indicator measurement for K2:

EI = 0.17SWG + 0.5GWG +0.3WC.
EI = 0.17(3.595) + 0.5(0.42) +0.33(0.857)
EI = 1.10

GVSM analysis can be seen in Table 1.

Table 1. GVSM K2 analysis

Waste Type	Production Process (Per 1 hour)				Total
	Pre cleaning	Cleaning	Milling	Handling	
Energy	157.65	73.26	243.09	16.625	490.625
Water	0	857	0	0	857
Material	0	0	0	0	0
Trash	0	89.11	0	3,506.14	3,595.25
Emission	0.14	0.06	0.21	0.01	0.42

3.5.2. C1 wheat flour
The larger EI value shows larger environmental impact caused by the production process [3]. The environmental indicator value for C1 flour was about 1.36. It shows that C1 environmental indicator was higher than K2. This affects the low GPI value.

EI = 0.17(5.95256) + 0.5(0.26) +0.33(0.6537)
EI = 1.36

GVSM analysis table for C1 can be seen in Table 2.

Table 2. GVSM C1 analysis

Waste Type	Production Process (Per 1 hour)				Total
	Pre cleaning	Cleaning	Milling	Handling	
Energy	96	45	150	9	300
Water	0	653.7	0	0	653.7
Material	0	0	0	0	0
Trash	0	273	0	5,679.36	5,952.56
Emission	0.09	0.04	0.13	0.08	0.26

3.6. Economy Indicator Measurement
K2 wheat flour
Selling price of K2 product is IDR 9,500. Production capacity per hour was obtained from the targeted plan of 266.4 ton per day and conversed into 11,102.76 kg/hour. Work hour/year was adjusted with the production process of K2. K2 was produced about 6 days each month, and thus its work hours/year was 1728.

Its total production cost/hour was IDR 87,284,000. The main cost for production/hour was

IDR 7,862 and calculated between ratio of total cost (IDR/hour) and work capacity (kg/hour). The result of economy indicator for K2 was obtained from ratio of selling price and its production main cost/hour, about 1.21. Economy indicator value for K2 wheat flour was considered good.

C1 wheat flour

Production capacity/hour of C1 product was 9,456.60 kg and produced about 16 days each month, thus work hour/year would be 4608 hours. Selling price per kg is Rp 8.000. Components in total production of C1 consist of fix cost and irregular. Total production cost/hour was IDR 55,990,014/hour. The total production cost per hour was about IDR 5,912 calculated between total cost ratio (IDR/hour) and work capacity (kg/hour). Economy indicator result for C1 product was obtained from ratio of selling price and total production cost per hour, about 1.35. This economy indicator value was considered low.

3.7. GPI measurement

GPI measurement was obtained by using equation (3). GPI value can be viewed in Table 3.

Table 3. GPI measurement

Product Name	Economic Indicator	Enviroment Indicator	GPI
K2	1.21	1.10	1.10
C1	1.35	1.36	0.99

GPI value for K2 is 1.10 and C1 is 0.99. Based on this result, green productivity of K2 is better than C1.

3.8. Alternative improvement for green productivity

Improvement in green productivity should be done in C1 wheat flour production with 3 alternatives:

a. Optimizing Production Process (OPP) can be done by implementing total productive maintenance (TPM) through human resources training for those in charge of production machine handling. TPM has the benefit of improving efficiency and effectiveness of production facilities [10].
b. Technology Modification (TM) by changing all the machines used for the production process in Mill E because all machineries were very old. The changing the production machine could improve he company productivity [9].
c. Raw Material Handling (RMH) should be done by determining the standard for raw material received from supplier so that its quality was always maintained and create specific room for wheat.

Table 4 shows that results from respondents have already consistent with CR value of 0.059. Optimization result of production process is the alternatives with the largest weight, which is 0.594.

Table 4. Weight processing result

Alternatives	Weight	CR
OPP	0.594	0.059
TM	0.315	
RMH	0.091	
Total	1.000	

The hierarchy consistency can be done by ratio between CI and IR if its value was less or equal with 0,1 and thus calculation can be considered valid [11].

4. Conclusion

K2 wheat flour has larger GPI value than C1 wheat flour which were 1,10 and 0,99 and showed that green productivity level of K2 is better than C1. Lower GPI value was due to higher environmental indicator value. Optimization Production Process (OPP) is weighed by 0,594 and done by implementing TPM through human resources training in handling production machine in Mill E. Further analysis should be done in creating GVSM map for future state. The development of more detailed alternatives comparison to improve green productivity value in K2 and C1 wheat flour production process should be done, so that its GPI ratio can be known. These could be done to improve the weakness of this study.

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A response surface methodology for optimizing the non-gluten over ripe canistel powder formulation

S.R.R. Pertiwi*, A. Aminullah, T. Rohmayanti, Hardono

Department of Food Technology and Nutrition, Faculty of Halal Food Science, Djuanda University, Jalan Tol Ciawi No. 1, Bogor 16720, West Java, Indonesia

*Corresponding author: sri.rejeki.pertiwi@unida.ac.id

Abstract. Over ripe canistel fruit contains high sugar and carotenoids. As it is an under-utilized fruit, it can be preserved by making it into powder beverage. In the processing of over ripe canistel powder, it is required an amount of water, maltodextrin and tricalsium phosphate (TCP). The objective of this study was to obtain the optimum formula of over ripe canistel powder using vacuum drier. Optimization was done using Design-Expert 7.0 Response Surface Methodology (RSM) software. Formula used in this study consisted of water 53-63%, maltodextrin 10-20%, and TCP 0-2%, with total with total 75% from the total interaction formulas and canistel fruit 25%. Responses of moisture content, yield, and flowability were analyzed. The formula of over ripe canistel powder significantly affected the yield and flowability, but did not significantly affect the moisture content. The optimum formula given by the Design-Expert 7.0 RSM software was 53.94% water, 19.06% maltodextrin, 2% TCP, with desirability value 0.729. The optimum formula gave prediction response values moisture content 4.37%, yield 26.12%, and flowability 30.14%. Results of verification for the optimum formula of over ripe canistel powder were moisture content 4.62%, yield 28.40%, and flowability 31.68%.

1. Introduction

Canistel (*Pouteria campechiana*) is a plant originating from Mexico that can grow in tropical and subtropical climate such as Indonesia (Kanak and Bakar, 2018). In Indonesia, canistel fruit is commonly found in West Java, especially in Padalarang and Cirebon. Canistel fruit contains alkaloids, tannins, flavonoids, steroids, and terpenoids (Mehraj et al. 2015). Based on Pertiwi et al. (2018), over-ripe canistel fruit has a softer texture, contains lower starch and more sugar than full slip canistel fruit. Over ripe canistel fruit can be utilized as canistel powder. The canistel powder produced will have a longer shelf life and can be used as a mixture of cake-making, cookies, ice cream and non-gluten food sources (Kanak and Bakar, 2018).

The principle of processing fruit into fruit powder is to reduce the moisture content in fruit juice to a certain extent so that microbial growth and enzyme activity can be prevented (Shishir and Chen 2017). Utilization of over-ripe canistel fruit into powder is done by drying process. One suitable drying method for agricultural products that is sensitive to high temperature but able to maintain the product quality is vacuum drying (Ando et al. 2018; Ramos et al. 2019).

The high sugar content in the over-ripe canistel will cause stickiness during drying. In an effort to reduce stickiness in canistel powder, it is necessary to add filler such as maltodextrin to produce non-sticky powder (Ramos et al. 2019), whereas to improve flowability and to inhibit clumping of fruit powder, tricalcium phosphate (TCP) is added (Aguilar et al. 2018).

In this study, the optimum formula for water concentration, maltodextrin and TCP used in the production of over-ripe canistel powder was determined. Determination of the three ingredients

concentration was carried out using Response Surface Methodology (RSM). According to Rosidah et al. (2017), the advantage of using the RSM method is that it is faster and informative compared to the approach of one classic variable or a complete factorial design.

2. Material and Methods

This research method was based on Myres et al. (2016) which had four stages. The stages were determining the formula, making the product according to the formula, testing the product responses and data analysis, and finally the formula optimization and verification of the optimum formula.

2.1 Formula determination

The formulation process was carried out using design expert DX 7.0 (trialversion) from stat ease with mixture design D-optimal. The research factors were water concentration (A) in fruit pulp making, the concentration of maltodextrin (B) as filler material and concentration of TCP (C) as anticaking agent. The lower and upper limit on each factor were (A) 53-63%, (B) 10-20%, (C) 0-2%. In which the amount of (A+B+C) was 75% while the 25% remain was over-ripe canistel fruit flesh. In this method, thirteen formulas were chosen by the design expert program randomly according to the statistical method or research design used (Table 1).

Table 1. Optimization of over-ripe canistel powder formulation using RSM

Formulation	(A) Water (%)	(B) Maltodextrin (%)	(C) TPC (%)
1	55.245	17.756	1.999
2	59.806	15.194	0.000
3	53.004	20.000	1.996
4	63.000	10.669	1.331
5	53.004	20.000	1.996
6	55.000	20.000	0.000
7	56.726	18.274	0.000
8	58.132	14.868	2.000
9	61.207	13.043	0.750
10	63.000	12.000	0.000
11	59.440	13.560	2.000
12	57.699	16.359	0.942
13	63.000	10.669	1.331

Source: d*esign expert* output (2018).

2.2 The production of over-ripe canistel powder

Canistel powder was made using vacuum drying method. In the amount of 25% of over-ripe canistel flesh was mixed with water, maltodextrin, and TCP with the concentration of each formula to produce canistel fruit pure. Canistel fruit pure was then vacuum dried at a temperature of 60ºC and a pressure of 65-70 cmHg until it produced over-ripe canistel powder.

2.3 Product response test and its data analysis

The product response parameters tested in this study were moisture content (AOAC 1995), yield (AOAC 1995) and flowability (Shishir *et al.*, 2014). The data were then processed by the

Design Expert 7.0 program with RSM statistical design of mixture design D-optimal method. The design expert program provided choice of polynomial model for each response, those were mean, linear, quadratic, cubic, and special cubic.

Based on the instructions from the application of design expert 7.0, there were three stages to accomplish polynomial equation, which was based on sequential model sum of squares [Type I], lack of fit tests, and model summary statistics. The sum of squares would choose the highest order of polynomial equation from one response variable whose variance analysis (ANOVA) gave significantly different result. Lack of fit tests would choose the order of the highest polynomial equation which gave the results that were not significantly different in terms of deviations in the response. The model summary statistics would select the order of the polynomial equation which contributed on the maximum "Adjusted R-squared" and "Predicted R-squared" values.

A response variable could be said significantly different or significant at the 5% significance level if the p value "prob > F" result of the variance analysis (ANOVA) was smaller than 0.05. The response variable whose significantly different result in the analysis of the variance could be used as a prediction model because the test variable had a significant effect on the response of the formula. Furthermore, the model considered most suitable would be displayed in contour plot in the form of two-dimensional (2-D) or three-dimensional (3-D) graph.

2.4 Optimization and selection of best formula

The optimization process was conducted to obtain a formula producing the optimal response according to the desired optimization target. The optimization value achieved was known as the desirability value which was indicated by the value in the interval of 0 - 1. The higher the desirability value, the higher the suitability of the formula obtained to achieve the optimal formula with the desired response variable. In determining the optimization target, scaling of interest was done for the desired goal. This scaling was called importance if it was selected from 1 (+) to 5 (+++++) depending on the importance of the response variable in question. The more positive signs given indicated the importance of the higher response variable. Based on the predetermined optimization target, the program design expert would provide the optimum formula solution which would then be proceed to the verification stage to ensure the correct prediction of the selected formula response values and the results of the laboratory research responses obtained.

3. Results and Discussion

The results of the response analysis based on the 13 formulas of trial design and the responses of the Design Expert 7.0 program with the RSM statistical design of the mixture design D-optimal method are shown in Table 2.

Table 2. Response of over-ripe canistel powder formula

Formula	Factor			Response		
	Water (%)	Maltodextrin (%)	TCP (%)	Moisture content (%)	Yield (%)	*Flowability* (%)
1	55.245	17.756	1.999	3.636	24.249	23.457
2	59.806	15.194	0	3.134	24.244	35.135
3	53.004	20	1.996	4.715	29.038	31.149
4	63	10.669	1.331	4.358	17.388	43.892
5	53.004	20	1.996	4.702	28.052	39.922
6	55	20	0	4.108	23.849	37.012
7	56.726	18.274	0	4.987	24.853	39.867
8	58.132	14.868	2	4.436	17.537	22.704
9	61.207	13.043	0.75	4.828	20.362	32.456
10	63	12	0	5.509	18.103	36.061
11	59.44	13.56	2	3.299	14.830	30.725
12	57.699	16.359	0.942	4.657	23.159	33.333
13	63	10.669	1.331	4.435	16.964	41.851

Sumber: *output design expert* (2018).

3.1 Moisture content of canistel powder

Moisture content is the amount of water contained in the material expressed in percent. Moisture content in food ingredients also determines the freshness and durability of these foods. The moisture content response test results ranged from 3.13% -5.51% (Table 2). Wong et al (2015) and Sangamitrha et al (2015) stated that fruit powder containing moisture content that less than 5% can prevent enzymatic reactions and damages caused by microbial activity. The results of the analysis carried out by the expert design program produced the polynominal model of the response of moisture content, which is shown in Table 3 and the three-dimensional graph forms are shown in Figure 1.

Tabel 3. ANOVA of moisture content response

Source	**Sum of** Squares	df	**Mean** Square	**F** Value	**p-value** Prob > F	
Model	0	0				
Residual	5.49	12	0.46			
Lack of Fit	5.49	10	0.55	360.19	0.0028	*Significant*
Pure Error	3.05E-03	2	1.52E-03			
Cor Total	5.49	12				
Std. Dev.	0.68	R-Squared		0		
Mean	4.37	Adj R-Squared		0		
C.V. %	15.48	Pred R-Squared		-0.1736		
PRESS	6.44	Adeq Precision				

Based on Table 3, the polynominal model of the moisture content response was the mean. The results of analysis of variance (ANOVA) at the 5% significance level indicated that lack of fit of

the model produced was significant. This was indicated by the smaller value of lack of fit than 0.05 (<0.0028) and F-value of 360.19.

The significant value of lack of fit shows that there is no conformity of moisture content response data and the model. A significant lack of fit indicates that variations in the replication of mean values are smaller than variations in design points from predicted values (Susilo, 2011).

The predicted R-squared value was negative, which was -0.1736. Negative predicted R-squared value indicate that the overall mean gives a better prediction for the moisture content response. The model produced for the response of moisture content was only made based on the mean value so that the equation was obtained as follows:

Moisture content (%) =+4.36961.....(1)

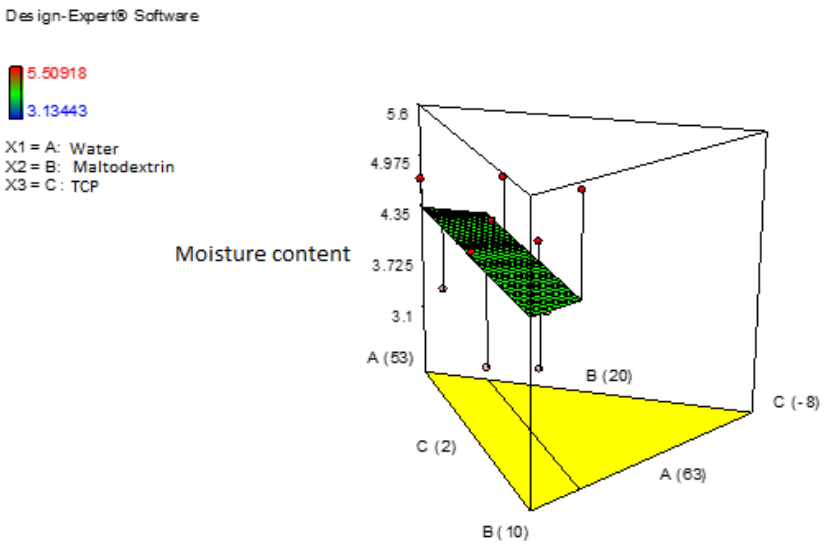

Figure 1. Three dimension graph of moisture content response testing

The countour plot graph in Figure 1 illustrates how the combination of components does not affect each other with the value of the moisture content response. The colors that look the same in all countour chart areas shows that the measured response values are the same in all combinations of the measured components. This is because the chosen polynomial model is the mean, so that the moisture content response value is considered the same in each combination. The response of moisture content also looks flat on each combination of components measured. The response rate of moisture content is considered not significantly different in each combination among components. The concentration of water used in making fruit pulp does not significantly affect the moisture content response. This is caused by the drying process with a vacuum dryer at the same temperature and pressure making the water in the material optimally evaporated to produce non-significant different powder's moisture content.

3.2 The yield of canistel powder

Yield is a ratio of the weight of powder produced and the weight of the canistel fruit flesh used. Calculation of yield is based on the dry weight of the material. The drying causes decline of moisture content in the material, resulting the decreasing of powder yield. The high yield indicates that the amount of powder obtained is increasing. The yield response test results

reveals the values in the range of 14.83-29.04% (Table 2). ANOVA statistical analysis in Table 4 demonstrates the polynomial model provided by Design-Expert 7.0 software.

Table 4. ANOVA of yield response

Source	Sum of Squares	Df	Mean Square	F Value	p-value Prob > F
Model	239.12	6	39.85	48.06	< 0.0001
Linear Mixture	184.82	2	92.41	111.44	< 0.0001
AB	12.83	1	12.83	15.47	0.0077
AC	0.29	1	0.29	0.35	0.5763
BC	0.75	1	0.75	0.9	0.379
ABC	14.35	1	14.35	17.3	0.0059
Residual	4.98	6	0.83		
Lack of Fit	4.4	4	1.1	3.82	0.2183
Pure Error	0.58	2	0.29		
Cor Total	244.09	12			
Std. Dev.	0.91	R-Squared		0.9796	
Mean	21.74	Adj R-Squared		0.9592	
C.V. %	4.19	Pred R-Squared		0.8501	
PRESS	36.58	Adeq Precision		19.441	

Table 4 shows that the more maltodextrin added, the higher the yield obtained. This is due to the addition of maltodextrin induces in the addition of total solid found in maltodextrin, so that it can increase the total solid of over-ripe canistel powder. The higher the total solid in the dried material, the higher the yield produced (Badarudin 2006).

Based on the results of the analysis carried out by the design expert program, the polynominal model of the yield response is special cubic. Analysis of variance operated in the design expert program with the mixture design d-optimal method on the yield response value of the formulas made reveals that the model made is significant. This means that the formula made has a significant effect on the yield response, so that the response value can be used for the optimization process to obtain a product with optimum characteristics.

F-value of lack of fit was 3.82, with the p value of 0.2183 indicating that the lack of fit is not relative significant to pure error. The insignificant value of lack of fit is a requirement for a good model. The insignificant lack of fit reveals the suitability of the yield response data and the model.

The predicted R-squared and adjusted R-squared value for the yield response are 0.8501 and 0.9592, respectively, which indicate that the predicted data and actual data for yield response are included in the model at 85.01% and 95.92%. Adequate precision for the yield response is 19,441 which illustrates the amount of signal to noise ratio. Adequate precision values greater than 4 (19,441) reveal adequate signal, so that this model can be utilized as a design space guide. Based on the analysis, the model is qualified as a good model, so that it is expected to provide good predictions. Equation (2) of the polynomial for yield response is as follows:

$$\text{Yield (\%)} = -0.54357A - 9.03602B - 282.31868C + 0.21309AB + 4.38195AC + 13.04752BC$$

- 0.19301ABC.....(2)

In which, A = concentration of water, B = concentration of maltodextrin, C = concentration of TCP, AB = influence of water and maltodextrin interaction, AC = influence of water and TCP interaction, BC = influence of maltodextrin and TCP interaction, ABC = influence of water, maltodextrin and TCP interaction.

Based on the equation, it can be seen that beside being influenced by three components of material (water, maltodextrin, and TCP), yield is also influenced by the interaction among the three components. The response of the yield will decrease with the increase in the amount of water concentration, maltodextrin and TCP and the interaction of the three ingredients. This is indicated by a negative value coefficient. The randemen response will increase along the increasing of water and maltodextrin interaction, water and TCP and maltodextrin and TCP interaction. This is shown by a positive coefficient.

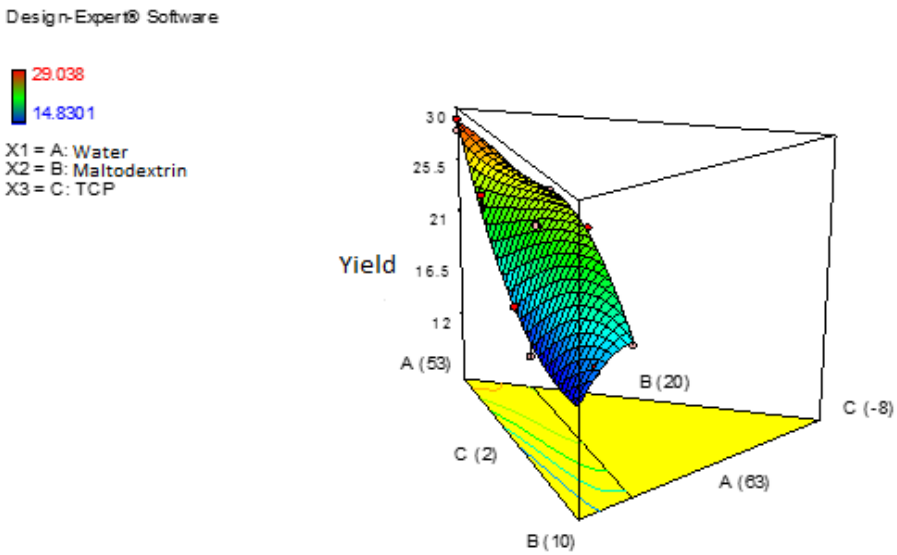

Figure 2. Three dimension graph of yield response testing

The countour plot graph in Figure 2 illustrates how the combination of components affects the response value. Different colors on the contour graph plot show the yield response value. The blue color shows the lowest yield response value, which is 17.0952%. The red color shows the highest yield response, which is 26.5484%. Lines consisting of points on the contour graph plot show a combination of the three components with different amounts that produce a yield response. Differences in surface height show different response values for each combination of formula components. The low area shows a low yield response value while the high area shows a high yield response value.

3.3 Flowability of canistel powder

The addition of anticaking agent into over-ripe canistel powder aimed to maintain the flow property of powder to keep it free-flowing or easily flow. Flowability is the ability of a solid grain or powder to flow or called ease of flow. The physical and chemical properties of a powder are very dependent on the surrounding environmental factors, namely particle size,

storage time, temperature, and fat content which can result in clumping (Ganesan et al. 2008).

Flowability response test results range from 22.70-43.89 (Table 2). The lowest flowability test value is 22.70 derived from formula 8. The lowest flowability value is included in the fairly easy flow category. While the highest flowability test value of 43.89 comes from formula 4 and falls into the category of very poor flow. The average value of the flowability response is 34.43 with a standard deviation of 6.21. The lowest flowability value is included in the category that is quite easy to flow because it is indeed the nature of hygroscopic fruit powder. Based on the analysis, the polynomial model of flowability response is special cubic. The results of the variance analysis (ANOVA) are found in Table 5.

Table 5. ANOVA of flowability response

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	424.49	6	70.75	5.5	0.0285
Linear Mixture	105.5	2	52.75	4.1	0.0754
AB	245.27	1	245.27	19.07	0.0047
AC	2.63	1	2.63	0.2	0.6671
BC	6.39	1	6.39	0.5	0.5072
ABC	64.26	1	64.26	5	0.0668
Residual	77.17	6	12.86		
Lack of Fit	36.61	4	9.15	0.45	0.775
Pure Error	40.56	2	20.28		
Cor Total	501.66	12			
Std. Dev.	3.59	R-Squared		0.8462	
Mean	34.43	Adj R-Squared		0.6923	
C.V. %	10.42	Pred R-Squared		-0.6705	
PRESS	838.01	Adeq Precision		7.149	

Table 5 demonstrates that the recommended model (special cubic) is significant with the p value "prob> F" smaller than 0.05 (0.0285). This means that the formula made has a significant effect on the response of flowability, so that the response value can be used for the optimization process, namely to obtain products with optimum characteristics.

F-value of lack of fit is 0.45 with p value 0.775 indicating that lack of fit is not relative significant to pure error. The insignificant value of lack of fit is a requirement for a good model. This insignificant lack of fit shows the suitability of the data flowability response and the model.

The predicted R-squared and adjusted R-squared values for flowability responses are -0.6705 and 0.6923, respectively. Negative predicted R-squared value indicates that the overall mean gives a better prediction for flowability response. Adequate precision for flowability response is 7.149 which shows the amount of signal to noise ratio. The value of adequate precision greater than 4 (7,149) demonstrates an adequate signal so that this model can be used as a design space guide. Based on the analysis that has been done, the model is qualified as a good model, so that it is expected to provide good prediction. Equation (3) polynomial for flowability response is as

follows:

$$\text{Flowability (\%)} = 0.19179A - 1.96233B - 379.61631C + 0.090864AB + 6.59772AC + 23.13948BC - 0.40851ABC \quad (3)$$

Based on the equation, it can be seen that beside being influenced by three components of material (water, maltodextrin, and TCP), flowability is also influenced by interactions among the three ingredients. Flowability response will increase along with the increasing amount of water concentration; interaction of maltodextrin, water and maltodextrin; interaction of water and TCP; and interactions of maltodextrin and TCP. This is indicated by a positive value coefficient. The flowability response will decrease along with the increasing of maltodextrin, TCP; the interaction among water, maltodextrin and TCP. This is indicated by a negative coefficient. Flowability value will be greatly influenced by TCP because the TCP variable has the highest negative coefficient value (good flowability has a low value).

The easier the powder flows, the easier the powder will segregate in the mixture because the particle movement is very high. The worse the nature of the flow of a powder, the more cohesive the powder and not easily segregated (Harnby and Edwards, 1992). Anticaking agent will coat food particles in the form of powder and absorb excess water so that the properties of powder granules can be maintained (Oelmuller and Grinschgl, 1998). In addition, the use of anticaking agent in powder products can reduce tension among particles increasing bulk density of powder products (Iskandar, 2001).

The countour plot graph in Figure 3 illustrates how the combination among components influences the flowability response value. Different colors in the contour graph plot show flowability response value. Blue shows the lowest flowability response value, which is 22.70. The red color shows the highest flowability response, which is 43.89. Lines consisting of points on the contour graph plot show a combination of the three components with different amounts that produce the same flowability response. Differences in surface height show different response values for each combination of formula components. Low area reveals low flowability response value while high area shows high flowability response value.

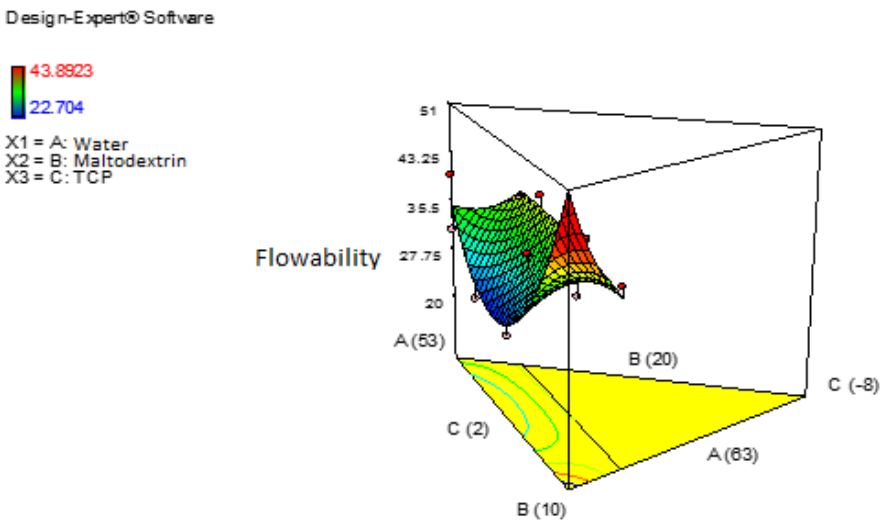

Figure 3. Three dimension graph of *flowability* response testing

3.4 Optimization of the selected formula with Design-Expert 7.0 Software

The selected formula is the optimal solution or formulation predicted by the design expert of mixture design d-optimal method based on the analysis of the response namely yield, moisture content, and flowability. The accuracy of the formulation and the value of each response can be seen in desirability. Desirability is the accuracy degree of optimal solution or formulation outcome. The closer to the value of one, the higher the accuracy value of the formulation. Therefore, it can be concluded that the desirability value that has approached 1.00 has a fairly high accuracy. The description of the elements optimized with each element having different goals and weighting interests is shown in Table 6.

Table 6. Description of optimized process and response parameter elements

Name	**Goal**	**Lower Limit**	**Upper Limit**	**Lower Weight**	**Upper Weight**	**Importance**
Water	is in range	53.00	63	1	1	3
matodextrin	is in range	10.66	20	1	1	3
TCP	is in range	0	2	1	1	3
Moisture content	is in range	3.13	5.50	1	1	5
Yield	maximize	14.83	29.03	1	1	4
flowability	minimize	22.70	43.89	1	1	3

Based on Table 6, the moisture content response is optimized with goal in range and importance (+++++) because for powder products, moisture content is an important parameter. Changes in moisture content will cause changes in microbiological, chemical and physical quality. The powder response is optimized by goal maximize and importance (++++). This is reasonable because the higher the yield, the better the economic calculation. Flowability responses are optimized with goal minimize and importance (+++). The lower the flowability value, the better the flow of powder, then the easier the flow of powder.

Table 7. The optimum formula solution

No	Water	Matodextrin	TCP	Moisture content	Yield	*Flowability*	*Desirability*
1	53.939	19.061	2	4.369	26.122	30.145	0.729
2	53.004	20	1.996	4.369	28.904	35.084	0.683
3	56.780	17.702	0.519	4.369	25.148	34.222	0.595

Source: *output design expert* (2018).

Based on the stages of optimization that have been done, the design expert program provides three optimum formula solutions that can be seen in Table 7. Formula 1 has a desirability value of 0.729, formula 2 is 0.683 and formula 3 is 0.595. By taking notice of the three optimum formula solutions, it is said that formula 1 has the highest desirability value, so it is recommended by the design expert program (selected). This indicates that due to the results of the optimization that has been done, formula 1 obtains the desired optimization target. Based on the recommendation, formula 1 will be proceed to the verification stage because it has the highest desirability value.

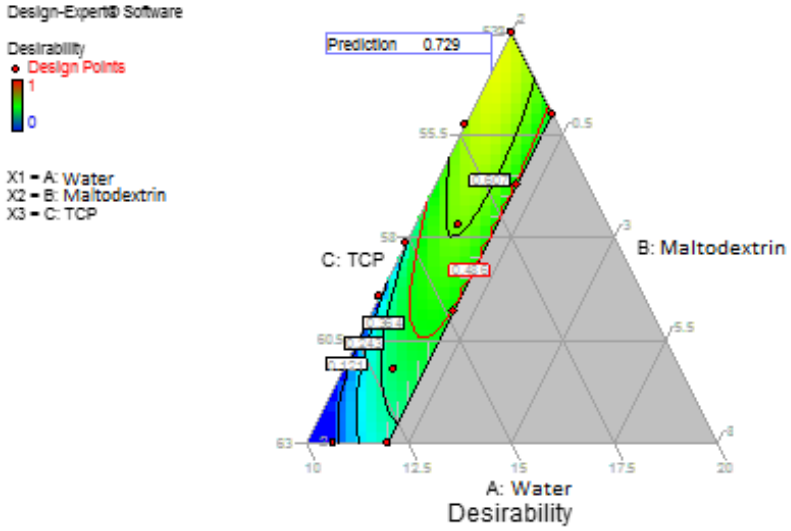

Figure 4. *Countour plot* of *desirability* test

Figure 4 presents the results of the optimum formula solution presented in the form of two-dimensional contour plot using a prediction model for moisture content, yield and flowability response. The value on the contour line is a combination of three components, namely water, maltodextrin and TCP those results in achieving desirability values. The lowest desirability value is shown in blue and the highest is indicated by green.

3.5 Selected product verification

After the formula optimization step was done by using the design expert program, then the verification phase was conducted. This verification phase aimed to prove the predictions of the response value of the optimum formula solution provided by the design expert program. From the verification stage, the actual response value would be obtained which would then be compared with the predicted response generated by the design expert program.

Beside predicting the response value of each given optimum formula solution, the design expert program also provides confident interval (CI) and prediction interval (PI) for each predicted response value at a significance level of 5%. Confident interval is a range that shows the average expected measurement results at a certain level of significance, in this case 5%. Prediction interval is a range that shows the prediction of the actual value of the results of measurements of individual responses at a certain level of significance, in this case 5%. The results of the verification carried out along with predictions from each response can be seen in Table 8.

Table 8. Prediction and results of response value verification for optimum formula solution

Response	DX Prediction	Verification Result	95% CI low	95% CI high	95% PI low	95% PI high
Moisture content	4.3696	4.62	**3.96**	**4.78**	2.84	5.90
Yield	26.1225	28.40	24.93	27.31	**23.60**	**28.65**
Flowability	30.1452	31.58	**25.46**	**34.83**	20.20	40.10

Source: *output design expert* (2018).

In Table 8, you can see the verification data with predictions made by the design expert program. The values of the verification result obtained were almost close to the predicted value. The results of the verification of the three responses still met 95% CI and 95% of predicted PIs. The difference among the results of verification and prediction is due to the variation of the process. This shows that the optimization of the canistel powder formula using RSM of mixture design D-optimal method according to the results of the actual analysis. The obtained equation is considered as still good enough to determine the optimum formula and the obtained response.

4. Conclusions

Over-ripe canistel powder formula significantly influences the yield response and flowability, but it does not significantly affect the moisture content response. From the results of calculations carried out in the design expert program with mixture design d-optimal method, it has been obtained that the optimum over-ripe canistel powder formula has a desirability value in the amount of 0.729. The optimum formula consisted of 53.94% water, 19.06% maltodextrin, 2% TCP and 25% over-ripe canistel fruit pulp. The optimum formula produces a prediction of the response value of moisture content of 4.37%, yield of 26.12% and flowability of 30.14%. Based on the results of laboratory testing verifications carried out on the optimum through over-ripe canistel powder formula, the moisture content response value was in the amount of 4.62%, yield was 28.40% and flowability was 31.68%.

Acknowledgement

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Sensory Characteristics of *Kacang nasi* and Soybean Tempeh

H Naisali [1,2], S N Wulan[1] and Yunianta[1]

[1]Departement of Agricultural Product Technology, Faculty of Agricultural Technology, University of Brawaijaya, Malang, Indonesia 65145
[2]Departement of Agrotecnology, Faculty of Agriculture University of Timor, Timor Tengah Utara, Indonesia 85613

E-mail: hylde3naisali@gmail.com

Abstract. *Kacang nasi* is one of the local potentials of Timor Island, East Nusa Tenggara Province with abundant amounts, but its utilization is still lacking even though the nutritional content of *kacang nasi* is equivalent to soybeans. *Kacang nasi* are usually for Timorese people cooked with *jagung bose* for a long time so that it decreases the nutrient content. The amount of nutrient content of *kacang nasi* seeds is equivalent to soybeans but *kacang nasi* have a low protein content. One way to increase *kacang nasi* protein content, product diversification was carried out. Tempe is a fermented soybean seed by *Rhizopus* sp. mold shaped compact solid, distinctive smell and white. Tempe is a nutritious food, a cheap source of protein and easily accessible to all levels of society. This study aims to determine the level of consumer acceptance of *kacang nasi* tempeh compared to soybean tempeh. The method used is a hedonic scale method 1-5 (dislake-verylike) with sensory attributes including color, aroma, texture, and taste. The evaluation sensory results of the two types of treatments were significantly different between attributes.

1. Introduction

Kacang nasi (Vigna unguiculata, (L). Walp) is one of the potential local beans of Timor-East Nusa Tenggara (NTT). No executing has been explored. Obstacles to using black *kacang nasi* because of the skin and hard seed texture. This hard epidermis is harder to remove compared to soybeans. In addition to the hard texture, the unpleasant odor is one of the factors that causes *kacang nasi* to be less preferred. This unpleasant smell shows the activity of the natural lipoxygenase enzyme in peanut seeds. According to Ginting et al., [1], this enzyme will be active when the seeds break because of the stripping and grinding process due to contact with oxygen. Another factor is the color of the beans which also causes the final color of the product to be less attractive.

According to Puspita et al.,[2], legume seeds are usually mixed with corn as a staple food on the island of Timor. The long time of cooking process causes a decrease in protein nutritional value. One way to maintain and improve *kacang nasi* protein content is making the tempeh. Tempeh is a food source of protein that is cheap and easily accessible to all fermented communities using molds of *Rhizopus* sp. In Indonesia, most people consume soybeans tempeh as a side dish or snack, and don't know tempeh from *kacang nasi*. So, the acceptance levels of *kacang nasi* tempeh compared to soybeans tempeh need done to be done. Thus, in this study was to determine the level of panelists acceptance of *kacang nasi* tempeh compared soy beans tempeh by hedonic test.

2. Material and Method

This research was conducted in a sensory laboratory, Department of Agricultural Product Technology, Brawijaya University. The samples of *black kacang nasi* was obtained from farmers in the South Letneo Village, Insana Barat District, North Timor Tengah Regency, East Nusa Tenggara Province, while Soybean Tempe was purchased from "UKM Tempe Sanan".

The process of making *kacang nasi* tempeh is done according to the production of soybean tempeh by Egounlety et al.,[3] with minor modification. *Kacang nasi* are washed and soaked in boiling water overnight. Soaking *kacang nasi* is peeled and soaked for 48 hours. Then the beans are washed and steamed for 20 minutes then dried. After the cold and dry *kacang nasi* are mixed with yeast and stirred until evenly then wrapped in plastic that has been perforated and pressed. Then the peanut packets that have been given yeast are left at room temperature for 36 hours until they become *kacang nasi* tempeh. The 2 type tempehs were fried until brown-yellow colour before serving to the panelists.

The method for sensory evalution used hedonic method, with scale of preference ranged 1-5 (not dislike like it to very much like) using 30 untrained panelists. Each panelist was given 2 fried tempeh (1 cm x 1 cm) produced from 2 different types of beans (*kacang nasi* and soybeans) and asked to give assesment based on the scale. The results of sensory evaluation was compared using paired T-test by Minitab 17 trial version.

3. Results and Discussion

3.1. Color

The color in a food product is very influential for someone's appetite where attractive colors and natural looks. The comparation of panelists preference for the color of *kacang nasi* tempeh (KNT) and soybean tempe (SBT) shown in Table 1 and the data of colour of tempeh shown in Figure 1. The average of panelist preference for KNT was 3.67 while SBT was 4.50. The formation of mycelium determines the white color of tempe. dense mycelium will cover so that the tempe will look pure white. according to Winanti et al [4], the color of good tempeh is the overall surface of pure white tempeh. Panelists tend to like the color produced by soybean tempeh compared to *kacang nasi* tempeh. Comparative results using paired T-test between *kacang nasi* and soybean tempeh obtained P-value = 0.000. The p-value <0.05 indicates that the colors of the two products have significant differences according to the panelists.

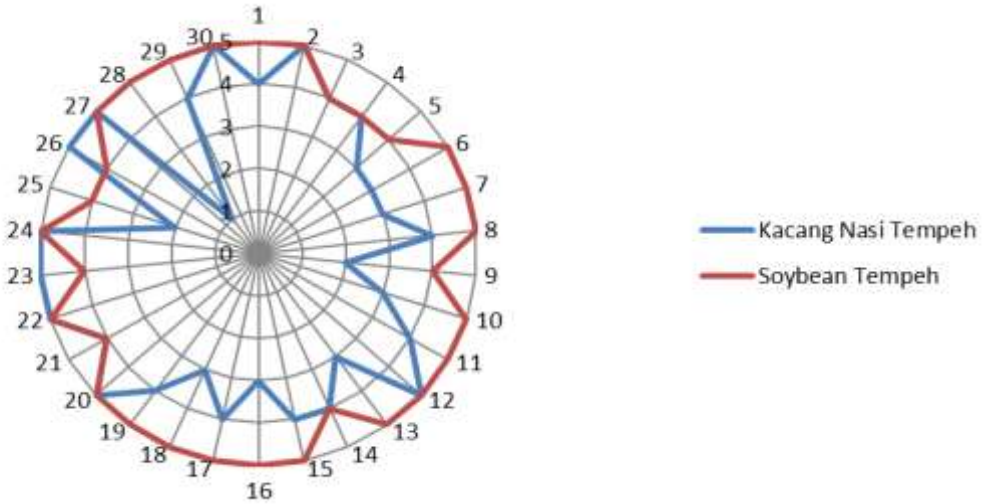

Figure 1. Preference of 30 Panelists on Color Parameter

Table 1. Sensory Fried Tempe Test Results with different raw materials

Tempeh Type	Sensory Properties*)			
	Colour	**Aroma**	**Texture**	**Taste**
Kacang nasi tempeh (KNT)	3.83±1.04	3.97±0.87	4.03±0.84	3.70±1.06
Soybean tempeh (SBT)	4.50±0.67	4.47±0.72	4.57±0.56	4.70±0.46
P value	0.000	0.030	0.003	0.003

Note :*) n=30 panelists

3.2. Aroma

In the food industry testing smell or odor is considered very important because it can quickly provide product results related to whether or not a product is accepted [5]. The fermentation process in tempeh will affect the aroma of tempeh. The all data preference on aroma parameter shown in Figure 2, while the comparation of panelists preference for the aroma of KNT and SBT shown in Table 1. The average of panelist preference for KNT was 3.97 while SBT was 4.47. The unpleasant aroma of tempeh is influenced by the raw material used and fermentation process. Winanti et al [4] stated that good tempeh has a distinctive aroma of fresh and not stinging tempeh. The tempe has a distinctive aroma of tempe, namely soft and not stinging aroma. Panelists tend to like the aroma produced by soybean tempeh compared to *kacang nasi* tempeh. Comparative results using paired T-test between KNT and SBT obtained p value = 0.030. The value of p value <0.05 indicates that the aroma of the two products have significant differences according to the panelists.

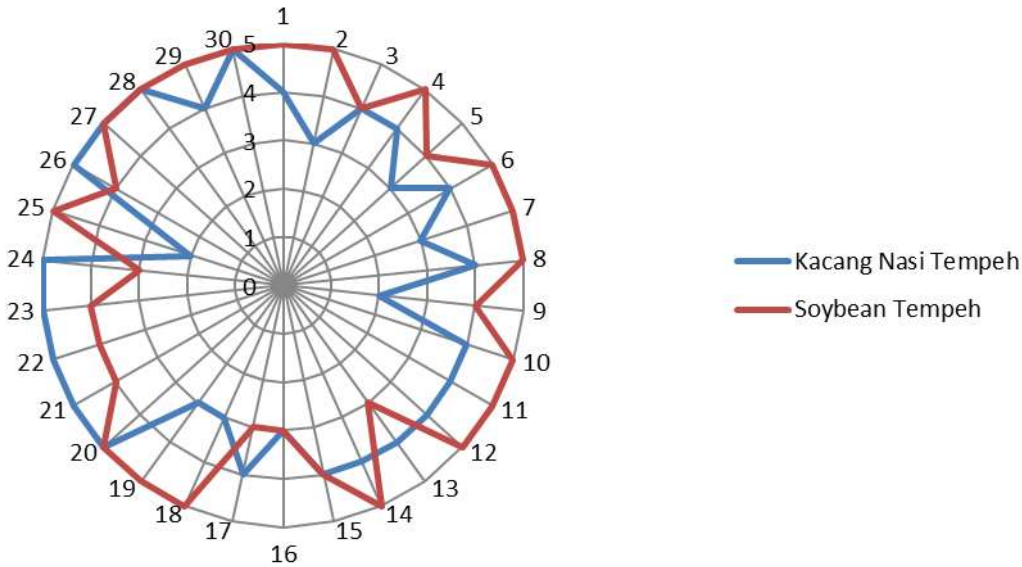

Figure 2. Preference of 30 Panelists on Aroma Parameter

3.3. Texture

The compact texture is caused by mycelia which connect the bean seeds. Mujianto [6] stated that good quality tempeh will produce tempeh in the form of compact solids. The more mold mycelium that grows in tempeh, the better texture of tempeh [7]. The mycelium will increase the density of the tempe period to one another so as to form a compact mass and reduce the air cavity in inside it.

The preference of panelists on the texture of the KNT and SBT shown in Table 1, while the all data of texture preference shown in Figure 3. The average of panelist preference for KNT was 4.03 while SBT was 4.57. Comparative results using paired T-test between SBT and KNT obtained p value = 0.003. The value of p value <0.05 indicates that the two products have significant differences on texture parameters according to the panelists.

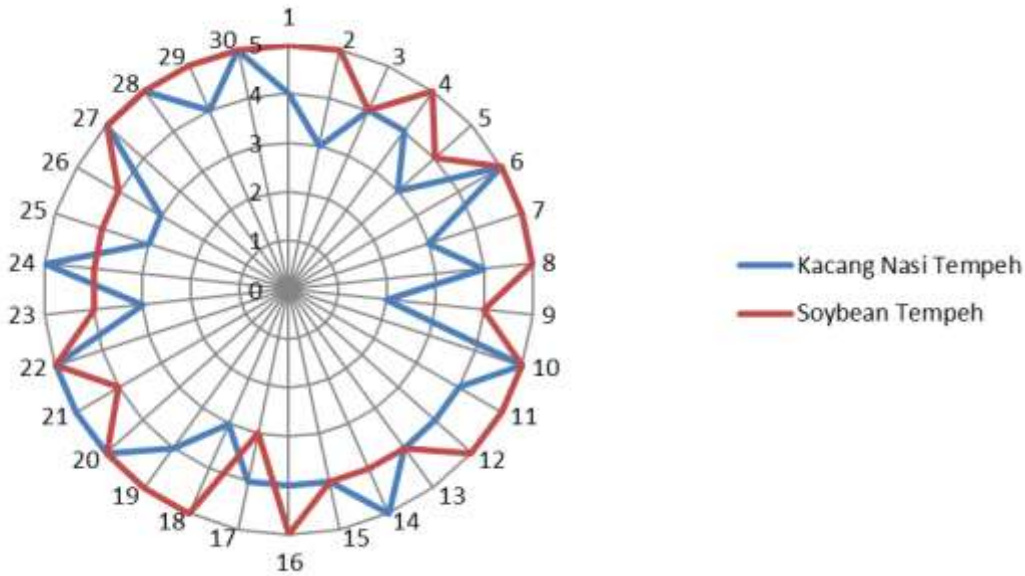

Figure 3. Preference of 30 Panelists on Texture Parameter

3.4. Taste

The taste of tempeh is generally savory because there is a high protein and fat content which is then hydrolyzed by mold into a simpler compound. The taste of tempeh is obtained from the fermentation process of carbohydrates, protein, and fat in the ingredients used by mushrooms so produce a distinctive taste [5]. This makes the tempe more savory when fried compared other tempeh. Tempe with a compact texture and mass when fried will not absorb a lot of oil fried, so that the resulting taste is more savory. The panelists preference for the taste of KNT and SBT shown in Table 1, and all the data shown in Figure 4. The average panelist preference for KNT was 3.70 and 4.70 of SBT. Comparative results using paired T-test between KNT and SBT obtained p value = 0,0003. The value of p value <0.05 indicates that the two products have significant differences on taste parameters according to the panelists.

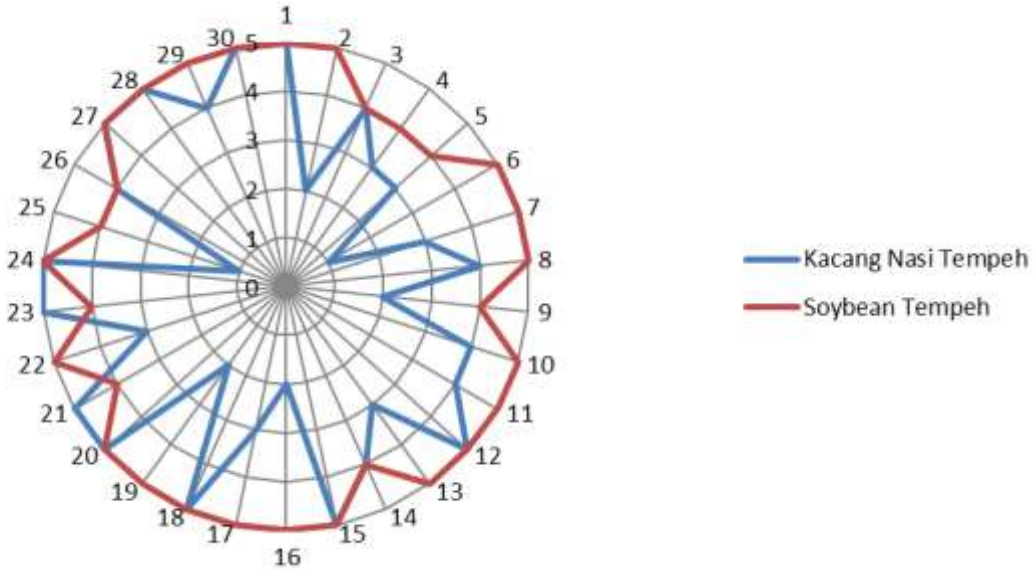

Figure 4. Preference of 30 Panelists on Taste Parameter

4. Conclusion

Based on the panelists assessment of the KNT and SBT samples, it can be seen that soybean tempeh (SBT) is the most preferred tempe by panelists than *kacang nasi* tempeh (KNT). All comparation for all responses (colour, aroma, texture, and taste) parameters showed that the KNT had a signifficant different compared SBT. The p-value comparation for colour, aroma, texture, and taste parameters was 0.000, 0.030, 0.003, and 0.0003 reespectively.

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Policy model on the production and availability of rice in Magelang Regency

I W Senjaya[1] and Sunarsih[2]

[1]Master Program of Environmental Science, School of Postgraduate Studies, Diponegoro University, Semarang – Indonesia
[2] Faculty of Science and Mathematics, Diponegoro University, Semarang - Indonesia

E-mail: matematison@gmail.com

Abstract. Magelang Regency is one of the national rice providers. As a National rice provider, the availability of rice need to be maintained sustainably in order to meet the needs of Magelang Regency and Surrounding area. As the main source of rice production, paddy fields must be protected from the conversion of built-up land such as settlements, tourism sites and others. local governments need to design policies that ensure the availability of surplus rice. This study aims to measure the impact of production policy scenarios and the application of law in Magelang Regency to protect the availability of surplus rice using system dynamic approaches. The scenarios that developed were law enforcement to decrease conversion of paddy fields and increased crop indexes to increase rice production, so increased the availability of rice as well. Simulation data were compared with the real data of the last five years from 2013-2017 (Central Bureau of Statistics of Magelang Regency) and had values that did not differ greatly from the actual data with errors of less than 10%. The simulation results showed that the moderate scenario could meet the needs of 216.6% rice with a surplus of 133,509.52 tons and the optimistic scenario met 229.5% of the rice needs with a surplus of 148,257.43 tons.

1. Introduction

Magelang Regency is in the province of Central Java, which means it plays a role in meeting the national rice needs of 14.51%. The total land use of 108,573 ha in Magelang, paddy fields amounted to 36,855 ha [2]. The decreasing in paddy fields occurred in Magelang Regency from 2005 about 37,445 ha to 37,219 ha in 2011 [8]. The practice of converting agricultural land to non-agricultural activities still occurs in 2013-2017. This can be seen from the number of paddy fields in Magelang Regency, which decreased from 36,892 ha in 2013 to 36,681 ha in 2017 [1]. This shows an average of 52.75 ha / year of conversion of paddy fields. While in non-rice field agriculture in Magelang Regency it also tends to decrease from 49,531 ha in 2013 to 49,494 ha in 2017 ([1], [2], [3], [4], [5]).

Magelang Regency has many tourism places. One of them is Borobudur temple as one of greatest Buddhist monuments in the world. Borobudur attracts tourists to visit Magelang regency for vacation. The more people come, the more area needed. The local community will start thinking to do conversion, unfortunately agricultural land. Local community start building new tourism place such as flower garden to attract attention of local or non-local tourists.

Some of the reasons for the conversion of agricultural land, namely 1) to build houses; 2) the owner of the paddy field is not a farmer so that the land is changed according to the interests of the owner; 3) the farm / paddy fields are released by developers for housing, shop houses, shops and

warehouses / factories ([6], [11]). In general, the factors that influence the conversion of paddy fields in the Central Java region are farmer's age, number of family dependents, outside farm income, land rent, and conversion process ([9],[12].

If prevention is not carried out, it is feared that not only Magelang regency will experience conversion of paddy fields, but also experienced by other districts which will certainly affect the national scale later. Both production and avalaibilty of rice will decrease in the future. The budget policy scenarios on increased production should be maintained to ensure the number of stock of rice ([19], [20]).

Formulating policies with a dynamic system approach is a systemic, holistic policy formulation, based on authentic data (real world) and adaptive and flexible to changes in changes in the strategic environment that are very dynamic ([13],[15], [16]). Through dynamic system modeling, it is expected to be able to describe the behavior of the existence of paddy fields and the availability of rice production.

2. Material dan methods

System dinamics model has been used in this study. This study uses two types of primary data and secondary data. Primary data is obtained through field observations and in-depth interviews with resource persons related to both directly and indirectly related to the conversion of paddy fields in Magelang Regency. While secondary data is obtained through literature studies, reports, regulations and related agencies such as the Agriculture and Food Department, the Central Bureau of Statistics and others.

2.1 Research area

Magelang Regency is one of the districts in Central Java Province which is located 110 ° 01 '51' and 110 ° 26 '58' East and between 7 ° 19 '13' and 7 ° 4 '216' 'South Latitude. Magelang Regency has an area of 108,573 Ha.

a. North Side : Temanggung Regency and Semarang Regency
b. East side : Semarang Regency and Boyolali Regency
c. South : Purworejo Regency and DIY Province
d. West : Temanggung Regency and Wonosobo Regency
e. In the Middle : City of Magelang

Figure 1. Magelang regency

2.2 Boundary system

The conversion system of paddy fields in Magelang Regency must include the sausage subsystem, the economic subsystem and the environmental subsystem, which is the system boundary of the model that will be made. The model is based on several key variables and the factors that drive the system devided into three subsystems bellow:

1) Land use subsystem: community forest, plantation, paddy field, dry field, built up land, and state forest/ponds.
2) Population subsystem : population, birth, death
3) Economic subsystem: crop indexes, productivity, harvest area, paddy production, rice production, milled dry grain income, availability of rice and rice needs.

2.3 Model construction

Causal diagrams of system boundaries will be used as a basis for making SFD flow charts (Stock Flow Diagrams) that will be simulated using the Powersim Studio 10 Professional program.

a). Symptoms / processes and elements of CLD are used as references to construct the model in Powersim Study 10 Professional.
b). For the flow diagram (Stock-Flow) that has been made then inputted data that are considered important in about the time of 2013-2017 were sourced from the Central Bureau of Statistics of Magelang Regency, Office of Agriculture and Food, Ministry of Agriculture and data from the District in Magelang Regency.
c). For Stock / level diagrams inputted the initial value of the year starting the simulation
d). For flow / flow diagrams using a simple mathematical equation formulation including multiplication, addition, subtraction or division.
e). Other parameters entered can be constants that can be obtained from agency data sources and related research
f). Running on a constructed diagram

2.4 Model verification and validation

Model verification is done to prove that the computer model that has been compiled in the previous stage is able to simulate the abstract model being studied [13]. Verification is also a process to ensure that the

computer program created and its application is correct. Model behavior validation is done by comparing between the magnitude and error characteristics of Absolute Mean Error (AME) is the deviation (difference) between the average value (mean) of the simulation results against the actual value. The acceptable deviation limit is <10% ([7], [13],[14]). Validation is done using data that is the main variable in the simulated model compared to the actual data obtained in the field.

Data from the last 5 years of 2013-2017 are taken from relevant agencies to be used as actual data as validation of data on land use sub-models, social sub-models, economic sub-models, and sub-models of environmental services. Valid status will be obtained if AME is less than 10%. The data validation will use the following formula:

$$AME = [(\underline{Si} - \underline{Ai})/\underline{Ai}] \times 100\% \quad (1)$$

$\underline{Si}$ = Σ Si /N, dimana S = simulation value

$\underline{Ai}$ = Σ Ai /N, dimana A = actual value

N = observation time interval

AME = *Absolute Means Error*

2.5 Model sensitivity

Testing the sensitivity of the model means intervening / treating the input model / structure of the model to see changes in the model output [13]. Models that have been verified and validated will be examined with several scenarios so that the most optimal efforts are obtained. Scenarios are designed based on the consideration of reference patterns on some of the main variables of all influential aspects. This description can be realized in graphical or verbal form.

The scenario in question is in the form of a combination of interventions that will be carried out on the model in the form of changes in the existing parameter values. Treatment / intervention of the model is based on conditions that may occur in the real world, as well as based on possible policy choices. In other studies, treatment / intervention on the model is often explained as existing, moderate, and optimistic conditions by changing some values in the parameters and structure of the model from the existing state of the initial model.

The existing condition is the condition of the model in a condition without treatment. While for moderate and optimistic conditions there are treatments / interventions for parameters which then produce changes in output in the future. Interventions / combinations of interventions can be either functional or structural. After the intervention, the model is simulated again to see the sensitivity value of existing, moderate and optimistic conditions.

Firmansyah states that sensitivity values between variables in the optimistic and moderate scenario, good optimistic and moderate value ratios are (2:1) [7].

3. Results and discussion

3.1. Causal loop diagram (CLD)

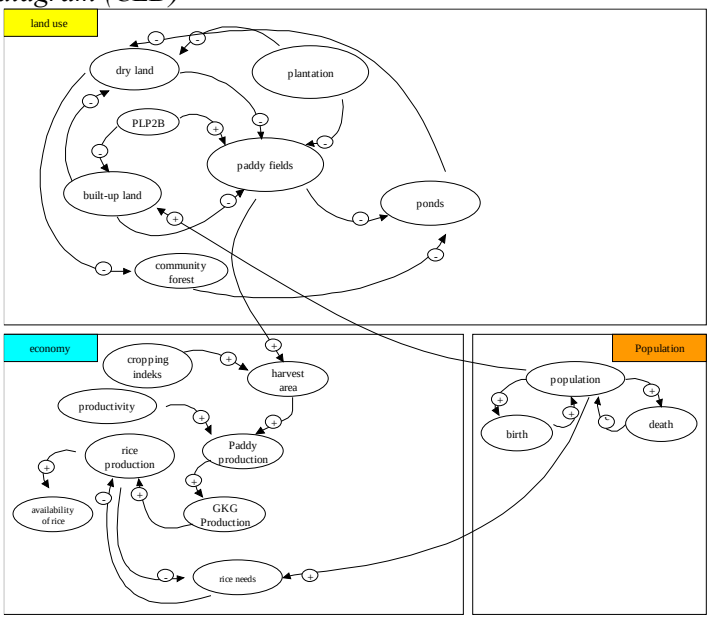

Figure 2. *causal loop diagram*

3.2. Sub model land use

The land use sub-model looks at the relationship between the use of paddy fields, built-up land, plantations, fields, community forests and ponds. Variables depicted in Stock Flow Diagrams (SFD) are presented in Figure 3. The assumptions used in this sub-model are the minimum area needed to build a house as a place of residence which is 36 m^2 per house or 0.0036 ha per house [17], so that if one house is occupied by 3 people [1], then the need for residential land is 12 m^2 per person or 0.0012 ha per person.

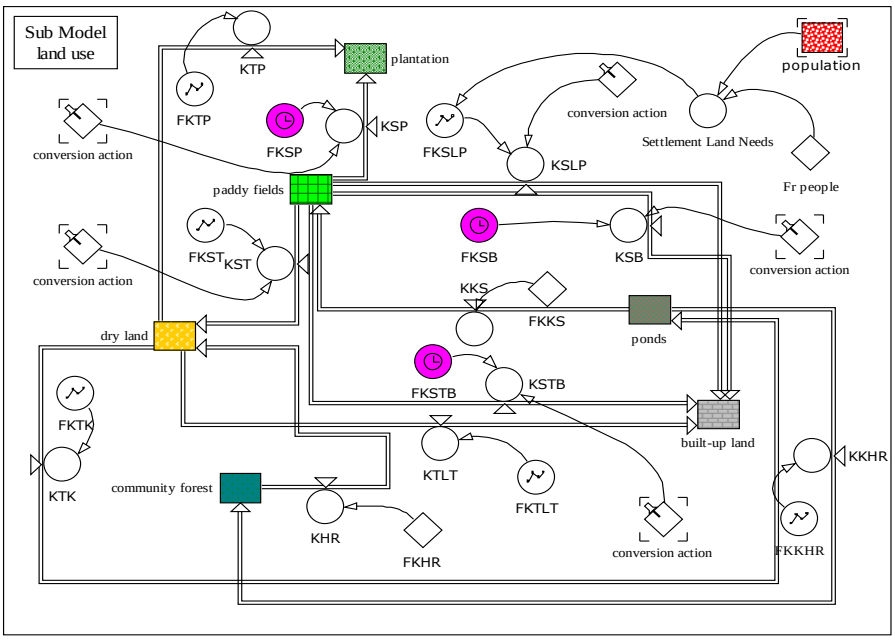

Figure 3. sub model land use

3.3. Sub model economy

In the sub-economic model, among others, it is seen rice production, rice needs, farmer's income and the needs of paddy fields that can meet regional needs. Variable details are presented in the following Stock Flow Chart:

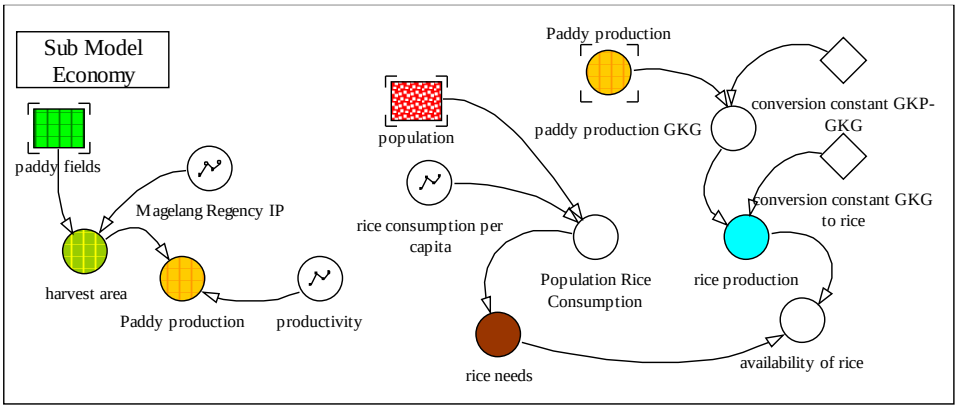

Figure 4. sub model economy

The assumptions built on the economic sub-model are average productivity growth data, the rate of Harvest Dry Grain (GKP) to Milled Dry Rice at 82.6%, conversion of Dry Grain (GKG) to rice by 63.84% [18].

3.4. Sub model population

The population in Magelang Regency is influenced by the number of births and the number of deaths each year.

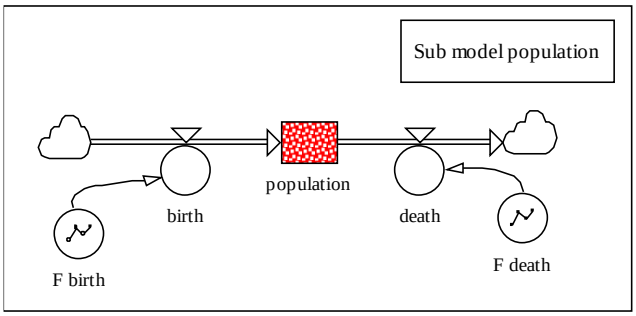

Figure 5. sub model population

3.5. Validation

Table 1. Validation of population, paddy production and rice production

year	Population (people)		Paddy production (tons)		Rice production (tons)	
	Actual	Simulation	Actual	Simulation	Actual	Simulation
2013	1,221,681	1,221,681	354,966	355,188.8	187,180.1	187,297.6
2014	1,233,695	1,240,546	345,883	345,006.1	182,390.5	181,928
2015	1,245,496	1,259,081	366,981	365,820.1	193,515.8	192,903.7
2016	1,257,123	1,275,548	422,153	422,073.2	222,609	222,566.9
2017	1268396	1,290,391	478,266	477,654.2	252,198.5	251,875.9
average	1,245,278	1,257,449	393,649.8	393,148.5	207,578.8	207,314.4
AME	0.977%	<10%	0.127%	<10%	0.127%	<10%
condition	Valid		Valid		Valid	

Table 2. Validation of paddy fields and rice needs

year	Paddy fields (ha)		Rice needs (tons)	
	Actual	Simulation	Actual	Simulation
2013	36,892	36892	104,575.9	104,575.9
2014	36,882	36,859.62	104,617.3	105,198.3
2015	36,862	36,817.64	105,991.7	107,147.8
2016	36,855	36,780.69	109,369.7	110,972.7
2017	36,681	36,568.23	104,008.5	105,812.1
average	36,834	36,783.64	105,712.6	106,741.3
AME	0.138%	<10%	0.973%	<10%
condition	Valid		Valid	

The simulation results for each sub-model are compared to the actual data of Magelang Regency in numbers and have an average percentage deviation (AME) of simulation values against actual and small acceptable values (less than 10%), so the model simulation results can illustrate the real conditions .

3.6. Scenarios

The scenarios that developed were law enforcement to decrease conversion of paddy fields and increased crop indexes to increase rice production, so increased the availability of rice as well:

1. Conversion action (100%) occurred and crop indexes 2.1 (existing)
2. Conversion action (75%) occurred and crop indexes 2.2 (moderate)
3. Conversion action (50%) occurred and crop indexes 2.3 (optimist)

The policy was carried out in 2021 for the projection of 2030, during the period 2019-2020 preparations and implementation were carried out to support the scenario to be implemented in 2021.

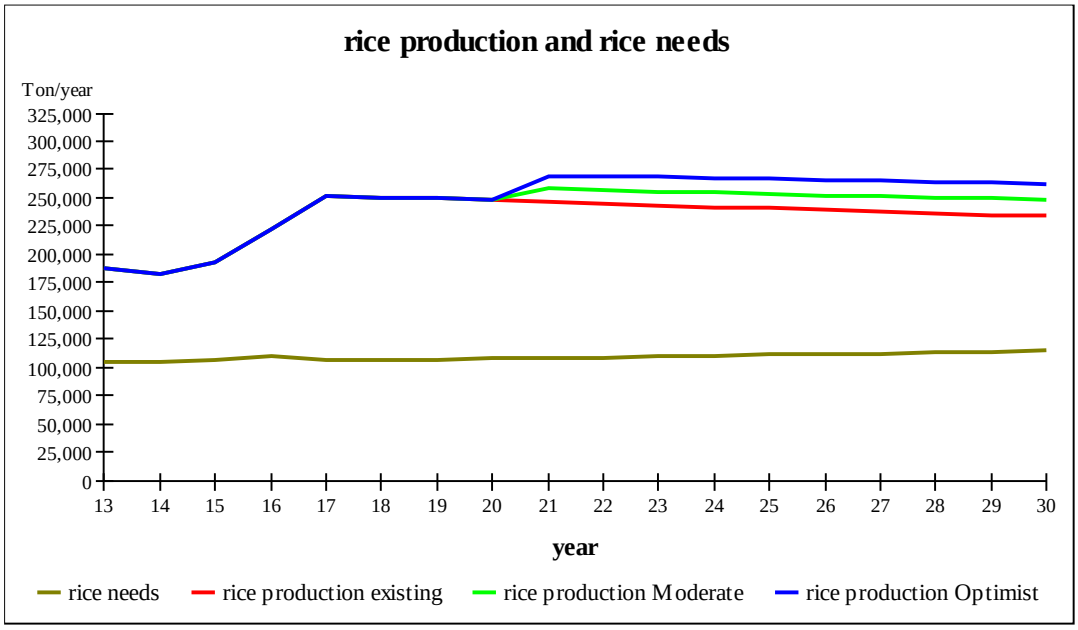

Figure 4. sub model economy

Table 3. Rice production scenarios

year	Existing	Moderate	Optimist
13	187,297.59	187,297.59	187,297.59
14	181,928.04	181,928.04	181,928.04
15	192,903.65	192,903.65	192,903.65
16	222,566.95	222,566.95	222,566.95
17	251,875.87	251,875.87	251,875.87
18	250,467.73	250,467.73	250,467.73
19	249,059.59	249,059.59	249,059.59
20	247,651.46	247,651.46	247,651.46
21	246,243.32	257,969.19	269,695.07
22	244,835.19	256,863.27	268,924.92
23	243,427.05	255,757.35	268,154.78
24	242,018.91	254,651.42	267,384.64
25	240,610.78	253,545.50	266,614.50
26	239,202.64	252,439.58	265,844.36
27	237,794.50	251,333.65	265,074.22
28	236,386.37	250,227.73	264,304.08
29	234,978.23	249,121.80	263,533.93
30	233,570.10	248,015.88	262,763.79

The simulation results of rice production and rice needs in several scenarios depict the availability of rice in Magelang Regency in 2030 in the figure. The graph of rice production for all scenarios is above the line of rice needs, meaning that the availability of rice in 2030 is still in surplus. So that Magelang Regency can still be one of the buffer of National rice needs.

The simulation results of rice needs for the projections for 2030 are 114,506.36 tons. The moderate scenario with an increase in cropping index averages 2.2 times a year resulting in a surplus of rice availability of 133,509.52 tons, with the production of 248,015.88 tons of rice. This scenario can meet the rice needs of Magelang Regency by 216.6%. While for the optimistic scenario, rice production will be 262,763.79 tons with a surplus of rice availability of 148,257.43 tons. Based on the simulation, the optimistic scenario can meet the rice needs of Magelang Regency by 229.5%.

4. Conclusion

Magelang regency still has a surplus of rice availability to meet the population's rice needs until projections in 2030

Acknowledgement

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The effect of training and agricultural innovations on farming performance (case study on paddy farmers in Malang, Indonesia)

N Haryati[1]

[1]Department of Agricultural Socio Economics, Faculty of Agriculture, Universitas Brawijaya

Email: noviharyati@ub.ac.id

Abstract. Human capital has become main problems in Agriculture system in Indonesia. Farmers are getting rare and youth are not interested in farming. Agricultural innovation and training by agricultural extension agents is an effort to increase the skills of knowledge and capabilities of farmers to jointly improve food security. The objectives of this study are: 1) to determine the characteristics of rice farmers, and 2) to understand the relationship of training and innovation to the performance of farmers. This is a descriptive quantitative research that conducted with case studies in Singosari District, Malang Regency Indonesia. The sampling technique was purposive, derived from 30 rice farmers who had received training and counseling from the Singosari Sub-District Extension Education Unit. Primary data was derived through questionnaires. Data analysis was done by formulating structural equation models by using WarpPls 6.0 software. Rice farmers in Singosari Subdistrict are in middle to advanced age with low eductaion. Most of them are elementary school graduates with experience of farming around 30 years. Overall, the Extent of Training, Preparedness to adopt paddy planting innovation has significant effect to human capital of farmers. Those three has a positive and significant influence on rice farming performance.

1. Introduction

Indonesian agriculture is still categorized as low condition and this is seen from the welfare of farmers, there are still many poor groups caused by government programs which are not optimal, only focused on farming, weak macro policy support, and a centralized approach. As a result, agriculture in Indonesia is still dominated by small scale businesses, limited capital, simple technology, strongly influenced by the seasons, local market areas, agricultural commodity markets which dominated by large traders and the biggest problem is human capital of farmers [7].

Training is an effort to develop human resources. Training is also an educational process that aims to remember the abilities or special skills of a person or group of people. Education and training is something that must be done by the organization, because this can be seen as investment. Regular education and training will be able to improve abilities and skills and productivity. Non-cognitive education has an effect on a person's behavior and a person's ability to choose. However, cognitive and non-cognitive education can increase productivity significantly [8]. Some study has shows significant effect of training to famer's productivity and income [10]. It also has led to the increasing of farming profits [4].

Farming technology innovations has developed through years. Some of them are in the form of varieties, seed quality, fertilizers, plant breeding technology and the using of agriculture machinery. High productivity is always become the biggest hope and so many big decisions need to be made by farmers as the manager. However, there are some changes in environment

that make them adapt as mention in Table 1. This is a case of paddy farmers in Kalimantan.

Table 1. Rice farming technology innovations and its challenges

No.	Technology Innovations	Challenges
1.	Varieties	The availability of agroecosystem is still small
2.	Seed quality	The seeds from state-owned enterprises is not all good
3.	Un organic fertilizer	The late supply of fertilizers from retailers
4.	Fertilizer dosages	Un appropriate recommendation
5.	Productivity	Under the maximum productivity
6.	Use of harvesting tool	The limited procurement
7.	Use of rice threshers	The limited procurement

Source: [2]

Therefore, research was conducted with the purpose to find out: (1) characteristics of rice farmers in Singosari District; (2) the influence of training and innovation to farmer's farming performances.

2. Materials and methods

2.1 Time and Place of Research

This research was conducted in Singosari Subdistrict, Malang Regency for 5 months, which began in July until November 2018. The research location was purposely chosen in Singosari Subdistrict because in it has a group farmer with high productivity of paddy. This place also has a good agricultural extension unit which regularly gives training and also a place where farmer always get information about innovation.

2.2 Methods

This type of research is quantitative-descriptive. Descriptive research aims to describe the relevant aspects of a phenomenon, while quantitative research is the analysis of data in the form of numbers through statistical measures [9]. The data used are primary data obtained by interviewing respondents, namely as many as 30 farmers. The sampling technique used was accidental sampling, ie the sample was chosen based on the ease of obtaining data, namely rice farmers in Singosari District, Malang Regency.

2.3 *Structural equation modelling*

After understanding the problem and identifying important variables, with the support of theory, the data analysis technique is continued by using the WarpPls 6.0-based Structural Equation Modelling approach. this approach is very suitable with research, because it can be done as a confirmation of the theory and can also be used to build relationships that have no theoretical foundation, do not require many assumptions and small sample size bias [9].

Preparedness to adopt Variable Cropping Innovations (X1) is a Formative variable based on a theory that Rice Cultivation Innovation and Technology are related to the use of varieties according to agroecosystems, seed quality, use of organic fertilizers, fertilizer dosage according to recommendations, use of agricultural equipment [2]. In addition, Preparedness for adopting innovations consists of Duration of use of air seeders, Regular testing for herbicide resistance, the using of pasture phases for weed control [12]. Whereas sub variables are represented by the use of superior varieties, the using of organic fertilizers, Regular testing for herbicide resistance, the using of sickle tools and rice transplants, and Use of pasture phases for weed control

Extent of Training (X2) is a reflective variable which is based on a theory that training is a

learning process to change behaviour so that it can work better, more productively, effectively and efficiently through increasing knowledge, skills, attitudes obtained through re-learning to get results optimal [11]. In addition, Extent of training in agribusiness management including crop specific training, commodity marketing training, finance and business management training, Lands care Training [12]. The sub-variables that represent are Crop specific training, Commodity marketing training, Finance and business management training, Lands care training.

Human Capital (Y1) is a reflective variable that is defined as a set of knowledge, expertise, and capabilities possessed by employees to provide solutions (the knowledge, skills and capability of individual employees to provide solutions) [6]. Human knowledge and experience are the main elements underlying human capital. The sub-variables consist of the level of knowledge and experience [12].

Farm Performance (FP) (Y) Reflective FP reflective variables are of Rate of change in total factor productivity and the average annual growth in farm equity over the decade of observation [12]. The sub-variable is the Rate of change in total factor productivity and The average annual growth in farm equity over the decade of observation.

2.3.1 Structural model

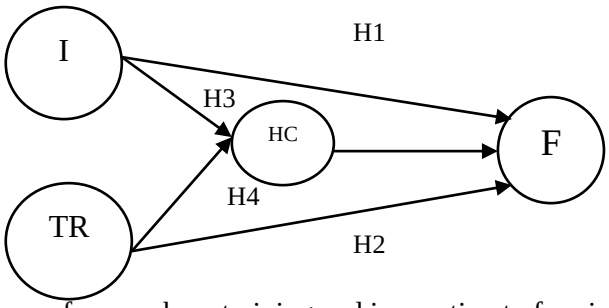

Figure 1. Path diagram of research on training and innovation to farming performance

2.3.2 Hypothesis testing and goodness of fit

H1: Training has a direct positive effect on farm performance
H2: Innovation has a direct positive effect on farm performance.
H3: Training through human capital indirectly has a positive effect on the farm performances
H4: Innovation through human capital variables indirectly has a positive effect on farm performance

2.3.1 Goodness of fit

Evaluation of goodness of fit is done on the outer model and inner model. On the outer model, a reflective indicator model is used. Outer models are measured using reflective indicators, there are three criteria for assessing the outer model, convergent validity discriminant validity, composite reliability. While the Inner model is measured using R^2 endogenous latent variables with the same interpretation as regression.

3. Result and Discussion

3.1 Characteristics of rice farmers in Singosari District Malang

Based on the primary data obtained from the interviews, the age group of 50-69 years old has the largest number of entire data age, those are 13 farmers. The highest age group of farmers is the age of 50-69 years, this can affect the level of productivity of rice in Singosari. This is because the aged farmers have a stronger physical and high enthusiasm to work [1]. The level of

education is often determining the level of competency of farmers in conducting agricultural activities [5]. Low education and implications of the lacking coordination in agricultural planning will also affect other types of work which can be done by farmers in increasing the income [3]. The research shows 80% of farmers are elementary school graduates while the rest of them is undergraduate. This shows that they have low level of education.

The farmers are able to obtain knowledge that is not learned in school [1]. Therefore, looking at the average experience of farming, farmers can get the knowledge instead of at school which can be a new innovation in his farming business. Related to this, 19 respondents have experience in farming for more than 10 years, while the rest is below 10 years.

3.2 Influence of training and innovation to farming performance

3.2.1 Validity and reliability test

The criteria used are convergent validity and discriminant validity. Convergent validity can be seen from the value of the load factor (factor loading). From these results it can be seen that the overall variables in the model have met both types of validity. Discriminant validity can be seen from the root value of AVE with the variable correlation coefficient concerned with other variables. The questionnaire was reliable enough to be used as a research tool. Composite reliability value most of the variables have met the rule, which is above 0.7 and also Cronbach's alpha coefficient is above 0.6.

Table 2. Composite reliability coefficients and Cronbach's alpha coefficients

No.	Variable	Composite reliability coefficients	Cronbach's alpha coefficients
1.	X1	0.862	0.785
2.	X2	0.649	0.309
3.	Y1	0.776	0.615
4.	Y2	0.921	0.828

3.2.2 Model fit and quality indices

Model fit and Quality indices from the model are mainly in a good and ideal result. It can be seen in Table 3 below.

Table 3. Model fit and quality indices

No.	Model fit and Qualtiy indices	Criteria	Result	Conclusion
1.	Average path coefficient (APC)	P<0.05	0.347; P=0.008	good
2.	Average R-Squared (ARS)	P<0.05	0,393; P=0,010	good
3.	Average adjusted R-Squared (AARS)	P<0.05	0.335; P=0.010	good
4.	Average block VIF (AVIF)	Acceptable if <=5; ideally <=3.3	1,266	ideal
5.	Average full collinearity VIF (AFVIF)	Acceptable if <=5; ideally <=3.3	1,423	ideal
6.	Tennenhaus GoF (GoF)	Small >= 0.1; Medium >= 0.25; Large >= 0.36	0,488	large
7.	Sympson's paradox ratio (SPR)	Acceptable if >=0.7; ideally = 1	1	ideal
8.	R-squared contribution ratio (RSCR)	Acceptable if >=0.9; ideally = 1	1	ideal

No.	Model fit and Qualtiy indices	Criteria		Result	Conclusion
9.	Statistical suppression ratio (SSR)	Acceptable if	>=0.7	1	ideal
10.	Nonlinear bivariate causality direction ratio (NLBCDR)	Acceptable if	>=0.7	1	ideal

3.2 Relationship between training and innovation on farming performance

The path of the analysis related to Training and Innovation to Farming Performance of farmers in Singosari Malang. It can be seen on table 4.

Table 4. Result on Hypothesis testing on Training and Innovation to farm performance

No.		Path coefficient	P value	Result
1.	X1 → Y1	0.22	0.09	Weakly significant
2.	X2 → Y1	0.54	<0.001	Highly significant

While the Structural Model can be seen on figure 1 as follows:

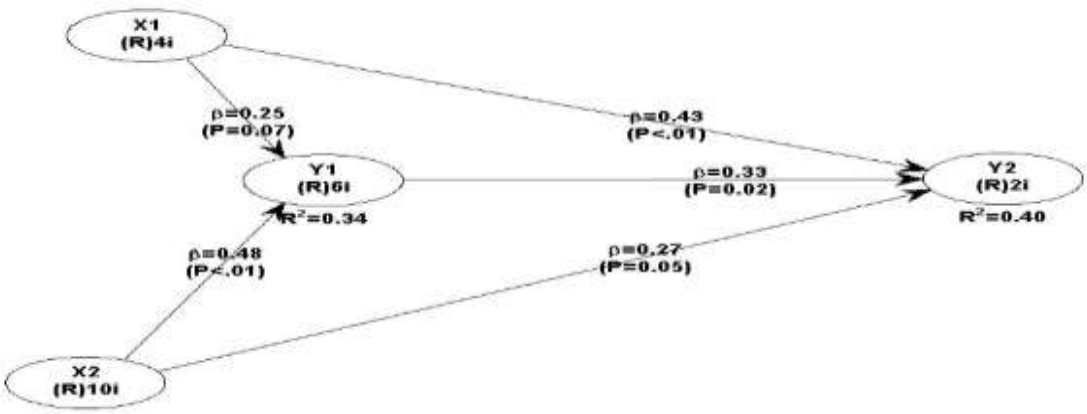

Figure 2. Structural model on training and innovation to farming performance

3.2.1 The effect of training on farming performance

Training and agricultural extension conducted by UPT Singosari Agricultural Extension to Farmers in Singosari District, Malang Regency, namely: training of rice cultivation systems, training of integrated plant pest control systems, training in applying fertilizers both organic and inorganic to rice plants and training and agricultural extension related to use of new varieties. The four variables show that training has a direct positive effect on farming performance with a path coefficient of 0.22 shown in Table 4. The training significance value of farming performance directly is weak because p value (0.09) is smaller than 0,10 [9]. Thus, these results indicate that H1 is accepted.

3.2.2 Relationship to innovation on farm performance

Agricultural development cannot be separated from the importance of agricultural innovation. The introduction of agricultural innovation is carried out by agricultural extension agents in Singosari District, Malang Regency. The innovations consisted of 10 things, namely the use of superior varieties, the use of balanced fertilizers, the use of appropriate drugs for pest diseases, the use of herbicides in pests, regular testing of drug use in plants, introduction of organic

fertilizers in rice farming, use of mechanization agriculture, use of agricultural tools such as rice transplants, weed handling techniques, techniques for handling planthopper pests by applying cropping cycles. The innovation provided has a direct positive effect on farming performance with a path coefficient of 0.54. This value shows that the innovation relationship to farming performance is positive and significant, even classified as highly significant because the p value is smaller than 1% [9].

3.2.3 Training and innovation indirectly to farming performances.

Training and agricultural extensions aims to improve human capital to be better at farming. Farmers' knowledge of innovation in agriculture will also be able to improve their ability to cultivate. The relationship between Training and innovation indirectly through human capital variables has a positive effect on farming performances. Both of these are proven in table that shows the results of hypothesis testing for intervening variable. The significance value of training on indirect farming performance through direct human capital variables is significant because p value (0.001) for innovation on farming performance and p value (0.02) for training on farming performance is smaller than 0.05 [9].

Table 5. Result on hypothesis testing on training and innovation indirectly to farm performance

No.		Path coefficient	P value	Result
1.	X1→ Y1→Y2	0.42	0.001	Significant
2.	X2 → Y1→ Y2	0.34	0.02	Significant

3.2.4 Research implications

1. The effect of agricultural innovation on farming performance will be better if given indirectly to farmers. It is shown that the existence of a human capital intermediary can provide a more significant effect than if the effect of providing innovation is done directly to farmers. We can understand this because innovation is a new one, it can be a finding or method based on high thinking. So that before it is delivered to farmers it would be better if the agricultural instructor first understood the use of innovation and from them innovation could be introduced to farmers. Once they understand it can be applied to agriculture.
2. Training on the other hand, has a more significant influence if it is directly given to farmers. This is better, than there is a variable intervening human capital. This means that cognitive training is more important than just providing knowledge to farmers (through increasing human capital). The more training such as plot demos conducted by farmers will make them more skilled in doing their farming, where in Singosari, the farmers' limits are as explained in the farmers profile section.

4. Conclusion

1. Characteristics of rice farmers in Singosari Subdistrict can be described as follows: Farmers are middle school level, most of them are elementary school level, the results of working are farming, with farming experience of around more than 10 years.
2. The effect of agricultural innovation on farming performance will be better if it is built from farmers' understanding of the innovation. Therefore, knowledge related to innovation and its use will be very important to be controlled by farmers. While the effect of training on farming performance is more towards the cognitive abilities / skills of farmers, so that direct practice will be more useful than just sharpening knowledge. Useful training, for example, is like a demo plot that visually shows a process that produces even out what is called productivity.

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Role of forest communities in utilizing forest products to support household food security in ub forest area

A Fibrianingtyas[1]

[1]Department of Agricultural Socio Economics, Faculty of Agriculture, University of Brawijaya, Malang, Indonesia

E-mail: alyaftyas@ub.ac.id

Abstract. The communities around and within the forest are generally disadvantaged people, the socio-economic conditions of this group of people are generally still low. Activities of the Tumpangrejo Hamlet community in agricultural cultivation in the area of UB forest, none of the residents planted major food commodities, such as rice, soybeans, and tubers. This is not enough to replace the role of rice as the main food for the local community. The objectives of this study are: 1) to identify the role of forest peoples in utilizing forest commodities to support household food security; 2) identify the relationship of the role of forest area communities to the level of household food security. This study uses a qualitative approach with descriptive data analysis methods. The results of this study are the role of the Tumpangrejo hamlet community in utilizing forest commodities unable to support household food security. So that the people of Tumpangrejo hamlet are classified into food insecurity groups, because availability of staple food does not exist, the average frequency of eating a community is 2-3 times a day, the community has expenditure on animal protein food and/or vegetable protein only.

1. Introduction

Poverty and food security are two related phenomena, and can even be seen as having a causal relationship. The people around and in the forest are generally left behind communities, the socio-economic conditions of this group of people are generally still low [1]. Their life has a very close relationship with the forest, many of their needs are obtained from the forest, especially to meet their household needs. Food products from forests in general are in the form of non-rice food, and have not been widely used by the community, because consumption patterns still depend on rice. The 2009 expectation food score (PPH) reached 75.7 (2015 target = 95) which indicates that the diversity of community food consumption patterns has not yet been realized [2], and public consumption is still dominated by grain groups [3].

This is also the case in Tumpangrejo Hamlet, Ngenep Village, Karangploso District, Malang Regency in the UB Forest area. Tumpangrejo Hamlet community is included in the "pesanggem" farmers. They work on forest land that was once owned by Perhutani but now belongs to UB Forest. Almost all the people of Tumpangrejo Hamlet use UB Forest to fulfill their family's living needs. Agricultural activities carried out at UB Forest are by growing robusta coffee plants. The community also planted intercrops in the form of turmeric and taro as additional income besides coffee. In addition to utilizing the forest to meet their daily needs, they also use the fields not far from their homes for cultivation of various horticultural commodities, such as chili, cabbage, mustard greens, and corn.

By looking at the activities of the Tumpangrejo Hamlet community, none of the community members grew major food commodities, such as rice, soybeans, and tubers. There are only a few residents who plant corn on the moor. It is also not enough to replace the role of rice as the main

foodstuff of the community. With these community characteristics, food diversification to reduce dependence on rice has not been able to do. Thus, the forestry sector is expected to contribute to the provision of non-rice food.

2. Materials and Methods

This research uses a qualitative approach. Data was collected from in-depth interviews with 8 selected informants and supported from secondary data. Then the data is analyzed using a qualitative descriptive approach [4], which includes:

2.1 Qualitative Descriptive Approach

a. Data Condensation

This activity includes the selection of key data and focusing on important matters. From the data obtained, data were chosen that included the rights and obligations of "pesanggem" farmers, planting patterns, frequency of feeding of household members, access to food, and food quality.

b. Data Display

After the main data are selected, the next activity is to present data in the form of narrative and relationships between categories.

c. Conclusion Drawing and Verification

This conclusion drawing activity aims to be able to answer the problem formulation which is still temporary. The conclusion of this research is the role of the community in forest areas in utilizing forest products has not been able to meet daily food needs.

3. Results and Discussion

3.1. Rights and Obligation of "Pesanggem" Farmers

a. Rights

1) The community gets the right to manage UB Forest land (not the land ownership right). The extent of land acquired by the community differs because it was determined when the forest was still owned by Perhutani.
2) The community has the right to manage and care for the coffee commodity as well as possible until the harvest.
3) The community has the freedom to grow commodities other than coffee as intercrops. There are several communities that plant chili, taro, and turmeric as intercrops.
4) The community has full rights to manage the harvest on the intercrops. But in reality the community does not have post-harvest management activities. The harvest is for self-consumption (subsistence) and is sometimes sold to middlemen and markets (Karangploso).
5) The use of forest products that is mostly done by the community is the search for fuel wood for household energy. The community does not cut trees to get firewood, but this firewood is obtained from tree branches that fall from the UB Forest land tree.

b. Obligations

1) The community is obliged to participate in maintaining and protecting the forest area from disturbance and destruction. This is done by the community by not cutting down trees carelessly.
2) The community is not allowed to build buildings for any purpose in the UB Forest area.
3) The community is obliged to sell pick-red coffee to the management of UB Forest with a profit sharing system of 30% and 70%. 30% for management of UB Forest and 70% for farmers.

4) There is a prohibition from UB so that the community does not conduct pine sap tapping.

3.2. The Linkage Between Utilization of Forest Products and Household Food Security

a. Adequacy of Food Availability

The availability of food in the household used in the measurement refers to adequate food and is available in quantities that can meet household consumption needs. Determination of the period of time for staple food availability in rural areas can be seen by considering the distance between the planting season and the next planting season [5]. This condition only applies to households with the agricultural sector as the main source of livelihood. In Tumpangrejo Hamlet, almost no community carries out the cultivation of basic food commodities, such as rice, corn, and tubers. The community only focuses on coffee farming in UB Forest land and vegetable farming in the dry fields. To make ends meet, the people get it from buying. So in terms of the adequacy of food availability, the Tumpangrejo Hamlet community does not have enough food availability.

b. Food Availability

The stability of food availability at the household level is measured based on the adequacy of food availability and the frequency of meals of household members in a day. Assuming that in certain areas people have the habit of eating 3 (three) times a day. The frequency of eating household members in the Tumpangrejo village is 2-3 times a day. This condition depends on the availability of food owned by the household. Sometimes there is a family member who is waiting to get a ration from a farm laborer. The stability of food availability in Tumpangrejo Hamlet can be seen in the following Table 1.

Table 1. Food Availability

Food Availability	Frequency of Eating of Household Members		
	>3 times	2 times	1 times
>240 days >360 days	Stable	Less stable	Not stable
1-239 days 1-364 days	Not stable	Not stable	Not stable
No inventory	Not stable	Not stable	Not stable

Tumpangrejo Hamlet is categorized as unstable because the people do not have food commodity farming business and the frequency of eating is 2-3 times a day on average.

c. Food Access

Indicators of accessibility/affordability in measuring food security at the household level can be seen from the ease with which households obtain food, as measured by land ownership and the way households get food. The Tumpangrejo Hamlet community has two types of land, namely UB Forest land and dry fields. However, in these two types of land there are no communities that grow basic food commodities. So it can be said that the community does not have a main food commodity farming land. To get daily food, people do it by buying. Accessibility/affordability to food in Tumpangrejo Hamlet can be seen in Table 2 below:

Table 2. Food Access

Field Ownership	How households obtain food	
Have	Own production	Buy
Don't have	Buy	

From the measurement of food accessibility indicators, then indicators of food availability continuity are measured, which is an amalgamation of the stability of food availability and accessibility to food. Continuity of food availability in Tumpangrejo Hamlet can be seen in the following Table 3:

Table 3. Continuity of Food Availability

Food Access	Stability of household food availability		
	Stable	Less stable	Not stable
Direct access	Continous	Not continous	Not continous
Indirect access	Less continous	Not continous	Not continous

d. Food Safety/Quality

The quality/safety of the type of food consumed to meet nutritional needs, seen from the presence or absence of food ingredients that contain animal and/or vegetable protein consumed in the household. Therefore, measures of food quality can be seen from the expenditure data for daily consumption of food (side dishes) that contain animal and/or vegetable protein. The only way for the people of Tumpangrejo Hamlet to obtain basic foodstuffs, including animal protein and vegetable protein, is to buy. The variations in eating of the Dumpang Tumpangrejo community with daily protein content are varied, sometimes only animal protein or vegetable protein alone combined with carbohydrate sources.

e. Food Security Index

Food security index is measured based on a combination of indicators of continuity of food availability and food quality/safety. The food security index of Dumpang Tumpangrejo can be seen in the following Table 4:

Table 4. Food Security Index

Continuity of food availability	Food quality/safety: Consumption of animal and/or vegetable protein		
	Animal protein and vegetable/animal protein only	Vegetable protein only	No consumption of animal protein, and vegetable
Continous	Resistant	Less resistant	Not resistant
Less continous	Less resistant	Not resistant	Not resistant
Not continous	Not resistant	Not resistant	Not resistant

4. Conclusion

The role of Tumpangrejo Hamlet community in utilizing forest products is not able to support household food security, because very few people optimize the UB Forest land and fields for cultivation of staple food commodities. The people of Tumpangrejo Hamlet are classified into food insecure groups, because staple food availability is not available, the average frequency of eating people is 2-3 times a day, communities have expenditures for only animal protein and/or vegetable protein food.

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Comparative study on purchase decision at Adi Jaya and Batik Tresna Art using store image and store atmosphere

Yudhi P, Arddy F and Syamsul A

JL. Raya Telang PO BOX 2 Kamal Bangkalan Madura 69162

Email: mada_arudam@yahoo.com, yudhimadaarudam@gmail.com

Abstract. The purpose of this research is to inquiry the influence store image on the purchase decision at Adi Jaya Store. The research approach is quantitatively through explanatory research method by using cross sectional data or data collected from field research. The data source was taken by primary and secondary data type. Independent variables apply in this study are the store location, merchandise, price, customer service physical facilities and store atmosphere. While the dependent variable is purchase decision at two store Adi Jaya and Tresna Art in Bangkalan city. Based on the results, store location, merchandise, price, customer service, and physical facilities have impact on intention to purchase positively. Store location that have positive influence both partially and simultaneously. Merchandise that have positive affect both partially and simultaneously. Price that have positive influence both partially and simultaneously. Customer service that have positive influence both partially and simultaneously. Physical facilities that have positive influence both partially and simultaneously. As for price dominant influence on purchase decision with the highest beta ($^{\beta}$) value of 0.361.Stor atmosphere have positive effect on purchase decision.

1. Introduction

In the modern economy like today, every company will face intense competition. Increasing competition intensity and number of competitors requires meet consumer needs, more satisfying than what its competitors do, so that an equal perception is needed in defining a product that has good quality. Products that have good quality are products that have excellent quality. Thus the company will be more seeing which business prospects will be undertaken and determining what strategies will be used to attract consumers' buying interest. This requires product differentiation from other companies.

Facing increasingly intense competition in the field of marketing, it is very important for entrepreneurs to develop sustainable competitive advantages. Sustainable competitive advantage can be formed in various ways, for example with products that are in accordance with the wishes of consumers, attractive promotions, competitive prices, store imagery, and many others. The company can apply many business strategies and one of them is strategy of marketing be the very important in running a business. One example of part of marketing is atmospheric store that is an environmental design activities in-store purchases with determine the characteristics of the store through arrangement and selection of shop and physical facilities merchandise activities. According to Kotler, (2008: 61) "Every store have a layout make it easier or more difficult for consumer to looking around inside"

Many phenomena in the business show that there is an influence on buying decision and it can be explained that store atmosphere have an important role in purchasing decisions. This also often occur in business in Bangkalan where the many business are stores, restaurants, batik houses, clothing, food, and house's material shops.

The store image is a characteristic of a store. To keep it, the store must pay attention to the factors forming the image of the store, namely the location of the store (store location), products (merchandise), price (price), customer service (customer service), and shop facilities. A positive store image will attract consumers to visit the store and make a purchase

Bangkalan s famous with culture, so many entrepreneurs establish business with cultural bonded like batik house. From many batik houses in Bangkalan, one of them is Rumah Batik Tresna Art, that makes everyone interested in visiting, cause has a difference with other shops, the atmosphere shop is unique and different from the other batik home atmosphere, and becomes its identity to attract consumers House of Tresna Art batik is one of the businesses model that shows the store atmosphere (store atmosphere) is able to influence consumers to make purchasing decisions on batik products. And we decide Adi Jaya Store in Bangkalan because it has distinctiveness if we look compare with other home distro.

Based on study conducted by Achmad Indra Widyanto et al (2014) on his research entitled the influence of store atmosphere on purchasing decisions showed that store atmosphere is very influential on increasing product sales. There is also research from Cindy Juwita Dessyana which explains that store atmosphere influences purchasing decisions. But there are also those who say that store atmosphere does not have a big effect on purchasing decisions. This happened in a study conducted by Theresia (2014) entitled the influence of store atmosphere, store location and product diversity on purchasing decisions.

Store atmosphere is one of the factors that influence a person's decision to make a purchase in a store, if the more convenient a store is, the more consumers are interested in shopping at the store. A good store design can also attract consumers' desire to know more about everything that the store has to offer (Utami, 2010: 270). Store atmosphere according to Berman and Evans (2001: 604) divides into several variables including: Exterior, General Interior, Store Layout and Interior Display. From background and introduction explanations above, this research will be conducted to examine whether the store atmosphere and store image affect the consumers purchasing decisions both at Tresna Art and Adi Jaya Store.

Based on the formulation of the problems above, the objectives of this study are:To find out and examine the influence of store atmospheres on consumers' buying decisions at home batik Tresna Art, To find out whether the location of the store (store location), product (merchandise), price (price), customer service (customer service), and physical facilities influence the purchasing decision at the Adi Jaya Bangkalan iron shop.

2. Material and Methods

Population is the sum of all objects (units or individuals) whose characteristics are to be suspected. The population of this study is consumers or customers of the batik house Tresna Art. A representative of the population called a sample that can be drawn conclusions later to generalize to the population. With the number of populations is infinite data which is not limited, in order to facilitate the research, the scope of the sample will be made smaller. For that the determination of the number of samples from the population is 25 times the number of independent research variables, the source of Roscoe in Ferdinand (2006: 191). Then the minimum number of samples to be taken in this study is 50 respondents.

Population is a generalization area consisting of: objects / subjects that have certain qualities and characteristics determined by researchers to be studied and then conclusions drawn (Sugiyono, 2012: 15). Population is a combination of all elements in the form of events, things or people who have similar characteristics that are the center of attention by researchers because they are seen as a research environment. Thus the population in this study were all consumers who had or had been shopping for iron products at the Adi Jaya Bangkalan store.

The sampling technique uses Purposive Sampling. "Purposive sampling is a technique determination of samples with certain considerations "(Sugiyono, 2015: 124). This sample has specific criteria that are considered for research, while the criteria in sampling are consumers who have made purchases at the Tresna Art batik house. The number of samples to be used is 75 respondents. The amount of sample used in this study is 97 respondents.

3. Result and Discussion

3.1. Definition of Marketing

Marketing is an activity between consumers and producers to exchange goods or services at prices was settled by doing interactions directly or indirectly to satisfy or to meet the consumers need. According to Kotler, (2008: 5) "The definition of marketing is a social process whereby with the process, individuals and groups get what they need and want by creating, offering, and freely exchanging valuable products and services with other parties". There are two factors that influence the company in marketing are:

1. External Environment of Marketing System.
2. Internal Variables of Marketing system.

3.2. Store atmosphere

The process creation of store atmosphere is an activity of designing an environment in a shop by determining the characteristics of the store through the arrangement and selection of physical facilities of the store and merchandise.

One of the factors that must be considered by the store owner is Atmosphere. From a marketer's perspective, the atmosphere of a store can have effects of consumers expectedly, thus increasing the likelihood of buying a product that might be ignored before. This can affect the amount of time and money spent while shopping. Utami (2006: 217) states that the atmosphere of the store is a combination of physical characteristics of the store such as architecture, layout, lighting, display, colour, temperature, music, and the overall aroma will create an image in the minds of consumers.

Whereas Store Atmosphere according to Sutisna (2001: 164) is the arrangement of internal spaces (in store) and outside space (out store) that can create customers comfortable.

The atmosphere relates to how managers can manipulate building design, interior space, floors, walls, aroma, colour, shape and music that customers experience which all aim to achieve a certain influence and buying decision finally. According to Berman and Evan (2001: 604) store atmosphere elements consist of four variables, namely Exterior, General Interior, Store Layout, and Interior Display.

According to Berman and Evans (in Utami 2010: 279) elements of atmosphere divide into four parts, they are exterior shop, general interior, store layout and interior appearance. Explanation of the core elements are:

1) Store exterior (exterior of the store) has Influence on store image, therefore the outside of the store must be planned as best as possible. The shop exterior includes:

a. Storefront
b. Marquee
c. Entrance
d. Display windows
e. Parking facilities

2) General Interior

A good and successful store is a store that can attract consumers' attention and help consumers to easily observe, check and select goods, and ultimately make purchases when consumers enter the store. General interior can be created from:

a. Flooring
b. Colouring and lighting
c. Scent and sound
d. Alley of the room
e. Store personnel
f. Technology
g. Cleanliness

3) Store Layout

Store layouts must be planned in determining specific locations. Store layout will determine consumers will enter or exit the store. Store layouts that must be considered are:

a. Types of goods
b. Goods arrangement
c. Shop facilities
d. Store settings
e. Item group

4) Interior Displays

Interior display are the signs be used to provide information to consumers for affect the store environment, the aim of interior display to increasing store sales and profits. Interior displays such as posters, location signs, picture marks.

3.3. Store Image

Understanding the store image (Store Image) according to Utami (2008: 15) is an overall picture that is more than just a sum per part, where each part interacts with each other in the mind of consumers. The location of the store is the first retail image variable that is used as a basis for consumers to shop at the store. According to Heizer & Render (2015) location is a driver of costs and revenues, so locations often have the power to make a company's business strategy. The strategic location aims to maximize profits from the new location of a store.

Products are everything that producers can offer to pay attention to, ask for, find, buy or consume the market as a fulfillment of the needs or desires of the relevant market. The products offered include physical goods (such as iron, cement, wood, furniture, and furniture) goods services (such as restaurants, lodging, transportation). According to Buchari Alma (2002) the price is a value determined for a product or service that is determined by money. According to Henry Simamora (2002) price is money that must be spent to get the desired product or service. Whereas according to Harini (2008) price is the value of money that someone needs to obtain a number of products and services

Facilities are a means to facilitate and facilitate the implementation of functions. Facilities are individual components of offerings that are easily grown or reduced without changing the quality and model of services. The facility is also a tool to differentiate one institution's program from other competitors. Tangible is a customer need that focuses on physical facilities such as buildings and rooms, available parking spaces, cleanliness, tidiness and comfort of the room, complete equipment, means of communication and appearance of employees.

3.4. Buying decision

A specific process of purchasing consists of five stages, as follows: problem recognition, information search, alternative evaluation, purchase decisions, and post-purchase behaviour. "Being the task of marketers is that marketers must be able to understand the buyer behaviour of at each stage and what influence will react to these stages" (Kotler, 2000: 211). Consumers through these stages in making purchasing decisions, but not all consumers who pass the five stages when making a purchase. The explanation of five stages:

1) Needs recognition
   The purchase process starts when consumers recognize a problem or need.
2) Searching Information
   Consumers who have been interested will encourage consumers to seek more information.
3) Alternative evaluation
   Alternative evaluation is the process of evaluating products and brands that will be selected to meet the needs and consumers wants.
4) Purchase decision
   There are two factors can influence purchase intentions and purchasing decisions, first is the attitude of other people and two is unexpected circumstances.
5) Post-purchase behaviour, Consumer satisfaction and dissatisfaction will influence next consumer behaviour.

3.5. Relationship of exterior with Purchase Decisions

Exterior Relationships with Shopping Decisions are Exterior having a positive influence on Shopping Decisions. Because with the Exterior, it will be able to attract customers to visit the shop and to shop. This is supported by research conducted by Fitriansyah Budi Prabowo (2014: 1-9) who obtained the results that the Exterior variable significantly influences purchasing decisions.

3.6. Relationship of General Interior to Purchase Decisions

According to Berman and Evans (2001) General Interior is a store display that makes visitors feel comfortable in the store. The General Interior of a store must be designed to maximize visual merchandising so it can attract buyers to come the store. But the most important thing to attract buyers after being in the store is in front of the display.

3.7. Relationship of Store Layout with Purchase Decisions

Planning of Store Layout includes structuring of space to fill available floor, classifying the products to be offered, setting in-store traffic, setting the required room width, mapping shop space, and arranging products offered individually.

Store layout will invite entry or cause customers to stay away from the store when consumers see inside through windows, storefronts or entrances. A good Store Layout will be able to invite consumers to be more comfortable traveling around and spending more money (Berman and Evans, 2001). The results of research conducted by Cindy Juwita Dessyana (2013: 844-852) show that Store Layout has a significant effect on purchasing decisions.

3.8. Relationship of Interior Display with Purchase Decisions

According to Berman and Evans (2001) each type of Interior Display provides information to customers to influence the situation. In other words, the Interior Display is a display of merchandise in the store. Usually in terms of themes adapted to the event taking place updatable, the arrangement of shelves and storefronts, discount posters, so can attract visitors to shop.

3.9. Relationship of Store Atmosphere Variables with Purchase Decisions

Looking at the previous research that I used for the references, explained, that store atmosphere variables are very influential to increase sales in the store. The four store atmosphere variables, namely exterior, general interior, store layout, and interior display, make consumers more interesting and likely want to know more and ultimately tend to buy. A good store design can also attract consumers' desire to know more everything the store offer (Utami, 2010: 270).

4. Conclusion

Based on the results of this study some conclusions can be drawn as follows:

1) Store atmosphere from home batik Tresna Art has a significant effect in increasing the purchasing decisions made by its consumers.
2) For further researchers if doing research with the same object is expected to improve this research, with Adding other independent variables are examples of quality products on batik houses Tresna Art or prices offered by the house batik Tresna Art.
3) Partially the store location variable has a positive effect on the purchasing decision variable at the Adi Jaya Bangkalan Iron Shop.
4) Partial products (merchandise) product variables have a positive effect on the variable variable purchasing decisions at the Adi Jaya Bangkalan Iron Shop.
5) Price (price) partially variable price has a positive effect on variable purchasing decisions at the Adi Jaya Bangkalan Iron Shop.
6) Customer service (customer service) partially variable customer service has a positive effect on variable purchasing decisions at the Adi Jaya Bangkalan Iron Shop.
7) Physical facilities partially physical facility variables have a positive effect on variable purchasing decisions at Adi Jaya Bangkalan Iron Shop.
8) Taken together the store location, product, price, customer service, and physical facilities variables have a positive effect on purchasing decisions at the Adi Jaya Bangkalan Iron Shop. Based
9) Judging from the five store location variables, products, prices, customer service, and physical facilities on purchasing decisions at the Adi Jaya Bangkalan Iron Shop, variable prices have a dominant influence on purchasing decisions.

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The quality determination of Umbul, Laminten, and Ngebrong spring in East Java

A N Mustaqiman[1], R Wirosoedarmo[1], B Suharto[1], R Sari[1], C Prasasta[1]

[1]Environmental Engineering Study Program, Department of Agricultural Engineering, Universitas Brawijaya, Indonesia

E-mail: aulia.nm@ub.ac.id

Abstract. Spring is the appearance of ground water to the surface land due to the ground water table being cut off, so that at that time, the groundwater is outward as a spring or seepage. The Tawangsari Village includes Bunder, Ngebrong, and Gerih Hamlets. Samples were taken using the grab sampling method to determine the quality status of the Tawangsari spring using the Pollution Index Method based on the Decree of the Minister of Environment of the Republic of Indonesia Number 115 in year 2003. The parameters tested included odor, water color, temperature, TSS, pH, BOD, COD, DO, PO_4, NO_3-N, NO_2-N, Total Hardness, Ammonia, and Total Coliform. The condition of the springs in the study area was physically good as the water color was clear and does not smell anything. Classification of springs in the study area based on drainage includes annual springs where springs emit water throughout the year. The availability of springs in this study area was very sufficient for the needs of the surrounding community as bathing, washing, latrines, irrigation, plantations, livestock and others. The quality of springs in the study area generally meets the first class quality standards. The results of research using the Pollution Index Method indicate that the springs in the study area were lightly polluted. The most polluted tested spring entering the water classification of class II was Ramidin spring in Bunder. All discharge value in the springs of the study area was quite large.

1. Introduction

Water is very important for all of aspect of life, especially for human.One of the water sources to fulfill human daily needs is a spring. A water spring is a point or certain places where water comes out from the ground. Water from springs is usually clearer and sometimes can be drink directly without having to be filtered. Springs can be found on the slopes or foot of mountains or around forest. River water flowing towards the estuary is caused by the springs [1-3]. If the conditions of the mountains are still overgrown by trees, the springs will function properly, but if the condition of the forest is damaged, the spring will stop producing water.

Geographically, Tawangsari Village is located in a high area of Pujon District which has quite strategic potential with a large amount of area of 770.04 Ha. Tawangsari Village is divided into 4 hamlets, named as Gerih , Manting , Ngebrong and Bunder. This research was conducted in the northern Tawangsari area included the Ngebrong and Gerih Hamlets. The northern part of Tawangsari is surrounded by forests. This area was mostly engaged in farming and filled by agricultural areas for farming various products such as citrus, carrots, onions, tomatoes and hydrangeas. Tawangsari Village had been considerable potential on both which has been utilized and has not been utilized. Efforts which have been made in the development of Tawangsari Village required testing of the spring-water quality through the Pollution Index Method. Water pollution is downturn in the quality of water to a certain level due to the contamination of

organism, energy substances, and / or other components within the water by human activities thus the water is unusable as its purpose. The Pollution Index (IP) method applied in this study is in accordance with the Ministry-regulation No. 113 of 2003 regarding the Determination of the Status of Water Quality. The Pollution Index (IP) method is a method aiming to determine the level of pollution permitted in the water quality parameters. The Pollution Index (IP) method will present groundwater quality thus the allotment of the water can be determined and improve the water quality if there is a decline due to water pollution.Pollution index is one of the methods used to determine the status of the water quality as well as to determine and calculate the level of contamination or pollution permitted in the water quality parameters. This index has a different concept from the Water Quality Index. Pollution Index (IP) is determined for the water utilization which then it can be use for several purposes on all parts of the water [4].

2. Materials And Methods

The locations in this research covered the springs located in the area of Tawangsari Village, North of Pujon District, Malang. The North Tawangsari area includes the Ngebrong Hamlet with coordinates of 7 ° 48'20.9 "S 112 ° 26'01.9" E and Gerih Hamlet with coordinates of 7 ° 49'07.5 "S 112 ° 26'51.5" E.Figure1 shows Tawangsari Village location map.

2.1 Research Stages

The stages of this particular research began from conducting location surveys, determination of sample points, sampling, laboratory tests to decision making which can be determined by using PIM and the result can be related with pollution stage by criteria of pollution index [5, 6]. The following explains the research stages:

1. Location Survey
   The location survey included determining the location of sampling points, observing the community activities and land use as well as interviewing the people of the area related to the social environment aspect.
2. Sampling
   The sampling technique was using the Grab Sampling Method Sampling was conducted at 3 springs, namely the Laharan Ngebrong springs, the Umbul Ngebrong springs, and the Laminten Gerih Springs.The current experiment measures the Water discharge by the Containment Method. This method is implemented for measuring springs which has no form of spread. The tools used in measuring the Water discharge include a measuring cup to hold water. a stopwatch to measure the time. and a pipe to drain or change the water flow. The sampling was used to calculate the water discharge was repeated three times and then calculated for the average value. The timing for the spring of Laharan is set by 5 seconds. Umbul spring is 5 seconds and Laminten spring is 1 second. The calculation of Water discharge was calculated with the formula $Q=\frac{V}{t}$where Q is Water discharge. v is volume of water. and t is time.
3. Laboratory Tests
   The spring-water samples, including Umbul Spring, Laminten Spring, Ngebrong Spring, taken from Tawangsari were conducted at the Perum Jasa Tirta Laboratory and the TSAL Laboratory ~~of~~ at Universitas Brawijaya. The parameters used in this study include color, temperature, TSS, pH, BOD, COD, DO, PO_4, NO_3-N, NO_2-N, total hardness, Ammonia, and total Coliform.The quality of the spring needs to be conserved or cared for to mantain its purposes.
4. Calculation
   The Pollution Index Method was applied for the calculation and measurement in this

research which refers to the Decree of the Minister of Environment No. 115 of 2003. The procedure for determining the Pollution Index includes:

a. Calculating the Ci / Lij price for each parameter of each sampling location with Ci is the test result concentration and Lij is the water quality standard which must be in accordance to the givernment regulation No. 82 of 2001

b. If the value of the concentration parameter declines, it can be interpreted that pollution will increase. For example the BOD, in determining the Cim theoretical value (for example for BOD, the Cim value is the saturated BOD value), thus it will be written in the equation as follows [6]:

$$\frac{Ci}{Lij} = \frac{Cim - Ci\,(result\ of\ the\ calculation)}{Cim - Lij} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

If the value of the quality standard for Lij has a range of value, then the following equation will be applied:

- Cij < Lij average

$$\frac{Ci}{Lij}(new) = \frac{[Cj - Lij(average)]}{[Lij(minimum) - Lij(average)]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

- Cij > Lij average,

$$\frac{Ci}{Lij}(new) = \frac{[Ci - Lij(average)]}{[Lij(minimum) - Lij(average)]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

When two values (Ci / Lij) are close to the reference value of 1.0, for example C1 / L1j = 0.9 and C2 / L2j = 1.1 or has very large value differences, such as C3 / L3j = 5.0 and C4 / L4j = 10.0, the method applied to overcome this are: (1) Use of the value (Cij / Lij) of the results if the value is <0 (2) The implementation of a new value (Ci / Lij) if the value (Ci / Lij) has the result of more than 1.0 with the calculation of the the following equation:
(1) use of the value (Cij/Lij) of the result value is < 0
(2) the new value (Ci/Lij) used if the value (Ci/Lij) more than 1,0 with the calculation (Ci/Lij) of the following equation:

$$\frac{Ci}{Lij}(new) = 1 + P\ Log\frac{Ci}{Lij}\ result\ of\ calculation \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

P is the constant value presented as 5. The value is determined independently in accordance along with of environmental observation and the requirements required by a certain allotment.

c. Determination of the average value and maximum value of all Ci/Lij [(Ci/Lij)R and (Ci/Lij)M].

d. Pij or PI price determination using equation :

$$Pij=\surd((C_i/Lij)_{2M}+(Ci/Lij)_{2R})/2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where:
Lij = is the concentration of water quality parameters of the water quality standard (j)
Ci = is the concentration of the water quality parameters results
PIj = pollution index for the purpose of the springs (j)
(Ci/Lij)M = maximum value Ci/Lij
(Ci/Lij)R = Ci/Lij value on average

The correlation between the level of pollution and the pollution index criteria is determined

according to the spring-water quality standards based on the Regulation of the Minister of Environment No. 115 of 2003 as follows:

1. $0 \leq PIj \leq 1,0$: has fulfilled the quality standards (good condition)
2. $1,0 < PIj \leq 5,0$: Slightly polluted
3. $5,0 < PIj \leq 10$: Moderately polluted
4. $PIj > 10$: Severely polluted

e. Observation of Activities and Land Use

The Observation of land activities and land uses is conducted to find information about the activities of the community around the research area and to find out the land use of the area. This information will be used as a consideration in making the area as an ecotourism area. The interview with the people from the Tawangsari Village in the northern part area was conducted to obtain information regarding insocial-data such as population data, gender, age, education and employment. These interviews were conducted directly with questions relating to land use and community activities around the research area. A measure of management strategy will be carried out if the level of the spring has been analyzed in the research area. The management strategy is applied to develop the Tawangsari Village into an Ecotourism Village.

3. Result And Discussion

The Umbul Springs is located in Tawangsari Village, Ngebrong Hamlet, which situated at the forest hill of Ngebrong Hamlet. The sampling coordinate point is 7.788298S 112.428033E with a height of the location of 1444 meters. The location of the Laharan Ngebrong spring is quite far (~5km) from the nearest settlements and the activities of the Ngebrong Hamlet people. The Laharan Ngebrong spring is located in Tawangsari Village, Ngebrong Hamlet, which is in the forest of Ngebrong Hamlet. The sampling coordinate point is 7.803956S 112.434660E with the location height of 1262 meters. The location of Umbul Ngebrong spring is not far (~600m) from settlements and community activities. Therefore it is accessible. The Laminten spring is located in the Tawangsari Village, at the Gerih Hamlet or to be exact in the forest around Gerih Hamlet. The sampling coordinate point is 7.804240S 112.444254E with a height of the location of 1187 meters. The location of the Laminten spring is inside the forest (~3 km) which is quite far from the settlement and community activities.

3.1 The Availability of The Springs

The availability of the springs in the Ngebrong and Gerih Hamlets is excellent because it is always sufficient to fulfill the water needs of the surrounding community. Weather changes does not affect the availability of water for the comunity even though in the dry season it tends to decrease. The Ngebrong Hamlet community uses the Umbul springs and Laharan springs to fulfill their daily needs while the Gerih Hamlet community uses the Laminten springs to fulfill their daily needs.Umbul Spring has worse quality than others due to it's BOD and COD. The better one was UmbulSpring for COD and Nitrit quality.The Spring-water has good quality water so that I can be used for drinking water or material to produce mineral water .

3.2 The Quality Springs in The Research Area based on Quality Standards

The table below is the quality of the springs area based on the Perum Jasa Tirta Laboratory results. The quality of spring water would be better if the variables or parameters were safe [6].

Table 1. The Springs Quality from Perum Jasa Tirta Laboratory

Parameter	Sample			Water Standard for Class 1
	Laharan	Umbul	Laminten	
BOD (mg/L)	7.41	6.65	6.33	2
COD (mg/L)	16.74	12.16	14.25	10
TSS (mg/L)	5.5	5.9	5.7	50
Nitrat (mg/L)	0.6092	0.8050	0.7151	10
Nitrit (mg/L)	0.116	0.0034	0.0035	0.06
Salinity (mg/L)	8	8	10	500
Ammonia (mg/L)	0.5011	0.3178	0.1998	0.5
Sulfat (mg/L)	6.071	4.356	4.705	400
Coliform (MPN/100 mL)	93.0	150.0	93.0	1,000

The quality of the springs in the research area from the result of Brawijaya University TSAL Laboratory which can be seen on Table 2. Both laboratories were accurate, but The Jasa Tirta Laboratory has more accurate. Author used both laboratories due to validation. Yet, there were physic variables by using TSAL Laboratory such as temperature and pH.

Table 2. The Springs Quality from the Brawijaya University TSAL Laboratory

Para meter	Sampling			Water STD forClass I
	Laharan	Umbul	Laminten	
T (°C)	27.2	27.4	27.2	Deviasi 3
pH	7.26	7.3	7.32	6-9
DO (mg/L)	5.82	5.43	7.22	6
BOD (mg/L)	1.15	0.84	2.42	2
Turbidity (NTU)	0.46	0.68	0.55	5

3.3 The Physical. Chemical and Microbiological Results of the Reasearch area's Springs Quality Physic

The water quality of the three springs in the research area is proven to be odorless. colorless and has an appropriate temperature in line with the class I of water quality standards. Based on the results of water quality testing which is conducted in the laboratory. it is illustrated in a diagram and depict the water quality based on physical aspects of the TSS (Total Suspended Solid) parameter then compared thoroughly with water quality standards.

Based on the Figure above we can see that the TSS values of the three springs has been in accordance to the the class I quality standard where the result obtained in the Laharan spring is 5.5 mg / L. Umbul spring is 5.9 mg / L. and Laminten spring is 5.7 mg / L. Based on the description above it is concluded that the turbidity value/level in all three springs has dulfilled the class I quality standards where turbidity level in Laharan spring is 0.46 NTU. Umbul is 0.68 NTU. and Laminten is 0.55 NTU.

3.4 Chemical Aspect

The results of water quality testing conducted in the laboratory are illustrated in a diagram. The water quality based on the chemical contaiments is measured in several parameters such as BOD. COD. DO. pH. Nitrate. Nitrite. Ammonia. Sulphate and Total Hardness level. The results from the laboratory showed the BOD value in the three springs did not fulfill the class I quality

standard where the BOD value in the Laharan spring is 7.41 mg / L. Umbul is 6.55 mg / L. and Laminten is 6.33 mg / L .

The test results showed that the COD value in all three springs were not qulified as the water of class I quality standard where the COD value in the Laharan spring is 7.41 mg / L. Umbul is 6.65 mg / L. and Laminten is 6.33 mg / L. The results from showed the DO value/level is in line with the water class I quality standards. The results form the testing conducted in the laboratory showed the pH values/level in all three springs had fufilled the quality standard of water class 1 where the pH of the Laharan spring is 7.26 mg / L. Umbul is 7.3 mg / L. and Laminten is 7.32 mg / L. The results from the laboratory testing showed the value of nitrate in all three springs had fulfilled class I quality standards where the value of nitrate in Laharan spring is 0.6092 mg / L. Umbul is 0.805 mg / L. and Laminten is 0.7151 mg / L.

From the laboratory test it is showed that the value of nitrite in the Laharan spring did not fulfill the class I quality standards in contrast with the Umbul and Laminten springs which met the class I quality standard where the nitrite value in the Laharan spring is 0.116 mg / L. Umbul is 0.0034 mg / L and Laminten of 0.0035 mg / L. **T**The following is the results from laboratory which showed that the ammonia level in all three springs is classifed in the class I of quality standards. The ammonia value in Laharan springs was 0.5011 mg / L. Umbul is 0.3178 mg / L. and Laminten is 0.1998 mg / L. Based on the test results previously conducted in the laboratory. the sulfate level of these spring is considered as in accordance to the class I category of quality standards. where the sulfate values in the Laharan spring is 6.071 mg / L. Umbul is 4.356 mg / L and Laminten is 4.705 mg / L. The Laboratory Result showed that salinity value in those water-springs had been compatibled with the standard (class1). Those were 8 mg/L for Laharan, 8 mg/L for Umbul,and 10 mg/L for Laminten.

3.5 Biological Aspect

The results of the water quality testing which has been performed in the laboratory will be illustrated in the following diagram therefore we can present the level of water quality based on biology which is obtained from the correlation between the water class category and the total coliform value which can be seen in **Figure 2**.

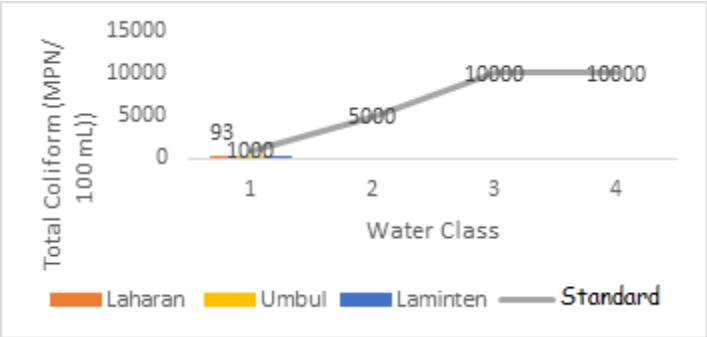

Figure 1. Diagram of Class Category of the Water and Total Coliform

The results of water quality testing in the laboratory showed that the total coliform value in the three classes of water are included in the class I of quality standard where the total coliform value in the Laharan spring was 93 MPN / 100 mL. Umbul of 150 MPN / 100 mL. and Laminten of 93 MPN / 100 mL.

3.6 Springs and Utilization Based on the Pollution Index Method
The results of the calculation of the springs pollution index can be seen in **Table 3:**

Table 3. Research Area Pollution Index Value

Location	Lab	Pollution Index Method	Status
M.A Laharan	Lab. PJT	2.785471411	Slightly Polluted
	Lab. TSAL	1.154513087	Slightly Polluted
M.A Umbul	Lab. PJT	2.528940116	Slightly Polluted
	Lab. TSAL	1.51753263	Slightly Polluted
M.A Laminten	Lab. PJT	2.570273144	Slightly Polluted
	Lab. TSAL	1.110537135	Slightly Polluted

Source: *Result of Measurement with Pollution Index Value*

The results of calculations through the Pollution Index method as in line with the Ministry of Environment Regulation No. 115 of 2003 regarding the guidelines for Determining Water Quality Status. the pollution index value at each point (springs) is at 1.0 <Pij ≤ 5.0 which is categorized a slightly polluted. It was one of 4 classes that define as slightly polluted matter meant there were some bactery of other patogen influencing the spring water [7]. Although spring-water was used for household needs such as personal hygine matter, irrigating crops, animal farming activities. and others, Thatspring-water could not be consumpteddirectly as drinking water due to slightly polluted. Water class II can only be used for recreation, agriculture, and fish pond, and for drinking needs, people must used water class I [8] .

3.7 Debit of The Springs
The Water discharge of each springs in the research area can be seen in **Table 4.** According to the table all of spring water have medium velocity to distribute water and its contain alongside river.

Table 4. Debit of The Springs

Location	Repetition 1	Repetition 2	Repetition 3	Average
Laharan	0.23 (l/s)	0.25 (l/s)	0.24 (l/s)	0.24
Umbul	0.18 (l/s)	0.14 (l/s)	0.14 (l/s)	0.154
Laminten	1.165 (l/s)	1.12 (l/s)	1.16 (l/s)	1.148

Source : *Result of Calculation. 2018*

3.6 Evaluation of the springs quality for potential ecotourism area
The test results based on the pollution index method indicated that the three springs in The North Tawangsari Village have been slightly polluted.

The water quality based on water quality standards according to Government Regulation No. 82 of 2001 stated that generally these springs has fulfilled the class I of water quality standards. The parameters which had not met the quality standards were the BOD (Biochemical Oxyigen Demand) and COD (Chemical Oxygen Demand) due to the daily farm activity from the upper area. The reason were stated that the high levels of BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) indicated that the water was contaminated

with organic materials such as decaying animals or plants. therefore aquatic organisms need sufficient amounts of oxygen to de-degenerate organic waste in the water.

The three springs are suitable for daily needs of the village community such as Bath. Washing, plantation, animal farming, irrigation, and others. Based on the water quality mentioned previously the northern part of tawangsari village is possible to perhaps develop as an area of ecotourism. Choosing an ecotourism meant includes all of aspect purpose.

4. Conclusion

The result of water quality standards except for the BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand) parameters which did not fulfilled the requirement for class I water quality standards. The contamination index value of the Umbul Ngebrong spring is 2.52 at the Perum Jasa Tirta Laboratory and at 1.51 in the TSAL Laboratory. The Laminten Gerih Springs Pollution Index value is 2.57 from the result of Perum Jasa Tirta Laboratory and at 1.11 in the TSAL Laboratory. The volumetric flow rate/Water discharge of the three springs is not affected by the season because the springs in the North Tawangsari Village are permanent springs.

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The tanning of Barramundi fish skin for shoe upper

R S Murti[1] and A D Pratiwi[1]

[1]Center for Leather Rubber and Plastics

Email: rihastiwi@gmail.com

Abstract. The Barramundi fish skin is a by-product of the Barramundi fillet industry which can be used as a raw material for the leather tanning industry. The Barramundi fish skin has a unique and specific grain that can be used as raw material for crafts or shoes. This study aims to determine the optimum formulation of a combination of chromium, mimosa and glutaraldehyde tanning agents on physical and chemical properties, such as flexing resistance, tear strength, color fastness, lastability, seam strength, chromium VI, tensile strength and elongation to meet the requirements of womens shoes . The raw skin were tanned using chromium tanning agent and then neutralized and tanned using a variation of 2-4% chrome , 2% mimosa , and 2% glutaradehyde. The Barramundi fish leather were tested with ISO TR 20879: 2007 : Footwear - Performance requirements for components for footwear - Uppers. The results showed that all of formulations met the requirements of ISO TR 20879: 2007 except the flexing resistance test was mildly damaged. For shoe upper, The Baramundi fish leather can be strengthened by coating the bottom of the leather with other stronger materials. The optimum formulation are combination of chromium-chromium and chromium-glutaraldehyde.

1. Introduction

Barramundi fish skin is a waste from a Barramundi fish fillet company, so far it has only been used as fish crackers with very little added value. Barramundi's skin grain has a very beautiful and attractive so that It can be used for handicrafts. Barramundi fish skin has good skin fiber, beautiful nerf, and large body size that produces skin that is broad enough so that it can be used as a raw material for tanning [1].

The tanning process is carried out by reacting raw skin collagen with tanning material into a stable, non-perishable leather, and can be used for various uses [2]. Many tanning materials can be used in the tanning process, including mimosa ,chesnut, aldehyde, etc. This tanning material can be applied singly or in combination. Combination tanning will produce skin with better physical properties because the superior properties of each tanning agent will complement each other so as to produce better leather quality.

Tanning using chrome tanning agent will result leather with a good variety of properties such as the leather more supple, high shrinkage temperature and its strength is high as well. Vegetable tanning material comes from plants, such as from acacia wood, mangroves, mahogany, and others. Vegetable tanned leather is usually only used for soles, bags, wallets, belts and crafts. Vegetable tanned leather has a stiff but soft nature, low wrinkle temperature, high tensile strength and solid [3]. The aldehyde tanning agent which is widely used in tanning is glutaraldehyde, the resulting leather has superior properties such as soft, limp, contained, sweat resistant and washing resistant. With the combination of those tanning material, it is expected that the Barramundi fish leather can be used for upper shoe material for women's shoes (fashion).

Shoes are an inseparable part of the world of fashion which is a complement and supporter of appearance, so that the use of shoes is a primary need, especially as Indonesia will be the center of Muslim women's fashion, it is necessary to innovate shoe innovations for harmony in fashion models and designs. Women's shoes with Barramundi fish leather is expected to be able to add to the collection or choice of women's fashion accessories, given the unique and beautiful shape of the Barramundi fish leather combined with a contemporary design, a Barramundi fish leather 's footwear will be obtained from women's shoes that meet the demands of the fashion world. The study about Barramundi fish skin tanning has been conducted by [4] Ceriops tagal as using vegetable tanning material. This research aims to determine the optimum formulation of a combination of chromium, mimosa and glutaraldehyde tanning agents on physical and chemical properties, such as flexing resistance, tear strength, color fastness, lastability, seam strength, chromium VI, tensile strength and elongation to meet the requirements of womens shoes.

2. Material and Methods

2.1. Materials

Experiments were conducted with Barramundi fish skin which preserved using salt, obtained from Probolinggo, East Java, Indonesia. The chemical for tanning incluces acids, bases, salts, chromium, mimosa, glutaraldehyde, surfactants, oil, leather dyes, solvents, binders and laquer.

2.2. Equipments

The apparatuses used were experiment drum, hand sprayer, hand staking tool, toggling machine, glazing machine, plating machine, thickness gauge, pH stick, tensile strength tester.

2.3. Methods

Leather weighed and recorded its weight, then put into the drum of the experiment, add water and chemicals according to formulas is done in the tanning process in the laboratory tannery. The process starts from sortasi, soaking, liming, deliming, bating, degreasing, pickling, tanning, netralization, retanning, dyeing, fatliqouring, fixation, and finishing. In the tanning process, there are three variation of combination tanning, include chromium-chromium (A), chromium-mimosa (B), and chromium –glutaraldehyde (C).

2.4 Testing of Barramundi Fish Skin Tanned

The test were conducted using ISO TR 20879: 2007: Footwear - Performance requirements for components for footwear – Uppers include testing parameters flex resistance, tear strength, color fastness, lastability, seam strength, breaking load, and elongation. Chromium VI content were tested base on SNI ISO 17075:2017: Kulit – Uji kimiawi – Penentuan kadar kromium (VI).

3. Results and Discussion

3.1 Flex Resistant and Colour Fastness

Flex resistance and colour fastness test show on Table. 1. From the Table 1, shows that the bend resistance test all passed the test, this shows that the resulting skin is quite elastic and limp. Chrome or vegetable tanned skin in general, the fibers are denser, so the situation becomes dry and stiff. Therefore, oiling is needed to be limper and more flexible [5]. The addition of fat or oil is intended to make the skin more limp and waterproof. When the tanned fibers are lubricated by oil or fat, the fibers will easily rub and the skin becomes weaker [6].

Table 1 shows that colour fastness all combinations tend not to fade on the leather, this shows that all tanning agent contribute to the attachment of the dye to the leather fibers so that the dry

rub resistance is good, or in other words there is almost no dye that is not bound to the skin and the washing process clean.

Tabel. **1**. Flex Resistance and Colour Fastness of Barramundi Fish Leather

No	Kind of test	Fish Leather Variation Code		
		A	B	C
1	Flex resistance (Dry 15 Kcs)	Light	Light	Light
2	Colour fastness			
	Staining			
	Wet (20 cycles) (grey scale)	4	4/5	4/5
	Dry (100 cycles) (grey scale)	5	4	4/5
	Marring			
	Wet (20 cycles) (grey scale)	5	5	5
	Dry (100 cycles) (grey scale)	5	5	5

From the **Table 1**, Colour fastness staining wet (20 cycles) appears that the wet rub resistance on the leather shows that the combination of chrome-mimosa and chrome-aldehyde is better than the chrome-chrome combination, this shows that vegetable tanners and aldehydes increase wet rub resistance in the coloring process. This is in line with the opinion of [7]. Vegetable tanning will produce a tanned skin that is filled, dark in color, durable and easily colored, because the tanner material will block positive ions in the skin so that the dye will easily enter and diffuse into the skin, as a result when there is a change in pH in the process of fixation of the skin charge becomes cationic and the dye will bind strongly to the skin. While aldehyde (glutaraldehyde) tanners produce washing-resistant skin so that if staining is done it will be more resistant to fading, Glutaraldehide makes the skin easier to dye, allowing it to be stained more intensely with excellent fastness and perspiration resistance (blue book).

Colour Fastness Staining Dry (100 cycles) test result shows that all combinations tend not to fade on the leather, this shows that all tanners contribute to the attachment of the dye to the leather fibers so that the dry rub resistance is good, or in other words there is almost no dye that is not bound to the skin and the washing process clean. Test result of Colour Fastness Marring wet 20 cycles and Marring Wet 100 cycles, shows that fade resistance is the resistance of leather coloring to dry rubbing and wet rubbing. The fastness test will give the effect of user comfort and consumer satisfaction on a product [8]. The color resistance test for rubbing is done using a crockmeter. Evaluation of the test results is done by comparing the color staining of the scrubbing cloth against the gray scale.

3.2. Tear Strength

From **Figure 1**, Tear strength test results show that no one has passed the requirements of ISO TR 20879: 2007 this is due to the thin thickness of the skin at each base of the scales, so the tear strength is low. However, from the graph it appears that the chromium-aldehyde combination has the highest tear strength, this is due to the fact that the tanned skin will form a cross bond with the COO group - while the aldehyde tanning material is cross-linked with a non-perishable amine group [9]. This cross-linking combination will strengthen each other so that the highest tear resistance is obtained.

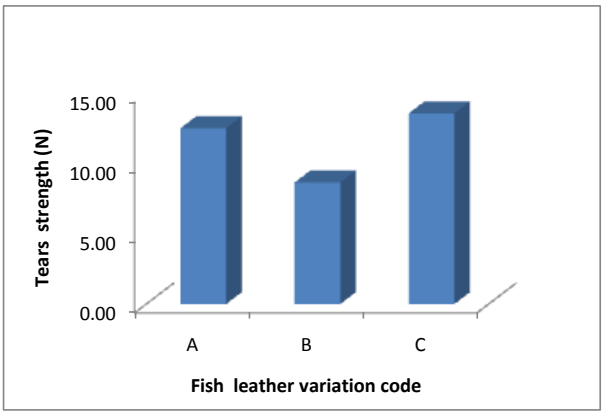

Figure 1. Tear strength of Barramundi fish leather

3.3 Lastability

Lastability is the resistance of the leather receiving punctures and pressure from blunt objects, the higher the eruption resistance, the better the leather. This burst strength is a measure of how resistant the leather of the shoe is to withstand the pressure of the toe, when the shoe is worn. From the Figure 2, It appears that tanned leather in combination with glutaraldehyde has the highest eruption resistance, this is because the tanning agent glutaraldehyde produces a supple and limp leather but contains because the glutaraldehyde tanning agent will disperse evenly across the entire cross-section of the leather. This is in accordance with the opinion BASF 2004 which states that the level of glutaraldehyde dispersion in the leather is very high so that the leather is flat, softer, sweat resistant, soft and elastic, more resistant to light, and smoother skin.

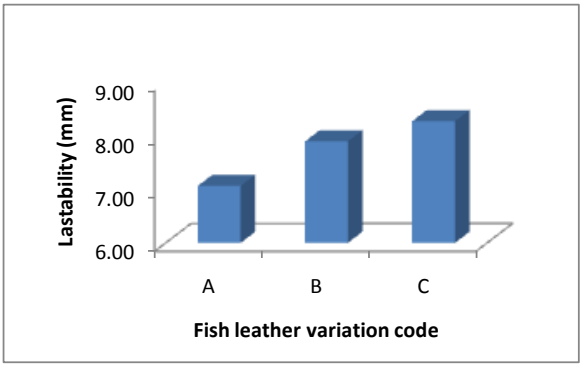

Figure 2. Lastability of Barramundi fish leather

3.4 Seam Strength

Seam strength is the ability of a stitch to accept the maximum load to tear the footage in line with the pull of the sewing thread. The distance between stitches is adjusted until the stitch distance is obtained according to the thread size per inch [10]. From the Figure 3, It appears that the chromium-Vegetable combination provides the highest value of seamstrength, this is because the tanned leather will obtain a dense filled skin so that its physical properties are good and tear resistant. Based on [5] states that tanned skin using vegetable tanners will produce less heat-resistant results, the skin is a bit stiff, but soft and gives the properties of skin that contains

(solid), brown color and high tear strength. Seam strength is directly proportional to tear strength, if the tear strength is high then the sewing strength is also high. Sewing strength is also influenced by the thickness of the skin, skin content, and density of collagen proteins, the magnitude of the braided angle of collagen bundles, and the thickness of the corium [11].

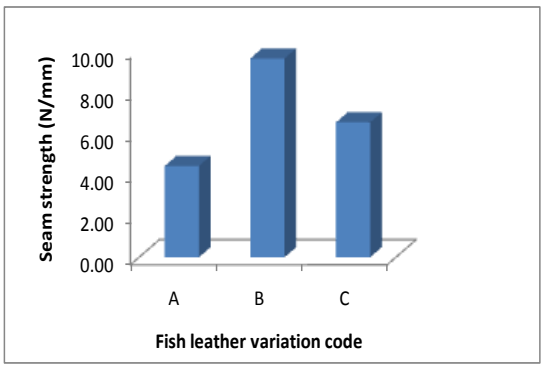

Figure 3. Seam strength of Barramundi fish leather

3.4 Tensile Strength

The results of the tensile strength test are measured in kg/cm2 skin cross-sectional area, where the test is done by pulling skin samples from two directions. The results of this test are usually used one of them to evaluate leather products that usually often get physical pull, for example: belts, shoes or sewing machine straps. It can be seen from Figure 4 that the combination of chromium-mimosa tanning has the lowest tensile strength, this is probably due to the fact that vegetable tanning materials come from plants / wood which are brittle / break easily by mechanical action.

Another possibility is that vegetable tanners enter and bind to the skin too little, so that the skin has less density so that the tensile strength is low, in this study the mimosa used 2 % whereas usually for vegetable tanning is above 15%. According to [12] more tannin is bound to the skin causing the tensile strength of the leather to be higher. Based on [5] states that tanned skin using vegetable tanning material will produce results that are less resistant to heat, the skin is a bit stiff, but soft and gives the properties of skin that contains (solid), brown color and high tensile strength.

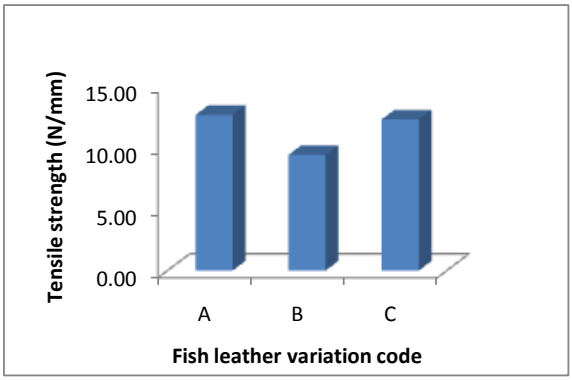

Figure 4. Tensile strength of Barramundi fish leather

3.5 Elongation

Strain strength/elongation shows the ability to stretch the skin, the longer the size of the skin at the time of breaking, the value of the resulting stretch strength is greater. The elastin is a fibrous protein that forms fibers that are very elastic because they have amino acid chains that form angles. These angles become straight when they are stressed and will return to normal if the voltage is released here. The stretching process occurs [13]. The Figure 5 shows that the highest chromose-mimosa elongation variation, this is in line with the lowest tensile strength test so that the elongation is high. The higher the tensile strength, the lower the elongation or vice versa [11]. The composition of protein fibers in the skin will affect the physical strength of the skin, namely the elongation and tensile strength of the skin. Breaking of collagen fibers will reduce the skin's ability to withstand the load of tension, so the tensile strength decreases but the elongation value rises.

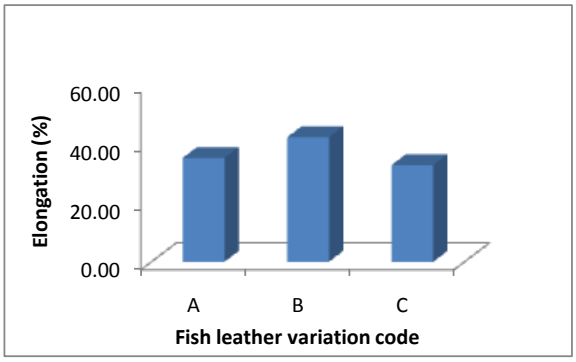

Figure 5. Elongation of Barramundi fish leather

3.6 Chromium VI

Chrome VI levels of all tanning combinations meet SNI ISO 17075: 2017 requirements, namely a maximum of 3 mg / kg, lowest Chrome VI levels of 2.03 mg / kg (chromium-chrome) and the highest 2.93 mg / kg (chromium-glutaraldehyde) (Figure 6). The direct source of Chrome VI is the contamination of chromium tanner III, complex metal coloring and chromium-based inorganic pigments, apart from the direct source of many tools, materials, auxiliaries and processes that can contribute significantly to the conversion of trivalent chromium to hexavalent chromium, for example skin with a temperature of 80 ° C for 16 hours. The presence of oxidizing agents in special chemicals used to make skin can cause the formation of Cr (VI) [14].

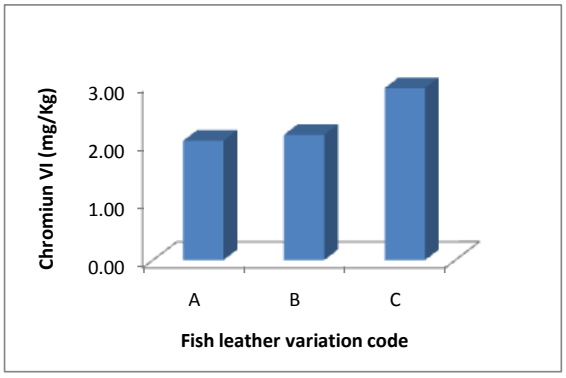

Figure 6. Chromium VI content of Barramundi fish leather

Fatliquor from vegetable or animal oils such as fish oil, rapeseed oil and soybean oil which are usually used to make the skin limp also have the potential to trigger the formation of chromium (VI). Any chemical that contains an oxidizing group can potentially cause large amounts of Cr (III) to Cr (VI) to change even under adverse pH conditions. In the aging process oil oxidation will usually occur because the double bonds will be oxidized by oxygen. This oxidation will form radicals and hydro peroxide. The peroxide formed will react with trivalent chromium and convert it to hexavalent during aging [14].

4. Conclusions

The results showed that all tanning combinations met the requirements of ISO TR 20879: 2007 except for the bending resistance test for mild damage, this in its application to the upper shoe can be strengthened by covering the bottom of the skin with other stronger materials. The combination of chromium-chromium and chromium - glutaraldehyde tanning agent produces skin with better test results than the combination of chromium – mimosa

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The potential of wastewater reuse in soy sauce production process (A case study: Grobogan district of Central Java)

A. F. Alfiana[1] and P. Purwanto[1,2]

[1] Master Program of Environmental Science, School of Postgraduate Studies, Diponegoro University, Semarang – Indonesia
[2] Chemical Engineering Departement, Faculty of Engineering, Diponegoro University, Semarang - Indonesia

Email: falfianaulia@gmail.com

Abstract. Soy sauce production process is one of well-known small-medium enterprises (SMEs) in Grobogan Distric. The production of soy sauce requires water in the process of washing black soybeans, boiling black soybeans, moromi fermentation, boiling moromi, boiling and striring soy sauce, washing of process equipment, used bottle washing, cleaning the production site and turning off the embers. The study case research aimed to determine the potential of waste water reuse in soy sauce process production. The subject of this research was one of the soy sauce production process in Grobogan District of Central Java. The data collection was done by using documentation, observation and interview method. The result show that the water could be reused by using black soybean washing water can be used in the bottle washing tub 1, water in washing tub 2 can be used for washing process equipment and used water of washing process equipment can be used to put out the embers on the furnace. Soy sauce production process can save water as much as 15.9 m^3 per month. In conclusion, the soy sauce production process had a big potential of waste water reuse that could reduce the water consumption and production cost.

1. Introduction

Water is a valuable commodity that was once available at almost no cost. However, times have changes, and now water is not free for people, for community or for industry. In fact, for industry, the cost of water has risen to levels now considered the same as other raw materials used in industry. Water fulfills several roles and function in all types of industries. Almost all water used in industry ends up as industrial wastewater (Ranade and Bhandari, 2014). The function of water in human life is not only to fulfil physical needs but also to fulfill daily needs. Water is one of the important commodities that sustain and maintain life on earth which is very solvent, vulnerable to pollution.

The company's activities cannot be separated from the use of water for industrial needs and domestic (bath, wash, and toilet). To meet these needs, the company can get it from local water company or other water sources. The intensity of water use both for domestic needs and industrial water use in the company must be carried out efficiently and effectively. This will cause difficulties if wastewater management is not done properly and correctly.

Recovery of wastewater, integrated management, reclamation, reuse and recycling can be used as a tool for better management of water resources for the most important stakeholders, scientists and policy makers on this very important issue (Maryam and Büyükgüngör, 2019).

Reuse is an effort that allows a waste to be reused without physical, chemical or biological treatment.

Sweet soy sauce is a liquid product obtained from fermented soybeans (*Glycine max L*) and sugar, brown sugar with or without the caramelizing process with or without the addition of other ingridients with the basic characteristics of total sugar not less than 40% (The National Agency of Drug and Food Control of Republic of Indonesia, 2006). Whereas according to SNI 3543: 2013, sweet soy sauce is defined as a liquid product made from soybean fermented liquid or soybean meal plus sugar with or without adding other food ingridients and food ingridients that are permitted. Soy sauce fermentation process consists of two stages: solid fermentation (koji/ tempeh fermentation) and liquid fermentation (moromi fermentation). Mold used in solid fermentation are *Aspergillus sp.* and *Rhizopus sp*. Solid fermentation is called koji if using *Aspergillus sp.* and if using *Rhizopus sp*. is called tempe. Solid fermentation takes 3 – 5 days. The next step koji is dried and then soaked in 20 – 30 % salt water. The process of soaking koji in salt water is called moromi fermentation. Moromi fermentation takes 14 – 28 days (Rahayu, 1985).

The raw materials used for soy sauce production are black soybeans, brown sugar, salt and water. Non product output as a by-product of the production process in the form of waste generation in the form of solid, liquid and gas emission. According to (Dirjen IKM, 2007), waste management of food industry (solid, liquid and gas) is needed to improve the achievement of the objectives of waste management in accordance with government regulation and to improve the efficiency of resource used. Liquid waste is waste produces by industrial activities that are disposed into the environment and allegedly can reduce environmental quality (Republic of Indonesia, 2014). In general, waste management is a series of activities which include reduction, collection, storage, transportation, reuse, recycling, treatment and or disposal.

By reusing used water from trays, bottles, slabs of nata de coco and soaking nata de coco can be obtained potential savings of Rp. 262,702,- per month (Ariyanti, 2014). Application cleaner production in amplang cracker production by reusing used fish water and production equipment to wash or clean the floor where the production process takes place and use the second rinse water for soaking production equipment can savings of water usage as much as 28,800 L per year or equivalent to Rp. 141,120,- (Wardiyatun, 2018). Based on research result in UD. Sinar Cerah with re-setting of sprying valve for washing process step I can reduce water consumption 1.35 m^3 each day and re-use wastewater from washing process step II for washing process step I can reduce waste water generation until 8.4 m^3 per day (Wijayanto, 2018). The benefits of wastewater reuse for the company both in terms of economical cost saving, improvement of work system, corporate work culture, environmentally friendly and doesn't cause social problem.

2. Materials and Methods

The research was a study case, which aimed to determine the potential of waste water reuse in soy sauce production process. As for the factory which used as the research subject was "Cap Udang" soy sauce factory, located in Grobogan District, Central Java. The research periode is between September – Desember 2018. The data collection was done by using documentation, observation and interview method. The research was carried out through 3 stage: observation, identification of process production of soy sauce in term of the use of materials, water and waste water produced from process production, and analysis of the potential waste water reuse in soy sauce production process.

3. Result and Discussion

3.1 Production process of soy sauce

Production process of soy sauce includes washing of black soybeans, boiling of black soybeans, cooling of black soybeans, koji fermentation, moromi fermentation, boililng of moromi, filtering of moromi, boiling and stirring of soy sauce, filtering soy sauce and cooling of soy sauce. Also the production process of soy sauce can be seen in Figure 1.

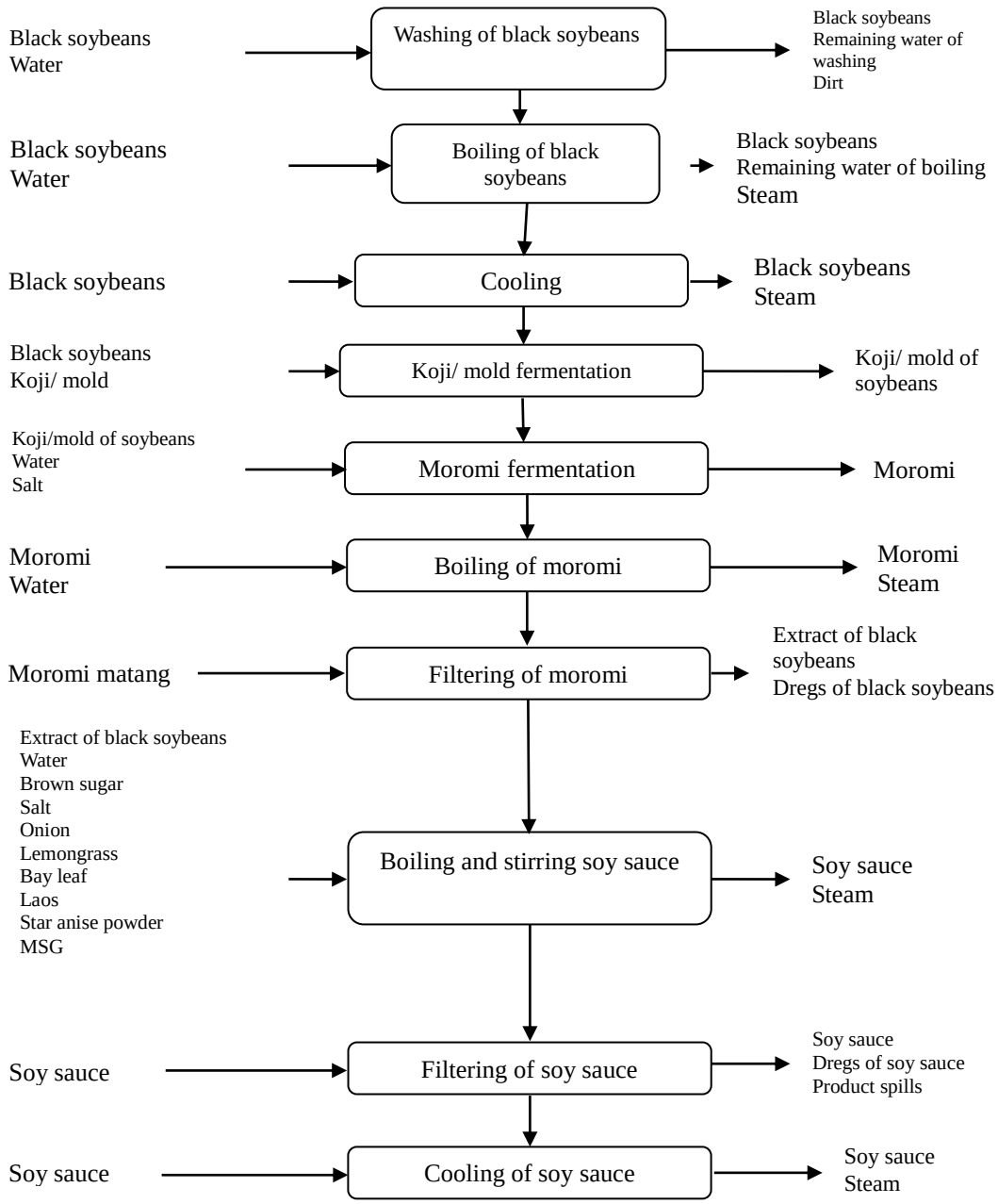

Figure 1. Flow diagram of production process of soy sauce

3.2 Water consumption

Water in soy sauce production process is used for washing black soybeans, boiling black soybeans, moromi fermentation, boiling moromi, boiling and stirring soy sauce, washing of the process equipment, washing used bottles, cleaning production sites, turning off the embers and employee needs. Water used is sourced from the grobogan district drinking water company with an average water usage of 156.9 m^3 per month with a price for small industrial class of Rp. 15.000,- per m^3. The water consumption per month can be seen in Table 1.

Table 1. Water consumption

No.	Process	Water consumption (m^3/month)	Water consumption (m^3/day)
1.	Washing black soybeans	9.0	0.30
2.	Boiling black soybeans	3.6	0.12
3.	Moromi fermentation	4.5	0.15
4.	Boiling moromi	1.5	0.05
5.	Boiling and stirring soy sauce	0.9	0.03
6.	Washing of the process equipment	9.0	0.30
7.	Washing used bottle	120.0	4.00
8.	Cleaning production sites	3.0	0.10
9.	Turning off the embers	2.4	0.08
10.	Employee needs	3.0	0.10
The total of water consumption		156.9	5.23

3.3 The potential of waste water reuse in soy sauce production process

Waste water in soy sauce production process can be used again for several process, among others are reuse the soybean washing water for supporting process, ie washing used bottles in tub 1, reuse water to wash the used bottles in tub 2 for washing of process equipment, reuse water to wash used bottles in tub 2 for cleaning of production sites and reuse the rinsing water from washing of process equipment to turn off the embers.

3.3.1 Reuse the soybean washing water for supporting process, ie washing used bottles in tub 1

The water used for washing black soybeans as much as 0.15 m^3 can be used to wash used bottle in tub 1 so that savings can be made of 0.15 m^3 per day or 4.5 m^3 per month.

3.3.2 Reuse water to wash the used bottles in tub 2 for washing of process equipment

The water for washing bottles in tub 2 as much as 2 m^3 can be used for washing equipment as much as 0.2 m^3. And the remaining washing process equipment needs are taken from clean water sources to rinse process equipment. So that savings can be made of 0.2 m^3 per day or 6 m^3 per month

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3.3.3 Reuse water to wash used bottles in tub 2 for cleaning of production sites

The water for washing bottles in tub 2 as much as 1.8 m^3 can be used for cleaning of production site as much as 0.1 m^3. So that savings can be made of 0.1 m^3 per day or 3 m^3 per month.

3.3.4 Reuse the rinsing water from washing of process equipment to turn off the embers

The remaining 0.1 m^3 of water from the rinsing of process equipment can be used to turn off embers that required water as much as 0.08 m^3. It savings can be made of 0.08 m^3 per day or 2.4 m^3 per month.

4 Conclusion

The factory used 5.23 m^3 water each day to produced soy sauce, which used to washing of black soybeans, boiling of black soybeans, moromi fermentation, boiling of moromi, boiling and stirring of soy sauce, washing of the process equipment, washing of used bottle, cleaning of production sites, turning off the embers and employee needs. From the result of this study it can be concluded that waste water can be reused as much as 0.53 m^3 each day or 15.9 m^3 each month which can reduce water consumption and reduce production costs.

Acknowledgement

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POSTER PRESENTATION

The effect of basic catalyst concentration on tobacco oil transesterification (Voor-Oogst) using ultra-sonic wave and its potential as renewable energy

A Santoso[1], Sumari[1], M Rusdi[1], A Rikcy W[1]
[1]Department of Chemistry, Universitas Negeri Malang Indonesia

Email: aman.santoso.fmipa@um.ac.id

Abstract: Synthesis of methyl ester from tobacco oil (Voor-Oogst) with KOH catalyst has been carried out using ultrasonic waves and a potential test as biodiesel. Tobacco seed samples were obtained from Probolinggo, East Java Indonesia. The stages in this study were: Isolation of tobacco seed oil with n-hexane solvent, esterification process, transesterification with variations in the concentration of KOH catalyst, characterization of methyl ester as a result of synthesis and identification of synthesis methyl ester components by GC-MS. The results showed the synthesis of methyl esters with a transesterification reaction at 0.8% KOH, 1% and 2% w/w catalyst concentration KOH of oil using ultra-sonic waves produce biodiesel respectively are 77.45% ; 84.55% and 80.72%, (2) Methyl esters from tobacco oil according to SNI biodiesel criteria with viscosity of 4.44 cSt, density 0.865 g/mL, refractive index 1.45, acid number 0.56 mg/g. The main constituent of methyl ester which is synthesized in the form of methyl palmitate, linoleic, oleic and stearic respectively are 18.72%; 30.76%; 27.26% and 9.35%.

Keywords: oil, tobacco seeds, methyl ester, ultrasonic

2.6 Introduction

Increasing energy requirements are closely related to the development of economic activities and increasing population, so the need for energy is something that cannot be avoided [1]. The availability of energy reserves is depleting, especially fuel oil. Petroleum is an energy source that cannot be renewed and have a negative impact on the environment, namely the high level of pollution in the air due to emissions resulting from the process of burning fossil fuels. Alternative substitute for solar (diesel oil) that is renewable (renewable energy) and environmentally friendly is biodiesel [2]. One of the advantages of biodiesel is reducing emissions without sacrificing engine performance and efficiency. The use of 100% biodiesel will reduce CO_2, SO_2, CO, and hydrocarbon emissions.

Biodiesel is very environmentally friendly because the flue gas from combustion released into the atmosphere will be absorbed again by plants for photosynthesis. Biodiesel can made from vegetable and animal oils and leftovers from oil or fat with a transesterification reaction [3].

Indonesia is one of the largest tobacco producing countries in 2017 reaching 198,296 tons with a land area of 206,514 ha. Tobacco is the raw material used in making cigarettes and cigars. Based on the seasons in Indonesia, tobacco is classified into two types, namely cigar tobacco (NA-Oogst), planted in the dry season and harvested in the rainy season and clove cigarettes (Voor-Oogst), planted in the rainy season and harvested in the dry season (Hanum, 2008). The use of tobacco as cigarettes and cigars only uses parts of the leaves so that in agriculture leaves waste stems, twigs, roots, small-sized leaves and tobacco seeds. Tobacco seeds contain about 36-41% oil and this is very potential as biodiesel (Sharma, 2013). Each tobacco tree produces seeds with an average weight of ± 25 *g* [4].

Biodiesel can be synthesized from vegetable oil by converting triglycerides to methyl esters with methanol solvents [5]. Making biodiesel requires a catalyst to speed up the reaction, the commonly used catalyst is KOH [6]. The stronger the base properties, the higher catalyst activity and the price is relatively more expensive. The researchers use a lot of KOH catalysts in the manufacture of bi-odiesel because the prices are cheap and the waste produced is more environmentally friendly [7], [8].

The transesterification reaction is generally carried out conventionally, so it takes a long time around 1-3 hours [9]. Biodiesel can be made from tobacco seed oil with a transesterification reaction for 90 minutes [10]. The long reaction time in this conventional method can be overcome by utilizing ultra-sonic waves in the reaction of making biodiesel (transesterification). The use of ultra- sonic waves in biodiesel synthesis from Jatropha oil with optimum reaction is reached at 10 minutes [11], so the synthesis of methyl esters with the help of ultra-sonic waves reaction time is faster and more efficient.

So far, tobacco seeds didn't have economic value and are not utilized further. Tobacco seeds become waste material (waste) in agriculture. One of the enhancements in the use of tobacco seeds can be the basic ingredient of methyl esters (biodiesel), as one alternative to renewable energy. Optimization of the process and finding renewable energy sources is needed to anticipate the decrease of petroleum reserves.

2.7 Material and methods

***1.1** Tools and materials*

The equipment used in this research are pipette volume, drop pipette, glass bottle, Erlenmeyer, triple neck flask, watch glass, measuring cup, beaker, filling funnel, thermometer, burette, a set of reflux devices, a set of distillation devices. Non glassware such as spray bottles, fillers, statifs, clamps, mortars and pestles, universal indicator paper, stopwatches, picnometers, filter paper, label paper, aluminum foil and hoses. Instructors used were analytic balance, oven, hot plate, and magnetic stirrer, a Buchi rotary vacuum evaporator (rotavapor) device, capillar-viscosimeter, re-fractometer, ultrasonic cleaner (Branson 42 kHz) and GC-MS spectroscopy. The materials used in the study: varieties of tobacco seeds (Voor-Oogst) from the Paiton area, Probolinggo Regency. The chemicals used are methanol p.a., H2SO4 p.a., oxalic acid p.a dihydrate, 96% alcohol, phenolphthalein indicator, KOH p.a., n-hexane technical and aquades.

2.8 Insolation of Tobacco Seed Oil (Voor-Oogst)

Tobacco seeds are obtained from post-harvest waste from tobacco leaves from the East Java

Indonesia Region. The initial treatment of brown beans is dried and then mashed. Isolation of tobacco seed oil is carried out by stages: as much as 70 g of tobacco seed powder are extracted by soxhletation using n-hexane powder. The extraction process is stopped until the solvent is colorless for about 60 minutes. Oil extraction is carried out repeatedly to meet the needs of the transesterification process. The mixture of the soxlet extract, the solvent was evaporated using a rotary vacuum evaporator. The extracted oil is dried with $MgSO_4$ anhydrous and then characterized [12].

2.9 Determination of ALB levels of Tobacco Seed Oil and Esterification

As much as 1 g of tobacco seed oil in Erlenmeyer 100 mL, added 10 mL of methanol p.a. The mixture is stirred and heated to boiling and added with 3 drops of phenolphthalein indicator. Then the reaction mixture is titrated with 0.1 N KOH until the color changes from colorless to pink. The volume of KOH needed is used to calculate the levels of free fatty acids [6] [8].

The level of free fatty acid in tobacco seed oil is quite high, it must be lowered by an esterification reaction. The method for decreasing FFA in tobacco seed oil with stages: as much as 100 grams of oil is put into a three neck flask and 5 mL of H_2SO_4 solution is added in 7.5 mL of methanol. Reflux temperatur was regulated from 65 to 67 °C for 1 hours, while stirring was carried out. The reaction mixture was added with 0.3 mL H_2SO_4 in 3.7 mL of methanol under reflux for 1 hour. The results obtained are moved into a separating funnel and washed with warm water. The results of the obtained organic compounds are dried and determined the levels of free fatty acids [13]

2.10 Transesterification

Transesterification of tobacco oil oil helped by ultrasonic waves is carried out through stages as many as 10 grams of oil are inserted into a three neck flask and heated to a temperature of 64-65˚C. Added 3 mL of methanol which has been dissolved by KOH catalyst with variation 0.8% ; 1% and 2% w/w of oil. The reaction mixture is put in an ultrasonic reactor for 10 minutes while stirring is carried out with a fixed temperature of 64-65 ˚C. The reaction results are transferred into a separating funnel and washed with warm water until neutral. The synthesis results are heated at ± 90-95˚C for 30 minutes and drying agent is added to dry the methyl ester. The reaction results are characterized and identified.

2.11 Characterization of Biodiesel

The physical and chemical properties of methylester are characterized by refractive index, density, viscosity, and acid number. Determination of the index can be done by refining the surface of the refractometer glass with alcohol. Tobacco seed oil is dripped on a refractometer glass.

Furthermore, index reading can be done when the dark light separator is right at the cross position of the observation lens. Measurements were made with two repetitions. The observed refractive index value and measurement temperature are recorded as data to calculate the refractive index value at a temperature of 25˚C.

2.12 Density (density)

The density of the type is determined by weighing the empty picnometer with an analytic balance and recording its weight, then inserting ± 25 mL of biodiesel in the picnometer and weighing the weight. Calculating the ratio of the period of a substance to the volume of liquid is a period of type

2.13 Viscosity

Viscosity measurement using Oswald Viscosity, by filling the tool with the synthesized methyl ester then the biodiesel flow time passes through the distance between the two markings on the viscometer. The same step is done with water as an appeal.

2.14 Acid Number Test

Methyl ester samples from tobacco seed oil weighed ± 1 gram were added 10 mL methanol p.a. The mixture of the solution was then heated to boiling and added to the indicator phenolphthalein. Then titrated with 0.1 N KOH until the pink color was formed. The amount of KOH needed is used to calculate the number of acid methyl esters synthesized.

2.15 Results and discussion

1.2 *Isolation of Tobacco Seed Oil*

Tobacco seeds (Voor-Oogst) as shown in Figure 1 were extracted by soxletation with n- hexane solvents. The extracted oil is liquid at a temperature of 25 ^{O}C with a clear brown color as shown in Figure 2.

Picture 1 . Tobacco seeds

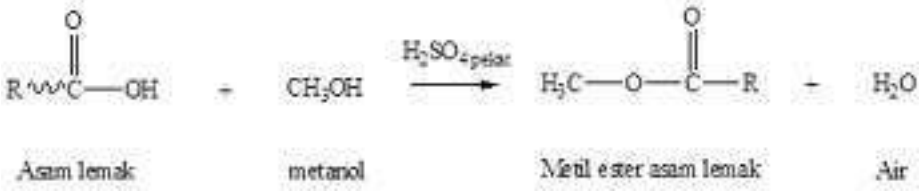
Figure 2 Tobacco seed oil

The results of isolation tobacco seed oil after characterization including density, refractive index, viscosity and free fatty acid content were obtained as shown in Table 1.

Tabel 1 Karakterisasi Minyak Biji Tembakau

Parameter	Nilai
Massa Jenis (g/mL)	0.9018
Indeks Bias (25 °C)	1.472
Viskositas (cSt)	47.58
Asam Lemak Bebas (%)	4.57

The fatty acid content of tobacco seed oil such as Table 1 is still high at 4.57%. This value is difficult to transesterify because the ALB level is more than 2%. Decreasing acid levels can be done by an esterification reaction, with the reaction:



After multilevel esterification of tobacco seed oil, the ALB levels were calculated, decreasing to 1.15%. This value has met the parameters of the number of tobacco seed oil acids for the transesterification process into biodiesel. Oils with ALB levels of less than 2% can be transesterified to produce methyl esters and glycerol [14].

2.16 Synthesis of methyl esters from Tobacco Seed Oil

Tobacco seed oil can be fertilized into its methyl ester with an alkaline catalyst trans-esterification reaction. As much as 10 grams of oil in three neck flasks are heated at temperatures of ± 64-65˚C. Added methanol (ratio 1: 6) 2.8 mL with KOH catalyst with a variation of 0.8% w / w of oil. Then the mixture is put in a reactor equipped with ultrasonic for 10 minutes. The reaction mixture is separated in a separating funnel and washed with warm water to neutral. The resulting methyl ester is dried and analyzed. The same step was carried out by replacing 1% and 2% KOH concentrations [15],[2]. The yield of synthesized methyl esters from tobacco seed oil is assisted by ultrasonic waves at various catalyst concentrations as in Table 2

Table 2 Result of Methyl Esters Synthesis

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	

The synthesis of methyl esters with the help of ultrasonic waves with a ratio of moles of oil and methanol is 1: 6 reaction results have been formed in about 10 minutes. The synthesis of methyl esters with mechanical stirrers and ordinary heating requires 120 minutes [16], [17]. The success of the transesterification reaction can be observed physically, it has been formed in two layers where the top layer as a mixture of esters and the bottom layer of glycerol and the remaining alcohol, as in Figure 1.

Figure 1. Esters and glycerol layers

The yields of transesterification at various catalyst concentrations are as shown in Table 2. The highest yield of transesterification was obtained at 1% w / w KOH concentration of 84.55%, which was higher than the catalyst concentration of 0.8%. This is due to the low concentration of the catalyst, the transesterification reaction is not perfect so the results are not optimal. At a concentration of 2% the addition of KOH bases includes overconsumption and causes saponification, and decreases the results of transesterification [17].

The mechanism of the transesterification reaction begins with the formation of methoxide which forms a reaction between methanol and KOH. The next stage of the methoxide ion will react with oil which is triglyceride. The mechanism is through the formation of highly unstable tetrahedral intermediates. The unstable intermediate releases fatty acid methylester as a result as well as diglyceride. With the same stage diglycerides will react with methanol and produce monoglycerides. Perfect transesterification reaction if glycerol and methyl ester fatty acids are produced.

Ultrasonic waves cause small bubbles to emerge in the liquid (micro cavitation). The formation of micro bubbles helps homogenize the reaction mixture so that the kinetics of the possibility of effective collisions is greater. The presence of ultrasonic waves also accelerates the transesterification reaction from two hours conventionally to around 10 minutes.

2.17 Characterization of Methyl Esters synthesized

Methyl esters obtained from the transesterification reaction with ultrasonic waves are characterized and compared with SNI biodiesel. The characterization results are: acid number test, viscosity test, density test and refractive index test of tobacco seed oil such as. Analysis results Acid numbers indicate the amount of milligrams of KOH needed to neutralize the free fatty acids contained in 1 gram of oil. High acid number indicates the damage or degradation of biodiesel due to oxidation.

Viscosity is a measure of the thickness of a substance. Viscosity is the main parameter in determining the quality of biodiesel. High viscosity can cause damage to the diesel engine combustion chamber. The density of biodiesel depends on the composition of the fatty acids and their purity.

Refractive index is defined as the ratio of the speed of light in the air to the speed of light in a particular medium. The high and low values of the refractive index are influenced by temperature factors, free fatty acid levels and oxidation. If the temperature is too high, the biodiesel will oxidize which results in the breaking of the double bond in the oil molecule. The loss of the double bond causes the oil to saturate and reduce the refractive index value of biodiesel. The results of the characterization of methyl esters synthesized from tobacco seed oil are written as Table 3.

Table 3. The character of biodiesel synthesized and SNI biodiesel

Parameter	Methyl Ester results	Biodiesel (SNI)
Acid number (mg KOH/g)	0.56	Max 0.80
Density (g/mL)	0.865	0.850 0.890
Viskosity (cSt)	4.44	2.30-6.00
Refractometer index	1.45	Max 1.45

As shown in Table 3, some of the characteristics of methyl esters synthesized from tobacco seed oil are in accordance with Indonesia's national biodiesel standard. So it can be concluded that the synthesis of methyl esters has the potential to be biodiesel.

2.18 Identification of Methyl Esters Synthesized

The methyl ester fatty acid ester components of the seeds are analyzed from the results of gas chromatography such as the chromatogram as shown in Figure 4. Each compound synthesized in the chromatogram will show the peak with a specific retention time.

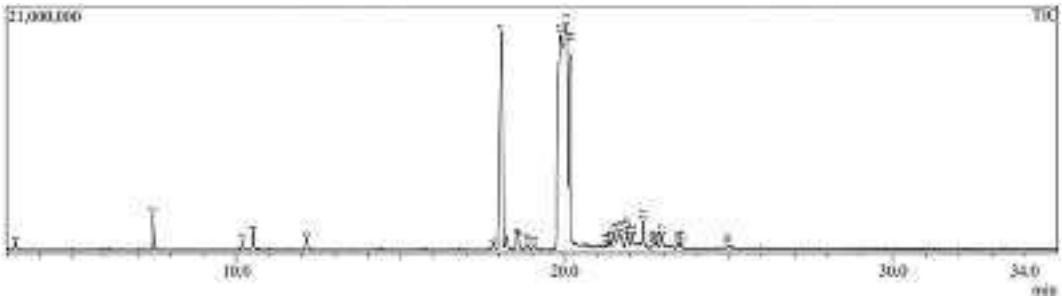


Figure 4 Chromatogram of tobacco oil methyl ester

The results of the chromatogram show that methyl esters or biodiesel from tobacco seed oil have four main constituent components. The retention time and peak area of the chromatogram of the four main components of the composition of biodiesel from tobacco seed oil are shown in Table 4.

Table 4 Chromatogram Retention times and Area methyl Esters Tobacco Seed Oil

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

The four main components of tobacco seed oil are identified by each peak mass spectrometry analysis in GC-MS. Peak with a retention time of 18.09 minutes with MS results as shown in Figure 5:

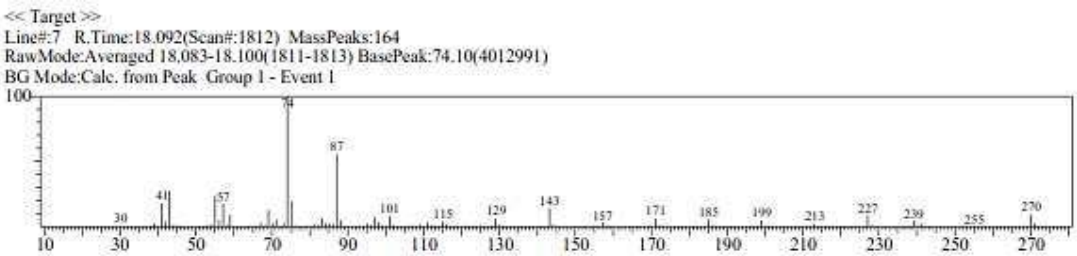
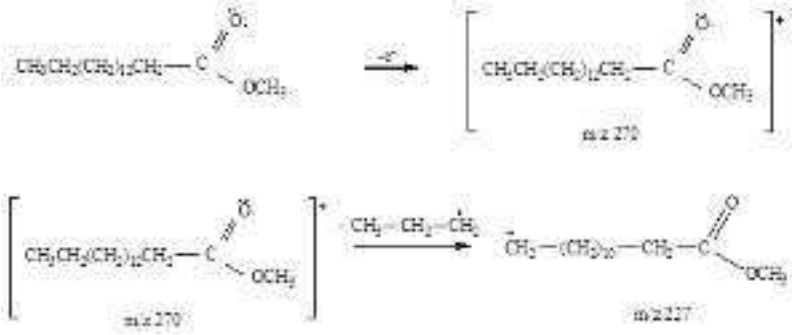
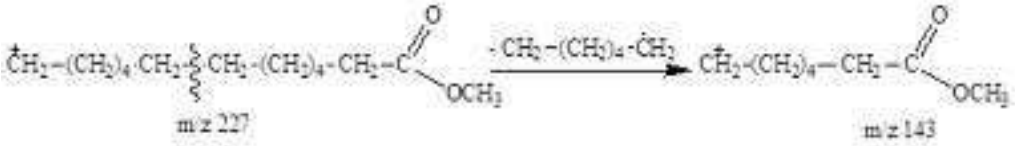


Figure 5 Spectrum of Mass Methyl Esters Retention Time (tr) 18.090 Minutes

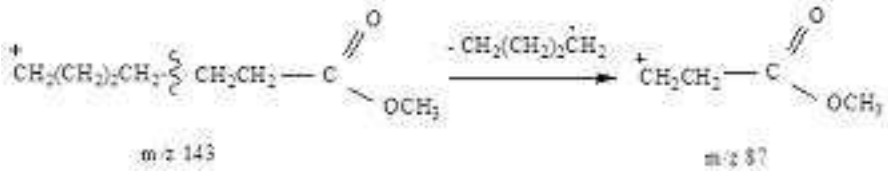
The mass spectrum of the compound with a retention time (tr) of 18.090 minutes was obtained compared with the mass spectrum in the WILEY 7 library. It is thought that it is methyl hexadecanoic or methyl palmitate. The formation of methyl hexadecanoic or methyl palmitate compounds is reinforced by fragmentation patterns with major peaks having m/z 55, 57, 74, 87, 143, 227 and 270. The peak with m/z 227 is thought to originate from the breakdown of molecular ions (m/z 270) as follows.



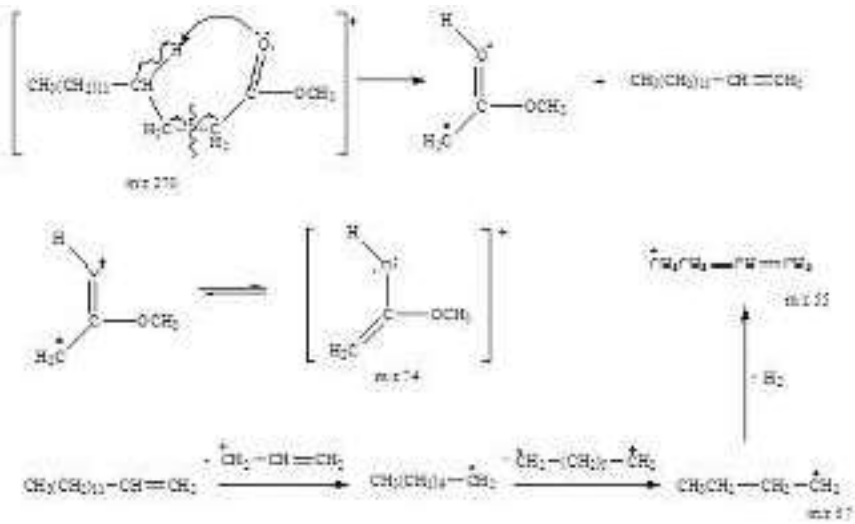
The peak with m/z 143 is thought to originate from the breakdown of molecular ions with m/z 227 as follows.



The peak with m/z 87 is thought to originate from the breakdown of molecular ions with m/z 143 as follows.



The peak with m/z 74 appears as a base peak, thought to have originated from the results of McLafferty's rearrangement with the following reaction.



From McLafferty's rearrangement reaction fragments were obtained which produced molecular ions with m / z 57 and 55. Based on the analysis of mass spectrum fragmentation with a retention time of 18.094 minutes it was suspected that the compound was methyl hexadecanoate or methyl palmitate with the following structure.

Each peak in the chromatogram analyzed the pattern of fragmentation in the same way as the previous analysis. The results of the analysis of the fragmentation pattern as a whole can be seen that the four main constituent components of the synthesized biodiesel from tobacco seed oil were 18.72% methyl palmitate, 30.76% methyl linoleate, 27.26% methyl oleate and 9.35% methyl stearate [11],[18].

2.19 Conclusions

Based on the results of the research that has been done, some conclusions can be taken as follows:

1. The concentration of KOH influences the synthesis of methyl esters from tobacco seed oil using ultrasonic waves, where the optimization conditions are achieved at the concentration of 1% KOH resulting in a yield of 84.55%.
2. The synthesis of methyl esters from tobacco seed oil with a transesterification reaction has a character that is, a density of 0.865 g / mL, a viscosity of 4.44 cSt, a refractive index of 1.45, an acid number of 0.56 g KOH / g of methyl ester and potentially as biodiesel.
3. Identification results using the GC-MS instrument, obtained by the synthesis of methyl ester compounds in the form of 18.72% methyl palmitate, 30.76% methyl linoleate, 27.26% methyl oleate and 9.35% methyl stearate.

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Strategic food price change and its welfare impact on poor households in Indonesia

A A Sa'diyah[1], N Khoiriyah[2], R Anindita[3], N Hanani[3] and A W Muhaimin[3]

[1] Department of Agribusiness, University of Tribhuwana Tunggadewi, Malang, Indonesia /Agriculture Sciences of Doctoral Program, Universitas Brawijaya
[2] Department of Agribusiness, Islamic University of Malang, Malang, Indonesia /Agriculture Sciences of Doctoral Program, Universitas Brawijaya
[3] Department of Socio-Economics, Universitas Brawijaya, Malang, Indonesia

E-mail: ana.arifatus@unitri.ac.id

Abstract. Indonesian has experienced high strategic food prices in recent years. This paper examines the welfare impact of rising strategic food groups' prices on Indonesian poor households using Linear Approximate Almost Ideal Demand System (LA-AIDS) approach. The elasticity coefficients derived from LA-AIDS are used to estimate Compensated Variation (CV) and Equivalent Variation (EV). The study uses SUSENAS (Indonesian National Socioeconomic Survey) raw data. Based on our estimates, the strategic food groups of rice, corn, and shallot are necessary goods, as their budget elasticity is positive and below one at the same time. Beef, chili, and sugar are luxury goods, with income elasticity above one. We find that, overall, higher strategic food price raised the average poor household's welfare. Higher food prices make most households worse off.

1. Introduction

During 2010 to 2015 there was a change in Indonesia's strategic food prices (table 1). Some of the factors that cause changes in strategic food prices include the transmission of international price situations and conditions, the problems of production and distribution, the moment of national religious holidays, local supply and imports, demand, and public expectations. Changes in food prices affect the high and low inflation that occurs, and in turn have an impact on people's purchasing power, especially for low-income / poor people [1]. Furthermore the development of food commodity prices greatly influences the welfare of the households at large, so that the development of food prices can be used as a partial indicator of the development of households welfare [2-5].

Table 1. Indonesia Strategic Food Price Data for 2010-2015

Commodity	Year					
	2010	2011	2012	2013	2014	2015
Rice	6,755.00	7,379.00	7,198.00	8,409.00	8,922.00	10,044.00
Corn	4,615.81	4,885.00	5,501.00	5,727.00	5,786.00	5,845.00
Soybean	8,912.00	9,779.00	10,316.00	11,049.00	10,120.00	9,881.00
Beef	66,329.00	69,732.00	76,925.00	90,055.00	94,210.00	104,328.00
Chilli	22,746.00	22,995.00	22,502.00	29,884.00	34,884.00	37,857.00
Shallot	18,894.00	25,928.00	21,949.00	30,751.00	26,511.00	34,000.00
Sugar	10,740.00	10,665.00	12,007.00	12,227.00	12,012.00	12,714.00

Source: [6-10]

Several studies on the impact of changes in food prices on welfare have been carried out. [11-13,5] has conducted research on the impact of rising food prices on poverty and welfare in India, Vietnam, Mexico and Ghana by using compensating Variation (CV) as a measure. The results of the study explain that the increase in food prices will reduce the welfare of households, especially households that have low income.

This research is different from several existing studies. This research focuses on the impact of changes in Indonesia's strategic commodity prices on welfare by using Computing variation (CV) and equivalent variation (EV). The study used two measuring instruments at the same time in the hope that the results of the research implications would be in the form of alternative food pricing policies that are most suitable. Furthermore, the purpose of this study is to analyze the impact of the increase in strategic food prices on poor households in Indonesia.

2. Materials and Methods

2.1. Data

Indonesian data on households incomes and expenditures was obtained from SUSENAS (Indonesian National Socioeconomic Survey). This data is cross-sectional and it is published by The Central Statistic Agency of Indonesia. The data is collected from each household for one week by performing direct interview. The data used is 2016 data. Data is limited to poor households totaling 28.652.

2.2. Model Selection

The Almost Ideal Demand System (AIDS) has several advanced of this demand system. Furthermore, there has enjoyed great popularity in applied demand analysis. First, AIDS derived from specific cost function and thus corresponds to a well defined preference structure. Second, a property of AIDS is a consistent aggregation from micro to market level. Third, nonlinear Engel curves are possible [14,15].

The explanatory power of the AIDS model has been recognized in demand studies conducted for both developed and developing countries. The approach has been used demand studies of Turkey [16], Demand for Food in Myanmar [17].

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log(x/P) + \mu_i \quad (1)$$

Where w_i, is expenditure share of good i, y is a total expenditure, and μ_i denotes the disturbance term. P is a price index defines as

$$\log P = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_k \sum_j \gamma_{ij}^* \log p_i p_j^* \quad (2)$$

The intercept α_i represent the estimated budget share of commodity i (rice, corn, beef, shallot, chili, and sugar) when all logarithmic prices and real expenditures are zero, interpreted as the subsistence consumption of commodity i. The $\beta_i's$ are real expenditure coefficients and represent the change in commodity i's expenditure share with respect to change in total outlay, ceteris paribus.

To be consistent with consumer demand theory, we must ensure that the demand system satisfies adding-up, homogeneity in prices and income and Slutsky simmetry conditions hold as follows:

$\sum \alpha_k = 1$, $\sum_k \gamma_{kj} = 0$, and $\sum_k \beta_k = 0$ (adding-up property)

$\sum_j \gamma_{kj} = 0$ (homogeneity property), and
$\gamma_{kj} = \gamma_{jk}$ (symmetry property)

The LA-AIDS model was then developed by including the variable of household size this was also done by [18,19]:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log(x/p*) + \beta_i \log ART_j + \mu_i \quad (3)$$

The Household survey reported by the SUSENAS report provides some zero expenditure in given type strategic food commodity. Zero expenditures imply that the demand system is the limited dependent variables or censored model and leads to bias estimation (Heien & Wesseils, 1990). The bias estimation for a system of equations with limited dependent variables in the demand system can be solved by using the consistent two-step estimation procedure for rice, corn, beef, shallot, chili, and sugar.

The IMR value is obtained from the following equation:

$$IMR_{ih} = \frac{\phi(x,\beta)}{\theta(x,\beta)} \; for \; y_{ih} = 1$$
$$IMR_{ih} = \frac{\phi(x,\beta)}{\theta(x,\beta)} \; for \; y_{ih} = 0$$

Where x is a social demographic factor, β is a commodity price log. y_{ih} is a dummy variable, $y_{ih} = 1$ if the household consumes commodities and $y_{ih} = 0$ if the household does not consume commodities.

IMR calculation is the first step. Calculation using a nonlinear seemingly unrelated regression (SUR). and linear seemingly unrelated regression (SUR) is used in the scond step. Adding up, homogeineity, and symmetry restrictions are imposed in the second stage. Heien and & Wesseils [20] used Heckman's two-step estimation by entering IMR in observation. So that the LA-AIDS equation is obtained as follows.

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log(x/p*) + \beta_i \log ART_j + IMR_j + \mu_i \quad (4)$$

The results of the estimation model with LA-AIDS are used to calculate demand elasticity.

The value of compensated own price elasticity: $\epsilon_{ii}^H = -1 + \frac{\gamma_i}{w_i} + w_i$ (5)

The value of compensated cross-price elasticity: $\epsilon_{ij}^H = \frac{\gamma_{ij}}{w_i} + w_j$ (6)

The value of uncompensated own price elasticity: $\epsilon_{ii}^M = -1 + \frac{\gamma_i}{w_i} - \beta_i$ (7)

The value of uncompensated cross-price elasticity: $\epsilon_{ij}^M = \frac{\gamma_{ij}}{w_i} - \beta_i \frac{w_j}{w_i}$ (8)

The value of Expenditure elasticity : $\eta_i = 1 + \frac{\beta_i}{w_i}$ (9)

Marginal Expenditure share: $m_i = \eta_i . w_i$ (10)

where ϵ_{ii}^M is the value of uncompensated own price elasticity, ϵ_{ij}^M is the value of uncompensated cross-price elasticity, ϵ_{ii}^H is the value of compensated own price elasticity, ϵ_{ij}^H is the value of uncompensated cross price elasticity, η_i is the value of Expenditure elasticity, m_i is marginal Expenditure share.

In this study the impact of price changes on welfare was analyzed using the Compensating

Variation (CV) concept approach [22-24,5] which uses observations of the household budget share after price changes and price elasticity are estimated as derivatives of the AIDS model. Compensated Variation is the amount of money needed to compensate a household after a price change and to restore the utility level after a change.

$$CV = \left[m^0 lnp_1 \left(\alpha_1 + \sum_{j=2}^{n} \gamma_{ij}\, lnP_j + \beta_1 lnm^0 + \frac{1}{2}\gamma_{ij}\, lnp_i\right) - \beta_1 m^0 lnp_i \left(\frac{1}{2}\alpha_i lnp_i + \sum_{j=2}^{n} \alpha_j lnp_j + \frac{1}{6}\gamma_{ij}(lnp_i)^2 + \frac{1}{2}\sum_{ji=2}^{n}\sum_{j=2}^{n} \gamma_{ij}\, lnp_i\, lnp_j\right)\right]_{p_1^0}^{p_1'} \quad (11)$$

The equivalent variation of a reform project transforming (p,m) into (p',m') is a change in income that the consumer would be indifferent about accepting in lieu of the price and income change induced by the project. In other words, the equivalent variation is the unique amount of money, denoted by EV, such that not having the reform project and instead of receiving the transfer payment EV results in the same utility for the consumer as not having this transfer payment but having the project being implemented. Of course, if EV is negative this means that taking away the amount from the consumer results in the same utility for the consumer as not having this transfer payment but having the project being implemented.

$$EV(p,p',m,m')=e(p,v(p',m'))-m \quad (12)$$

3. Results and Discussion

3.1. Estimation of Strategic Food Demand for Poor Households

Poor households are households that have the highest income of IDR 335,124 / month. The number of poor households is 28,652 households. The results of the analysis show that the corresponding price parameter coefficients in beef commodities are negative, which means that the increase in beef prices will reduce the share of demand for beef. This is in accordance with Downward Slopping's demand curve theory and supports the results of the study [25, 26].

Variable coefficient values for other commodity prices vary, some are positive and some are negative. Share of expenditure on rice commodities will decline due to the increase in prices of corn, meat, shallots and chillies (Table 2).

Table 2. Estimation of Parameters for Strategic Food Demand for Poor Households

Variable	Rice	Corn	Beef	Shallot	Chilli	Sugar
Intercept	7.745	-6.628	-2.055	1.203	-1.369	0.844
Price of Rice	-0.541	0.279	0.177	-0.005	-0.035	0.004
Price of Corn	0.279	-0.116	-0.139	-0.001	-0.001	-0.003
Price of Beef	0.177	-0.139	-0.047	0.004	-0.019	0.006
Price of Shallot	0.006	0.007	-0.006	0.002	0.001	-0.002
Price of Chilli	0.028	0.002	0.007	0.001	0.055	-0.001
Price of Sugar	0.051	-0.033	0.008	-0.002	-0.001	0.001
Expenditure	-0.87	0.481	0.316	0.001	0.016	-0.003
Household Size	0.798	-0.466	-0.281	-0.001	-0.030	0.006
Invers Mill's ratio	3.618	1.437	-1.242	-1.201	1.563	-0.967
β	0.021	0.062	-0.053	-0.005	0.008	-0.007
R^2	0.998	0.999	0.999	0.999	0.999	0.999

Source: Primary data and calculations

The coefficients of household size for rice and sugar are positive and significant for poor

households. This means that when there is an increase in the number of household members, the share of expenditure for rice and sugar increases. On the other hand, the coefficient of the number of household members for corn, beef, shallots, and chilies is negative and significant, meaning that when an increase in the number of household members will cause a decrease in expenditure for corn, beef, and shallots.

The inverse mill's ratio variable was found to be significant for rice, corn, beef, shallot, chili, and sugar consumption in terms of the products studied.the fact that the inverse mills ratios were found to be meaningful for other products indicates the need to include this variable in the model. The IMR variable is a variable used to avoid estimation results that are biased due to zero consumption.

3.2. Expenditure Elasticity and Marginal Expenditure Share

The value of expenditure elasticity and marginal expenditure share for poor household presented in Table 3. All expenditure elasticity values are positive, meaning that the increase in income will increase consumption of all strategic foods (rice, corn, beef, shallots, chilies and sugar). this condition illustrates that Indonesia's strategic food is a normal good. This finding is in accordance with the findings [18,21]. The beef had the highest expenditure elasticity (14.86), followed by sugar (1.47), Chili (1.031), shallot (0.974), corn (0.934), and rice (0. 283). Rice, corn, and shallots are commodities of necessities because the value of elasticity is less than one. Beef, chili, and sugar are elastic/ luxury goods because the value of expenditure elasticity is greater than one.While luxury goods are products that are not essential but are highly desired, the demand for necessity goods does not decrease although the price increases. The expenditure elasticity of rice for poor households in Indonesia is lower when compared to the expenditure elasticity of rice in Mali, Africa [28, 29]. This shows that in Indonesia poor households allocate less expenditure on rice consumption than in Mali and Bamako.

The marginal expenditure share measures the future allocation of any increases in income [30]. Table 3 shows that in the long run, as income increases, poor households will increase the expenditure share on Indonesia's 6 strategic foods.

Table 3. Expenditure Elasticity and Marginal Expenditure

Food Group	Expenditure Elasticity	Marginal Expenditure Share
Rice	0.283	0.218
Corn	0.934	0.353
Beef	14.836	0.190
Shallot	0.974	0.050
Chili	1.031	0.073
Sugar	1.473	0.117

Sumber: Primary data and calculations

3.3. Own and Cross Price Elasticity for Poor Household

Table 4 shows that all price elasticities, both uncompensated and compensated, are negative, according to the demand theory. According to the theory of commodity, price demand has a negative relationship with the number of demands. This supports the findings from Ghahremanzadeh and Ziaei [30]. The value of beef price elasticity is greater than one both compensated and uncompensated. This shows that beef is a luxury commodity for poor households

Compensated price elasticity provides a more accurate picture of cross-price substitution between strategic food groups because it describes the size of the substitution effect after

reducing the effect of income. So the value of compensated elasticity is smaller than the value of uncompensated elasticity.

Uncompensated cross elasticity shows that rice is a commodity that has a complementary relationship with corn, beef, chili, and sugar, and has a substitution relationship with shallots. Meanwhile, when viewed from the value of compensated cross elasticity, rice has a complementary relationship with maize, and beef, and has a substitution relationship with shallot, chili, and sugar.

Table 4. Uncompensated and Compensated Price Elasticities Results

Commodity	Rice	Corn	Beef	Shallot	Chilli	Sugar
			Uncompensated			
Rice	**-0.6062**	-0.5867	-0.6053	-0.5698	-0.5554	-0.5494
Corn	-11.2406	**-0.0466**	-2.0628	-2.6528	-2.8923	-2.9926
Beef	-154.9461	-51.7711	**-47.9831**	-55.0357	-57.8217	-58.9882
Shallot	0.1127	0.0935	0.0929	**-0.0928**	0.0960	0.0949
Chilli	-0.0563	-0.0332	-0.0324	-0.0339	**-0.0323**	-0.0348
Sugar	-0.2823	0.0693	0.0816	0.0582	0.0487	**-0.0822**
			Compensated			
Rice	**-0.8358**	-0.5790	-0.6049	-0.5554	-0.5354	-0.5270
Corn	-1.2762	**-0.0193**	-2.0453	-1.9958	-1.9757	-1.9673
Beef	-47.2127	-47.9558	**-48.9817**	-47.9323	-47.9122	-47.9038
Shallot	0.8632	0.1201	0.0942	**-0.8564**	0.1637	0.1721
Chilli	0.7572	0.0140	-0.0119	0.0375	**-0.9424**	0.0660
Sugar	0.3787	0.1066	0.0806	0.1301	0.1501	**-1.3124**

Source: Primary data and calculations

3.4. Food Price and Household Welfare

The Value of The impact of changes in prices on welfare can be seen from the value of CV. Table 5 shows that rural poor households will have a greater impact than urban households due to rising prices. The positive value of CV in the village and in the city shows that the increase in the price of 6 strategic commodities causes the household to go worse off.

Table 6 shows the equivalent variation values. Equivalent variation is the amount of money that, paid for a person, a group, or a whole economy, would make them as well as a specified change in the economy. Providing a monetary measure of change that is similar to, but not, in general, the same as compensating variation. The EV value of 65.6% means that the price increase of 6 strategic commodities will have an impact on reducing household welfare by 65.6 % .

Table 5. Compensating Variation for Poor Household

Food & Non_food Items	W/O Subst	Subst Only	W/ Subst
URBAN			
ALL Items	**-24,834**	**1,932**	**-22,902**
Rice	-13,059	309	-12,750
Corn	-49	0	-49
Beef	-336	119	-218
Shallot	-4,454	627	-3,828
Chilli	-6,216	870	-5,345
Sugar	-720	7	-712
Other foods	0	0	0
Non-food	0	0	0
TOTAL (RUTA)	**-24,834**	**1,932**	**-22,902**
% to AVERAGE HH			**56.3%**
RURAL			
ALL Items	**-28,494**	**2,053**	**-26,442**
Rice	-15,494	331	-15,162
Corn	-181	0	-180
Beef	-315	106	-209
Shallot	-4,993	694	-4,299
Chilli	-6,621	913	-5,708
Sugar	-891	8	-883
Other foods	0	0	0
Non-food	0	0	0
TOTAL (RUTA)	**-28,494**	**2,053**	**-26,442**
% to AVERAGE HH			**74.1%**

Source: Primary data and calculations

Table 6. The Value of Equivalent Variation for Poor Households

Food & Non_food Items	W/O Subst	Subst Only	W/ Subst
ALL Items	**-27,032**	**2,628**	**-24,404**
Rice	-14,521	633	-13,888
Corn	-128	3	-125
Beef	-324	135	-189
Shallot	-4,778	776	-4,001
Chilli	-6,459	1,056	-5,403
Sugar	-822	25	-798
Makanan Lainnya	0	0	0
Bukan-Makanan	0	0	0
TOTAL (RUTA)	**-27,032**	**2,628**	**-24,404**
% to AVERAGE HH			**65.6%**

Source: Primary data and calculations

4. Conclusion

Based on our estimates, the strategic food groups of rice, corn, and shallot are necessary goods, as their budget elasticity is positive and below one at the same time. Beef, chili, and sugar are

luxury goods, with income elasticity above one. The results of the analysis using CV and EV obtained the value of CV for poor households in rural areas with the highest value, thus implying that the income policy will have a greater impact than the price policy.

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