Food and energy development based on local potency, environmental degradation, and global perspectives

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Abstract. Environmental degradation is increasingly threatened in line with the higher pressure on natural resources in an effort to liven up food production and biofuel energy. Food cannot be substituted by other products and can only be expanded through agronomic technology development, while energy can be generated from various sources, including by converting food into biofuels. Food and energy can be developed in Indonesia that has potential on the local endowment to produce food, generate primary energy (solar, wind, and water), and utilise new source renewable energy. In Indonesia, food and energy can be improved with enormous potency on local endowment to mount food production, produce primary energy (solar, wind, and water), as well as finding a new platform of renewable energy sources. Local or native food and the provision of alternative energy sources can encourage economic activity in local communities and promote bargaining positions in the global economy. Development on local food and alternative energy can be done by paying attention the use of local resource, function and role of community development and local organizations to support rural economic development and sustainable agriculture.

1. Introduction

Food and energy are fundamental commodities in the global era and became a strategic sector for supporting the economic development of developing countries. The threat in environmental degradation is advance due to pressure on natural resources and efforts to enhance food production and biofuel to meet the increasing demand for food and energy [1]. The flexibility of farmers to produce food or fuel was affected by bio-product prices and supported by particularly food trade liberalization on a global era. Another issue that related to natural resources problem is the pressure of biodiversity caused by the adverse effects on agricultural land expansion to reduce greenhouse and gas emissions to generate petroleum substitute products [2,3].

Development of food would be the priority because food can be produced and liven up through technological improvement and cannot be substituted from other forms, such as synthetic food, while the energy can be produced from various alternative sources of energy with the utilization of technology from existing products, renewable energy, and new renewable energy [4,5].
Food and energy can be developed as a focus for future agricultural development and Indonesia, an important position in the global era and liberalization of trade [6]. Rural areas and communities are taking an important role in local food development. Furthermore, if the local production is surplus, the production could be distributed to other areas in Indonesia. Economic growth and environmental preservation an effort is a trade-off as the use of fossil fuels continues to rise in triggering economic growth, climate change, and environmental degradation [7].

The paper discusses food and energy as products that potentially can be developed in Indonesia supported by abundant natural resources, social and local culture. Food development based on the potential of local resources, such as natural resources, local culture, and local institutions, will increase the resilience of rural communities and, at the same time, will maintain the preservation of natural resources and the environment. The study would also provide the information that local food and energy development will contribute to food security at the national level by reducing dependencies on food imports yet improve terms of trade or net exports which will positively impact on national economic growth.

2. Food and Energy in the Global Perspective
Globally, globalization is meaningful and provides diverse understanding from various perspectives in determining the position of a country, society, or individual who has a bargaining position on various aspects and uses it in institutional strengthening to strengthen its position, such as the WTO, Multi-National Companies, and AFTA. Many scholars state that globalization is the era of regional cooperation and partnership that allows people on its territory simultaneously interact in the wider global context. The interaction also should be understood as activities such as transactions on trading activities, build political power, regional security, and so on. The WTO institutions also campaigned for regional cooperation to promote trade and investment liberalization. It can be seen from regional cooperation such as NAFTA, AFTA, APEC [8]. Through the cooperation/partnership, each individual or element of society can meaningfully participate in the interaction at the level of the region and globally.

Globalization can be defined as the era of competition and cooperation. Opportunities posed by competition are largely achieved by the developed countries. Various potential with the development of technology owned by developed countries that can not be followed by others developing countries with various limitations. Based on the principle of interdependence, developing countries can compete with their uniqueness or endowment. Each country has different forms of endowment with a variety of developments, including the technology used. Endowment factors are understood as gifts of God, which is only found in areas that have been set by the Almighty. This factor should be developed based on the potential and culture of the country. Globalization is a competition where ethics and values become important to directs people to interact extensively, but the ability to interact is determined by its potential. Potential quantity and specificity are affecting interaction and acts in the global arena.

Globalization will have a strong impact to the markets of food and energy. The increment of energy prices has a major impact on the agricultural sector, particularly food that can be used as a feedstock for producing biofuels instead of petroleum-based fuels (gasoline, diesel, oil). In addition, the agricultural sector can improve the competitiveness of agricultural products on the demand side, such as rubber and cotton. Both types of agricultural products can be substituted from the synthesis product using fossil fuels as the main raw material. The rising trend in energy prices, followed by a decline in fossil fuel reserves, has resulted in increased demand for biofuels.

3. Global Demand for Food and Energy
The conversion of food to energy in order to meet the world’s energy needs encourages the development of commodities which tend to be monoculture that will lead to environmental damage and natural disasters. For example, the development of palm oil in Indonesia is very rapid [9]. Growth in agricultural production and productivity can reduce hunger and poverty, but farmers as
producers do not receive the benefits of technological advances and remain poor and lack of progress in improving the nutritional deficiencies [10,11]. A Developed country can reduce malnutrition through food trade liberalization. Contrary, the population in developing countries is faced with food productivity and purchasing power access. Low food prices are associated with higher per capita income levels causing many consumers in developing countries able to improve their food intake, including consumption of meat and dairy products [12]. The development of the consumption of animal products in order to improve the nutritional quality of food would threaten the adequacy and environment because about two-thirds of the food can be used as animal feed [13].

Food and energy are two forms of the basic needs of the population that should be developed to meet the needs in very rapid progress of civilization [14] [15]. Increasing the needs of both commodities will affect the utilization pressures on natural resources and the environment. The food and fuel crisis is a serious problem not only faced by the world but also Indonesia. Fossil oil reserves continue to decrease and will be a load on foodstuffs.

Economic growth in Asia has a great contribution to the growth of the world economy and effect in world energy demand. Half of the increase in world demand for energy will be used to meet the growing energy consumption in China and India [16,17]. The world’s largest energy supply source after coal is sequentially derived from gas, biomass, nuclear, hydro, and new sources of renewable energy [18]. The use of alternative energy sources and a new renewable energy source will reduce dependence on fossil energy-producing resources and simultaneously considering the social and environmental aspects.

World energy consumption growth in the next 20 years will be dominated by developing countries and some countries that are included in the world’s giant economy. Environmental issues continue heated and become prolonged discussion because of energy consumption for the country is dominated by the use of fossil fuels. The main and continuous consumption of fossil energy is dominated by China, the Middle East, India, Africa, Eastern Europe (Eurasia), Latin America, and other Asian countries, while the group of industrial countries that joined the OECD actually showed a reduction in the use of fossil energy [19]. Some food is converted into biofuel to meet energy demand as the main driver of economic growth. This shift positioned agriculture as a source of biofuel, which will significantly affect the utilization of natural resources for food production and biofuels.

4. Food and Energy Proposed on Agricultural Development
Agricultural products intended for food and energy requires the use of natural resources. Agricultural resources as the main production factor of resources tend to scarce, for example land and water. Efforts to intensify agricultural production through area expansion will have an impact on the environment and food security [20]. Increasing energy prices have a major impact on the agricultural sector as additional fees for various activities related to the agricultural sector, as well as the production cost of biomass directed to the bioenergy material production. Reducing food production will jack up food prices. Expansion of agriculture with monoculture might have serious consequences for vegetation and biodiversity. In addition, the security of food for the poor will be worsened if the production of biofuel material increased since it will cause food prices to rise. Higher energy prices are greatly affected the production, trade and consumption of food [21]. Production and distribution costs will be expensive if energy prices rise, such as manufactured fertilizers, pesticides, and distribution costs.

Throughout the history of agriculture in Indonesia, farmers and villagers could use the energy that derived from their land to meet the daily energy needs, by using extracted oil from coconut, candlenut, and other biomass for lighting. Even now the rural population still uses biomass from branches/twigs of trees and dry shrubs collected at the time working on farming, also use of biogas technology derived from animal waste. In addition, energy can be produced by utilizing kinetic energy from water flow in rivers or winds at high altitudes using turbines is a common activity carried out in rural areas. In addition, solar technology that produces electricity is cheap. The energy needs to produce electricity have been overcome by most of the population in developing countries, including
Indonesia. This progress illustrates that people in rural areas have been exploring alternative energy from surrounding natural resources. Through the utilization of alternative energy from agriculture that has been done long ago, farmers are able to produce energy integrated with farming activities.

Food and energy products can be produced based on local resources which found in many areas in Indonesia which supported by a variety of endowment. While energy savings can be made through the movement of labor-intensive development activities and used appropriate technology. A variety of environmental friendly based technologies is potential to be developed across the archipelago in Indonesia

5. Local-based Food and Energy on the Global Perspectives
Local products produced from certain local resources and culture have become more competitive in the global era with a very broad competition arena, produced a limited and unique product which almost has no similarities from other regions. Malaysia has promoted the slogan of global think, acting locally in the 1990s, which forming a real motto that must be held by Malaysians in facing the global era with intense competition. It is inevitable that efforts are continued to be kept global to create the changes of further liberalized trade with various activities. But it is believed, the alteration is increasingly providing the bargaining position of a state that has the endowment that be able to develop.

Efforts to get profit from the competition arena with high bargaining power can only be made through the development of a specific product or creating an efficient economic scale through cooperation among countries in a region known as a regional cooperation. This partnership evolve the concept of improvement and regional economic development through the functional interaction between regions or countries based on its potential. This interaction is a resultant with a larger output than if done separately, so cooperation will have a competitive advantage in free competition at the global market. This collaboration is built in order to create a strong bargaining position. The cooperation is not only for trade, but also on other aspects such as politics, security, culture, and so on. Specific local potential in free competition era is getting stronger because it is supported by information and communication technology (ICT), ICT is synonymous with globalization

Profound changes were produced by globalization, advances in production technology, and ICT. From difficult and expensive information to be cheaper, whereas localities with uniqueness which fond by limited people, then attract lots of people interest so as price rises because of ICT supports from less known become many people know it. ICT support for limited production produces the competitive advantage in the global era.

Agricultural development is a major part of economic pace in Indonesia, even most establishment of the agricultural sector growth in the rural area. Expansion activities should be focused on the rural area so food and energy belt industry could be supported easily by the local community, local social organization and local public administration. These actors could play a better role for rural economic development.

There are several regions and products in Indonesia that have comparative advantages because they are able to manage their local potential. For example, Bali island is more widely known by members of the world community than Indonesia, Luwak coffee produced on the island of Samosir and Kalosi Coffee produced in Enrekang District, the traditional feast of death in the community better known to be held in Tana Toraja in South Sulawesi compared known as the national rice barn and the largest producer of cocoa in Indonesia.

The growth of local food and energy in order to support local economic development could done by local society because it is supported by the local potency in the form of natural resources or endowment, so as cultural as fundamental needs. Local economic development can be shown from the following empirical studies.
1) The development of local food by farmers’ groups in the village of Martajaya, West Sulawesi province [22]. Rice cultivation through the self-reliance fullness by village irrigation of farmers group render farmer able to cultivate rice twice a year. The farmers could fulfill their needs and

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also provide food for the palm oil plantation worker near the village in cooperation with the local merchants. Food development is based on the traditional cooperation between farmer groups and local trader. The success of local community in autonomous development is part of the farmer groups’ role who successfully mobilizes local potencies in the form of availability of water, agricultural land, which the majority of farmers members are Bali ethnic. Balinese are known as ethnic, which has strong culture in the agricultural life.

2) The development of pump-based rice farming and the collective stall has been successfully self-reliant extended by farmers in the village of Patila, South Sulawesi province [23]. Farmers able to produce food locally with the evolve of cattle and rice farming. Both food commodities can be worked out because supported by the advance of farmer groups on the basis of social capital. Zakat management as a source of development funding then forms social capital in rural areas. Zakat management is able to form public trust in its management and at the same time work together to build a network with zakat payers from the village who migrate to other provinces Social capital drives the development of farmer groups and collective stall to develop local food in the village as well increasing farmers’ income. The collective stall will be further developed to produce biogas and manure which is a basic requirement for household energy and farm inputs factors respectively.

3) Production of palm sugar and sugar cane can be developed by using appropriate technology (AT) on a micro and small business scale [24]. A way to increase fuel efficiency, employment opportunities and rural community income and encourage forest and agricultural land conservation of can be achieved through utilization in energy-saving technology in the production of brown sugars. By Adding up productivity, economies of scale, and product quality; make these categories had a potential impact in resulting progress for brown sugar. These activities are known as reducing the use of woodfuel which can be achieved to 70-80 percent so by utilizing agricultural waste as an energy source; will promptly encourage the development of palm sugar and its cultivation as one of conserving way in protecting the forest since in its cooking process is not using wood as fuel; The utilization on marginal land and unproductive land will took sugarcane plants functioning as conservation plants; and contributing as an export commodity, so as a producer on a various product by its planting.

Above elucidation were samples of best practices which describe the potential development of local food and energy through the establishment of function and role of local organizations as one of the development actor.

6. Conclusion Remark
Food and alternative energy is a highly strategic sector for Indonesia as an agricultural country because it offered a huge potential to increased food production and to generated BEM, so on primary energy (solar, wind, and water), and a new source of renewable energy. Indonesia has the big bargaining power in the global era and the trade liberalization of use its endowment by the development on local food and food diversification. Community movement in term of diversification, as a driven of development of local food and renewable alternative energy, should be supported by government policy as a pioneer to make these activities be widely known in the community. The community development activities can be done by local organizations and supporting rural economic development also sustainable agricultural development. The development and management of local economic resources could be encouraged through the role of local organizations to produce local or traditional food as well alternative energy sources and at the same time encouraging economic activities of the group and local community.

References
[1] Ajanovic A 2011 Biofuels versus food production: Does biofuels production increase food prices? Energy
[2] Horrigan L, Lawrence R S and Walker P 2002 How sustainable agriculture can address the
environmental and human health harms of industrial agriculture Environ. Health Perspect.

[3] Peacock C and Sherman D M 2010 Sustainable goat production-Some global perspectives Small Rumin. Res.

[4] Hassan M H and Kalam M A 2013 An overview of biofuel as a renewable energy source: Development and challenges Procedia Engineering

[5] IRENA 2015 Renewable energy in the water, energy and food nexus

[6] D’Odorico P, Davis K F, Rosa L, Carr J A, Chiarelli D, Dell’Angelo J, Gephart J, MacDonald G K, Seekell D A, Suweis S and Rulli M C 2018 The Global Food-Energy-Water Nexus Rev. Geophys.

[7] Darma R, Rahmadanini R, Tenriawaru N A and Amandaria R 2015 Climate Change Adaptation in the Perspectives of Food, Energy Crisis and Environmental Degradation for Food Sovereignty in Indonesia Int. J. Agric. Syst. 1 77–89

[8] Hfbauer G 1994 Whiter APEC? The second conference on APEC: NAFTA/ASEAN/SAARC (Bali)

[9] Tan K T, Lee K T, Mohamed A R and Bhatia S 2009 Palm oil: Addressing issues and towards sustainable development Renew. Sustain. Energy Rev.

[10] Aniekwe C C 2010 Agricultural trade liberalization and small-holder development: West African rice farmers in perspective Second Africa Rice Congr. Bamako, Mali

[11] Ramos-Sandoval R 2019 Does associativity affect likelihood Peruvian small-scale farms internationalization? SHIRCON 2019 - 2019 IEEE Sciences and Humanities International Research Conference

[12] Sharda A J and Shetty S 2008 A comparative study of oral health knowledge, attitude and behaviour of first and final year dental students of Udaipur city, Rajasthan, India. Int. J. Dent. Hyg.

[13] Shepon A, Eshel G, Noor E and Milo R 2016 Energy and protein feed-to-food conversion efficiencies in the US and potential food security gains from dietary changes Environ. Res. Lett.

[14] Ringler C, Bhaduri A and Lawford R 2013 The nexus across water, energy, land and food (WELF): Potential for improved resource use efficiency? Curr. Opin. Environ. Sustain.

[15] Al-Ansari T, Korre A, Nie Z and Shah N 2015 Development of a life cycle assessment tool for the assessment of food production systems within the energy, water and food nexus Sustain. Prod. Consum.

[16] IEA 2007 World Energy Outlook 2007: China and India Insights (Paris: oecd publishing)

[17] Tanaka B 2008 The demand for energy increases 45 percent till 2030 Kementeri. Energi dan Sumber Daya Miner.

[18] International Energy Agency (IEA) 2018 Market Report Series Renewables 2018 Analysis and Forecast to 2023 Int. Energy Agency

[19] Anon 2011 International energy outlook 2010 International Energy Outlook and Projections

[20] Rapsomanikis G 2011 Safeguarding food security in volatile global markets Safeguarding food Secur. volatile Glob. Mark.

[21] Bekkers E, Brockmeier M, Francois J and Yang F 2017 Local Food Prices and International Price Transmission World Dev.

[22] Darma R 2011 The Development of Local Organization Function for Agricultural Development in Indonesia J. US-China Public Administration 8 1165–72

[23] Rahim Darmaa A M M and Amandariac R 2012 Zakat, Local Social Organization, and Social Capital in Rural Economic Development Social. Study 2 189-197

[24] Darma R, Amandaria R, R.Akzar, Arsyad M, Tenriawaru A N and Dirpan A 2020 Energy and Land Conservation: Brown Sugar Processing with Appropriate Tecnology Int. J. Adv. Sci. Technol. 29 1707–17