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INTERNATIONAL CONFERENCE

ENGINEERING & TECHNOLOGY DEVELOPMENT
UBL ICETD
2013

The Second International Conference on Engineering and Technology Development

2nd ICETD 2013

27, 28, 29 August 2013, Bandar Lampung, Indonesia

PROCEEDINGS

In Cooperations With :

APTIKOM

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

SURYA INSTITUTE

Hosted by :
Faculty of Engineering and Faculty of Computer Science,
Bandar Lampung University (UBL), Indonesia

2nd ICETD 2013

The Second International Conference On Engineering And Technology Development

28 -30 January 2013
Bandar Lampung University (UBL)
Lampung, Indonesia

PROCEEDINGS

Organized by:

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PREFACE

The Activities of the International Conference is in line and very appropriate with the vision and mission of Bandar Lampung University (UBL) to promote training and education as well as research in these areas.

On behalf of the Second International Conference on Engineering and Technology Development (2nd ICETD 2013) organizing committee, we are very pleased with the very good response especially from the keynote speaker and from the participans. It is noteworthy to point out that about 80 technical papers were received for this conference.

The participants of the conference come from many well known universities, among others : University Kebangsaan Malaysia – Malaysia, APTIKOM – Indonesia, Institut Teknologi sepuluh November – Indonesia, Surya Institute – Indonesia, International Islamic University – Malaysia, STMIK Mitra Lampung – lampung, Bandung Institut of Technology – Bandung, Lecture of The Malahayati University, B2TP – BPPT Researcher – lampung, Starch Technology Center – Lampung, Universitas Islam Indonesia – Indonesia, Politeknik Negeri Malang – Malang,University of Kitakyushu – Japan, Gadjah Mada University – Indonesia, Universitas Malahayati – Lampung, Lampung University – lampung, Starch Technology Center – Lampung, Universitas Riau – Riau, Hasanuddin University – Indonesia, Diponegoro University – Indonesia, King Abdulaziz University – Saudi Arabia, Parahyangan Catholic University – Indonesia , National Taiwan University– Taiwan, Surakarta Christian University – Indonesia, Sugijapranata Catholic University – Indonesia, Semarang University – Indonesia, University of Brawijaya – Indonesia, PPKIA Tarakanita Rahmawati – Indonesia, Kyushu University, Fukuoka – Japan, Science and Technology Beijing – China, Institut Teknologi Sepuluh Nopember – Surabaya, Researcher of Starch Technology Center, Universitas Muhammadiyah Metro – Metro, National University of Malaysia – Malaysia.

I would like to express my deepest gratitude to the International Advisory Board members, sponsor and also to all keynote speakers and all participants. I am also gratefull to all organizing committee and all of the reviewers who contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector of Bandar Lampung University (UBL) who give us endless support to these activities, so that the conference can be administrated on time

Bandar Lampung, 29 August 2013-08-26

Mustofa Usman, Ph.D
2nd ICETD Chairman

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THE POTENTIAL OF AGRICULTURE AND FORESTRY BIOMASS WASTES AS SOURCE OF BIOENERGY

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Absrtact-*Indonesia as a agriculture country has very much of agriculture and forestry biomass-wastes. Until now, that biomass wastes were sold out without some treatment to produce the higher value product. The agriculture and forestry biomass-wastes contain lignocelluloses material that have 3 groups carbohydrate structure : cellulose, hemicellulose and lignin. That material were potentially to treat to product ethanol that can use as new and renewable energy. It is important, the use of agriculture and forestry biomass-waste did not over-lap with food and feed programe and also support the national energy strategy and green energy concept. Technology convertion of biomass-waste to product bioenergy could be done by physic, chemical and biologically. To enhance the sustainability of the world energy supply, it is necessary to substantially increase the worldwide biomass energy utilization. The biomass waste is a potentially and interesting as energy raw material. It is one of alternative programe to change non-renewable energy to new and renewable energy.*
Key word : *Agricultutre , forestry, biomass waste, bioenergy, new and renewable energy*

INTRODUCTION

The energy consumption trend in Indonesia is show increased significally, specially fossil energy. The increasing of energy consumption has to seriously attention in environmental impact, especially in the air pollution problem. The use of the primer energy was dominated by gasoline, that one kind of fossil energy, while the quantity of these energy source will be limited. The use of energy fossil energy have been caused many negative impacts. Beside of the exhausted gas accumulation problem, the price of fossil energy is expensive. It is a fortune to develop another alternative energy to change of the fossil energy. That energy has to clean (green), new and renewable. Many source in Indonesia have developed as a source of alternative energy, such as solar energy, wild energy and biomass energy. The cope with the rapidly increasing energy demand in developing country and to enhance the sustainability of the world energy supply, it is necessary to substantially increase the worldwide biomass energy utilization. Brasil, America and some Uerope country have been used bioethanol as biomass energy. The use of bioethanol as alternative energy was done by mixturing bioethanol with gasoline. The mixture of bioethanol and gasoline is called gasohol. The biethanol production process in Indonesia used carbohydrate material as raw material. That has to seriously attention, because the use of carbohydrate material will be interrupt with the national food and feed programes. The use of biomass waste materials to produce bioethanol have be done as the simultaneously strategy to fullfil the food and energy. Bioethanol could be produce from cellulosic materials. The cellulosic materials can be found from biomass wastes like sawdust, rice straw, sorghum stem etc. The use of biomass waste as energy raw material has to develop, that will to give added value of biomass waste and not interrupt with the national suplly of food and feed. It is a fortune to develop biomass wastes, especially agricultural and forestry wastes as energy raw materials. The developing of agriculture and forestry waste as bioenergy raw material has to base on the national energy strategy and green energy strategy.

THE DEVELOPING BIOMASS AS ENERGY RAW MATERIAL REFERENCE

The developing of biomass as new energy raw material is based on National Energy Strategy and Green Energy Initiative. The 1998th National Energy Strategy has been reformed by the 2008th National Energy Strategy. The National Energy Strategy was use as base of energy utilization. That Energy strategy was based on source of energy , exploitation of energy, mission and policy Fossil energy is a actual energy use in Indonesia. The are some negative problem of fossil energy, beside the quantity of these energy source will be limited, the price of the fossil energy is expensive. That strategy are base on not balancing profile of the use energy, the high growth and inefficiency of the use energy, the use of energy source for industry, the energy source be to main export commodity, the national price of energy was not economically and the usew of energy will be cause environmental impact.
To solve the national energy problems, it has to developed some national initiative such as energy intensification, energy diversification and energy convertion. The mission of national energy policy are the suplly of domestic energy will be guaranted, to give the added value of energy function and the sustainable national energy will be carry out

GREEN ENERGY CONCEPT

The green energy concept is a opinion or conception that consider of supply and exploitation of energy as a unity concept to create the sustainable energy supply recently and the future ,and to fullfill the way of life standard of recently generation, without sacrifice the way of life standar of the future generation
Base of green energy concept are the optimalization of exploited renewable energy, the use of clean and efisience of technology and the energy save culture.

Figure 1 show the flow chart of green energy application

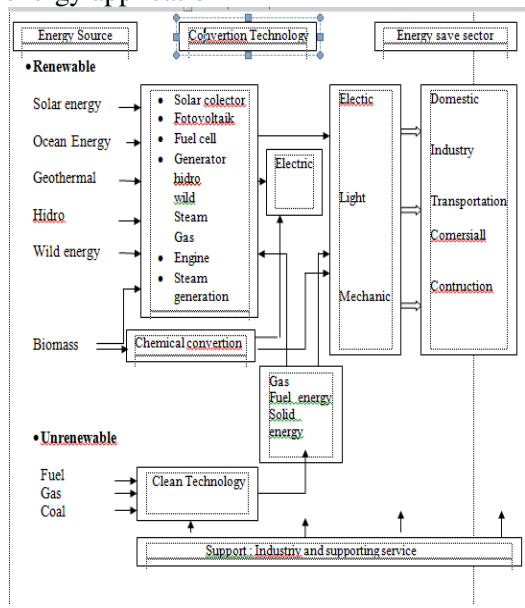

Figure 1 : Flow chart of green energy

The convertion of the unrenewable energy (fossil energy) like gasoline, gas and coal has to used as a efficient technology and also to apply the clean energy concept. The fossil energy production usually will give environmental negative impacts.
The use of biomass waste as energy raw material will support the green energy concept, because the process production and the product of biomass energy is cleaner than the process production and the product of fossil energy.

THE USE OF BIOMASS WASTE AS RENEWABLE-ENERGY RESOURCE

The agriculture and forestry biomass waste are one of important renewable energy sources. Indonesia as a agriculture country has very much of agriculture and forestry biomass-waste and that biomass wastes were sold out,without some treatment to produce the higher value product. The sources and potential of agriculture and forestry biomass waste are show in table 1.

Table 1 . The potential and distribution of agriculture and forestry wastes in Indonesia

Biomasa	Main region	Production (million ton/ year)	Technical energy potential Million GJ / year
Rubber wood	Java, Sumatera, Kalimantan,	41	120
Logging residues	Sumatera, Kalimantan	4.5	19
Sawn timber residues	Sumatera, Kalimantan	1.3	13
Plywood production residue	Java, Sumatera, Kalimantan, Irian Jaya, Maluku	1.5	16
Sugar residues	Java, Sumatera Selatan, Kalimantan	Bagase : 10 Cane tops : 4 Cane leaves : 9.6	78
Rice residues	Java, Sumatera, Sulawesi, Kalimantan, Bali, Nusa Tenggara	Husk : 12 Bran ; 2.5 Stalk : 2 Straw : 49	150
Coconut residiues	Java, Sumatera, Sulawesi	Shell : 0.4 Husk : 0.7	7
Palm Oil residues	Sumatera, Kalimantan, Sulawesi, Maluku, Nusa Tenggara, Irian Jaya	Empty fruit bunches : 3.4 Fibrex : 3.6 Palm shells :1,2	67

The agriculture and forestry biomass waste are the material contain of major of lignocellusic material. This materials contain three major group of structural carbohydrate : ie. Cellulose, hemicelluloses and lignin. Garotte et al were clasificated of biomass waste into hardwoods. Softwoods and agriculture residues. The hardwood waste contain 39-45% cellulose. 14-37 % hemicelluloses and 17-30 % lignin. The softwood waste contain 41-50% cellulose, 11-27% hemicelluloses and 20-30% lignin. The composition of different agriculture residue varies widely. For example. Rice straw contain 32-47% cellulose, 19-27% hemicelluloses and 5-24% lignin.

The energy convertion technology of agriculture and forestry biomass waste can be broadly divided into thermo chemical convertion and biochemical converrtion. Some of the thermo chemical convertion are direct combustion, gasification, esterification and convertion into solid fuel. The kind of biochemical convertion are methane fermentation, ethanol fermentation. This papers focuss on the convertion of agriculture and forestry biomass waste by fermentation to product ethanol. Ethanol that produce from biomass material is called bioethanol

To produce ethanol from lignocellulosic waste material, it is be separate the lignin material from cellulose and hemicelluloses material. The lignin material will be inhibited the production of sugar from cellulose ang hemicelluloses material.

The cellulose and hemisellulose material be hydrolyzed to produce C6-sugar and C5-sugar, followed by ethanol fermentation of C6 and C5-sugar.

While the ethanol production from biomass waste not be economic yet, in the future this process has potentiated as an alternative to solve the energy problem and not interrupt with the national suplly of food and feed. The scheme of ethanol production from biomass waste is show in figure 2.

The production of ethanol from biomass waste were divide into sepatation of lignin material from cellulose and hemicelluloses material, the hydrolyze the cellulose and hemicelluloses material to product C6 and C5-sugar , the ethanol fermentation of C6 and C5-sugar. The last step is concentrated the produce ethanol by distillation and dehydration process until the level of fuel grade ethanol.

BIOETHANOL AS A NEW AND RENEWABLE ENERGY

Ethanol that produce from biomass material is called bioethanol. The consumption of bioethanol were more for drink and pharmasiticall. The use of bioethanol for fuel energy has to fullfil fuel grade ethanol (> 99.6% ethanol). For direct used as engine fuels, fuel grade ethanol has to blended with gasoline in various portion. The mixture of bioethanol and gasoline is call gasohol

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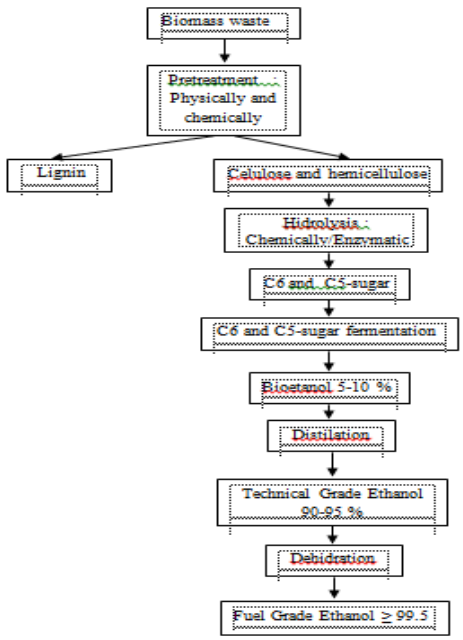

Figure 2. The scheme of ethanol production from biomass.

No engine modification is needed when bioethanol is blended with gasoline up to 20%. Some countries has already used 10% of bioethanol blended 90% with gasoline, known as gasohol E-10
Gasoline engine performance using gasohol E-10 compares gasoline and Pertamax can be seen in table 2.

Table 2. Comparation of gasoline engine performance using gasohol E-10 to gasoline and pertamax

Parameter	Fuel		
	Gasohol E-10	Gasoline	Pertamax
Power (KW)	41.23	30.70	40.09
Force (N)	1856.10	1393.80	1804.00
Fuel consumption (l/h)	30.39	31.03	27.38

The excellent performance of gasohol E-10 comes from its high octane number and the present of oxygen in bioethanol molecule compared to those gasoline and oertamax. When gasohol is used, the level of carbon monoxide can be diminished even back to the save level.

CONCLUCION

1. The use of agriculture and fotestry biomass wastes as energy raw materials is a alternative option that has to be support by government, as a option to find a new and renewable alternative energy. It is a fortune to develope in Indonesia, cause Indonesia have very much of the agriculture and forestry biomass wastes are , and did not interrupt with food and feed programe
2. The energy convertion technology of agriculture and forestry biomass waste is still expensive, but it is important to develop this technology,cause the source of the fossil energy will be limited and Indonesia has very much of agriculture and forestry biomass-wastes.
3. Bioenergy is one of energy alternative that change the non-renewable energy (fossil energy) to renewable energy

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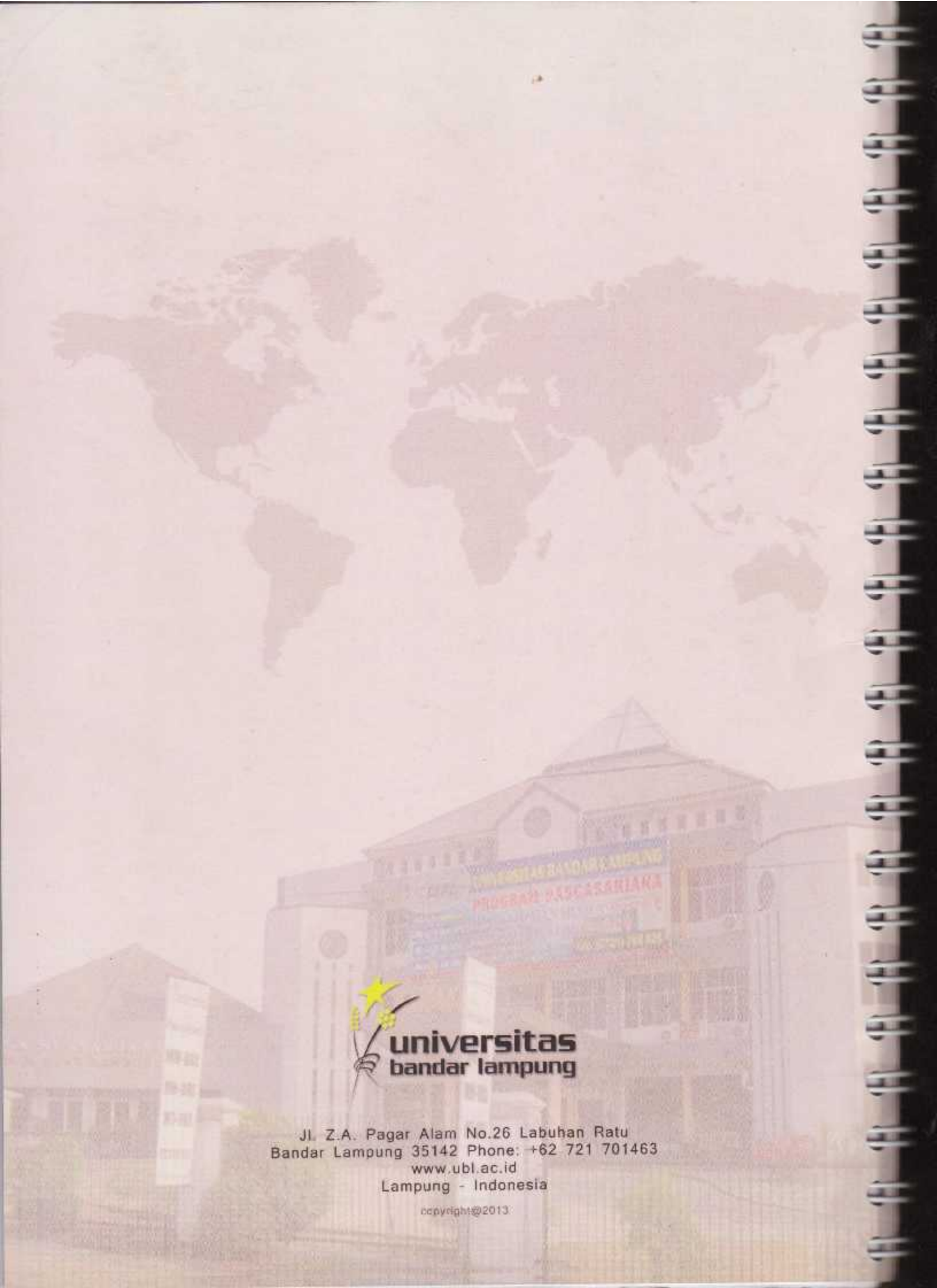

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