THE BLUE ECONOMY: CONCEPT AND A FEASIBILITY CASE STUDY

Roslan Jamaludin 1*, Ling Sing Liang 1 and Shahimi Mohtar 1

1 School of Technology Management and Logistics, College of Business, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah.
E-mail: jroslan@uum.edu.my; slling9109@gmail.com; shamimi@uum.edu.my

Abstract. This paper describe the concept of the Blue Economy and explored its feasibility in agriculture sector. The concept of the Blue Economy can be seen as an alternative to the Green Economy which is extremely expensive throughout its implementation. The main focus of the Blue Economy is the practices of sustainability by eliminating waste and pollution; utilizing by-product to add variety and increase productivity, and most importantly creating job opportunities. A case study was conducted at a rice processing plant, thru interviews and observation to explore how its correlation with the Blue Economy concept. This study found that the rice processing plant has implemented some aspects of the Blue Economy but still further opportunities can be delivered. There is limitation throughout this study which includes the lack of information sources from previous study since the Blue Economy is a new concept.

Keywords: The Blue Economy, Green Economy, Sustainability, Waste, Pollution, Ecosystem

1. Introduction

This paper explore the concept of the Blue Economy and investigates how a rice processing plant actually practice the concept of the Blue Economy. The study of the Blue Economy is to provide an alternative to the concept of Green Economy which required extremely high cost throughout its chain of implementation. The Blue Economy focuses on the practices of sustainable economy by eliminating waste, pollution, utilizing by-product to increase productivity, and most importantly creating jobs and new potentials.

The Blue Economy emphasizes on sustainability which goes beyond mere preservation through the practice of regeneration. To ensure the ecosystem sustains its evolutionary dynamism, nature’s endless flow of creativity, adaptation, and abundance could be manipulated (Pauli, 2010). The Blue Economy suggests the elimination of burden to environment, eliminating waste and by-products, increase productivity, and grow revenues. The significance of the concept is in addressing a crisis never experienced before around the globe. Climate change, jobs scarcity, high prices of goods and services are all problems of our age.

The Green Economy project which has been launched for more than 30 years, still rely on increasing funds, subsidies and tax cuts continue to be the primary drawbacks. Furthermore, Green Products are still categorized as luxury products where low and middle income population cannot afford (Pauli, 2010). Pauli argued that “sometimes environmentally sound products only succeed on the market when a marginal group of consumers is prepared to pay the premium” (Pauli, 2010), as shown in Figure 1. Thus, The Blue Economy provide ways, strategies and alternatives which could overcome the current environmental problems and existing scheme's drawbacks.
The Green Economy

Costly implementation.
Expensive products.

The Blue Economy

Utilize by-products and create new cash flow.
Generate revenues rather than expenses.
Affordable and beneficial to men.
Sustaining the ecosystem.

Figure 1. Comparison between the Green Economy and the Blue Economy.

2. The Blue Economy

The Blue Economy is a concept proposed by Professor Gunter Pauli, who is known as the founder of ‘ZERI - Zero Emissions Research and Initiatives’, and author of ‘The Blue Economy’. The concept is about making full potential of the existing ecological system, its economical efficiency, and simple technology, processes and approach. It is built to construct a sustainable world through ‘The Blue Economy Innovations'. The Blue Economy began as a project to identify one hundred of the best nature-inspired technologies that could effects the global economies, while sustainably providing basic human needs e.g. drinkable water, abundance food supplies, jobs opportunities and healthy shelter. As a result, “the Blue Economy offers a blueprint that follows physics and nature in materials selection and production methods. From this basis it initiates a generative and regenerative cascade of implementable innovations. Thus we have sustainable product, sustainable manufacture, and sustainable ecosystems. Besides, it also creates competitive products, competitive processes, and competitive business models that go far beyond core business practices” (Pauli, 2010).

In addition, the Blue Economy is responding to the basic needs with what is locally available and encourage people to utilize by-products and waste to benefit the ecosystem. Pauli (2010) suggests “introducing more innovative technologies to the market based on the Blue Economy concept because innovative technologies will generate new cash flow, which will create jobs and build social capital”.

2.1 Elements of the Blue Economy

There are four fundamental elements that make-up the concept of the Blue Economy. They are innovation, market, cash flow and potentials (The Blue Economy Solution, 2014). The following sections described each elements.

Innovation - Innovation is the engine of growth in the Blue Economy. Researcher stated that innovation is the process of change that creates and grows wealth and Pauli argued, “innovations that generate cash flows without depending on public subsidies and grants are considered sustainable solutions”. (Pauli, 2010). The element of innovation is important to identify the problems and find solutions and opportunities. The practice of innovation started with the connections built between the problems. For example, the problem with coffee-grounds. Coffee-grounds as by-product should not be incinerated but can be reused as manure (fertilizer) for mushrooms (Valhallamovement., 2014), as shown in Figure 2.1.
Hence, the connections between the problems is very relatively simple to identify opportunities. The discovery that resulted from such a screening was that coffee grounds are not manure but substrate for mushrooms. Coffee ground consists of about 2000 different molecules whereof some have coloring properties and some even have deodorant properties, which can be integrated in products such as sports clothing.

Market - Pauli (2010) states that “the greatest risk is the conservative market that is always slow to adopt new innovations and the industries refuse to change their conventional way of doing business”. In Figure 2.3, the element of innovation and its relationship with marketing in the Blue Economy has been shown clearly. The coffee ground is no longer a waste but benefit as manure to the mushrooms agriculture. For example, Starbucks in Spain make known of their choice of marketing their coffee grounds to the mushroom agriculture industry.

Figure 2.1. Coffee-grounds, problem with other related problems (Source: Mees, 2013).

Figure 2.2. Connections between the problems (Source: Mees, 2013).

Figure 2.2. Elements of innovation in the Blue Economy
Cash Flow - When the first problem has been extended to a system of problems and needs (as shown in Figure 2.1, Figure 2.2 and Figure 2.3), a detailed screening of possible potentials of cash flows can be generated and importantly “without depending on public subsidies” (Pauli, 2010), as in many cases in Green Economy. The Blue Economy looks at the animal world and nature, although the key is mostly technology, but not always high tech. Cash flow can be generated by transforming the waste into new raw materials. For example, coffee grounds may not be incinerated but to be reused as manure for mushrooms. This is to get cash out of branding the waste. Starbucks has market their coffee grounds to the mushroom agriculture, hence this innovation and marketing has help Starbucks created new cash flows.

Potentials - Pauli iterated that “introducing more innovative technologies and marketing based on the Blue Economy concept will generate new cash flow, which in turns create jobs and build social capital” (Pauli, 2010). From the example of coffee manure described in previous sections, opportunities have been generated in the process of screening the problems with innovative approach. For example, Starbucks in Japan distributed their coffee grounds to a contact lens manufacturer to produce new contact lens materials and feed the fermented coffee-grounds for dairy cows, alternatively makes the coffee grounds into new added values than simply used as compost (Braw, 2014). They also and has created new job opportunities as they use the coffee-ground to benefit to mushroom agriculture.

2.3 The Blue Economy Related Examples

Rabbits and Fuel – Based on the findings of previous research, fibrolytic bacteria have been detected from the gastrointestinal tract or faeces of rabbits. These bacteria could be a source of new hydrolytic enzymes for the biofuel industry (Cerón Cucchi et al. 2013). A researcher named, Dr. Sean Simpson from New Zealand researched for alternative uses of waste liquid discarded from fuel, discovered that bacteria found in the digestive track of a special breed of rabbits that could potentially convert waste to fuel. (Pauli, 2010). Currently, potential market in producing biofuel is very promising. By 2020, it is expected that 200 nations will have programs to produce biofuels. Estimates indicate that by 2030, up to 30% of transport fuel blend will be biofuels. This is an effort to reduce the carbon footprint generated by the automobile and transportation industry (Pauli, 2010). From the innovative solutions and market potential, support for the much needed first cash flow from investors is initiated and hence, innovation from to the development of by-product from waste lead to competition among the fuel manufacturing industry in the future (Pauli, 2010).

Coffee: Export Crop Provides Food Security – Billions of people around the world drink coffee every day. Assuming that each cup takes about 25 grams of ground coffee to produce, it takes 350 million kilos of coffee to consumed daily (Pauli, 2010). The used coffee-grounds were trashed which contributes a significant amount of waste to the ever-increasing landfills. However, used coffee-grounds are actually a highly productive ingredient for plants and gardens, as describe earlier. There are some characteristics of used coffee-grounds which includes high in nitrogen which are very valuable nutrient for plants, digestible by worms for improving soil structure, a natural pesticide for repelling flies and slugs, an agent for bacterial control and weed killers. Farming mushroom on coffee is 80% more energy efficient than a stand-alone energy intensive process. By-product like hulks, pruning, pulp and grounds without value is converted into a quality animal feed for cattle on the farm or pets at home. Growing mushrooms on coffee-ground are profitable business with increasing demand especially tropical varieties such as shiitake, maitake, and ganoderma enjoyed double digit growth for decades. In other words, the waste generate quality food at lower cost, eliminating unnecessary transportation, producing fresh mushroom locally, while reducing the load on landfill and generating jobs opportunities.

2.4 The Blue Economy and the Way Forward

Zero Emission Research and Initiatives (ZERI) is a global network of creative minds seeking solutions to world challenges. Gunter Pauli, as a founder of the initiatives, is committed to find more
opportunities on the implementation of initiatives. From the regeneration of the rainforest in the savannas of Latin America where trees stood tall 200 years ago, to the regeneration of 100 million corals around the Caribbean island of Bonaire, ZERI network effort to bringing more benefits to people and nature with local resources. In shorts, the Blue Economy is ZERI’s philosophy in action.

The Blue Economy Summer School (BESS) came into existence to represent and transmit the principles of the Blue Economy. The vision is to create the academic center and hub for the Blue Economy at the Faculty of Business and Economics, University of Pecs, Hungary. Furthermore BESS’s aim is to link institutions and self-created organizations together. With the assistance of the Blue Economy network a long awaited paradigm shift could become reality (Hartung, 2014).

The Monterey Institute of International Studies at Monterey, California; set-up the Center of the Blue Economy (CBE) intended "to promote ocean and coastal sustainability by providing the best available information to empower governments, NGOs, businesses, and concerned citizens to make educated decisions about the marine environment" (Monterey Institute of International Studies, 2014).

The “Blue Economy Summit” was held on 19-20 January 2014 in Abu Dhabi to address the unique climate and sustainability challenges facing Small Island Developing States (SIDS) and marine ecosystem, where 180 participants from governments and organizations from around the world were present (Small Island Developing States, 2014).

In European region, Copenhagen, Denmark is the biggest potential to become Blue City. In Southeast Asia region, Singapore is chosen. This is due to high level of collaboration and social cohesion. Among other countries in this region participated in the Blue Economy initiatives are Indonesia and the Philippines. Gunter Pauli has launched the Blue Economy in Ho Chi Minh, Vietnam on 19th. April 2014. In Africa, he will launch the first coffee-laced clothing in Bogota on the “Day of Coffee” in Columbia in June 2014 (ZERI, 2014).

3. Implementation of the Blue Economy in a Rice Processing Plant

A case study investigating the implementation of the Blue Economy concept was conducted at a rice processing plant (name of company to remain anonymous) located at Perlis, Malaysia. An interview with the Production Engineer using a set of semi-structured questions. There are a total of four sections in the questionnaires. First section contains five questions about the element of Market. Second section also containing five questions focuses on the element of Innovation. Third section on the element of Cash Flow contains three questions, and final section about the fourth elements i.e. Potentials, contains 4 questions. The interview was recorded, then transcribed, analyzed and reported in this paper (however not all questionnaires are elaborated at the analysis section). A visit around the plant and its laboratory provide the opportunity to observed and learnt the rice processing activities and the equipment.

The rice processing plant produce a super 15% grade rice (rice is one of government controlled item, therefore the price will not fluctuate and the its market is consistent). The by-product from the processing rice includes rice husk, bran, broken and brewer (see Figure 3.1) and the composition of the by-products are shown in Table 3 and Figure 3.2.

![Rice husk](image1)
![Rice bran](image2)
![Broken and Brewer rice](image3)

*Figure 3.1. By-products of rice.*
Table 3. Rice composition by weight.

<table>
<thead>
<tr>
<th>Types</th>
<th>Composition by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice husk</td>
<td>22%</td>
</tr>
<tr>
<td>Rice bran</td>
<td>10%</td>
</tr>
<tr>
<td>White rice</td>
<td>68%</td>
</tr>
<tr>
<td></td>
<td>Head rice (52%)</td>
</tr>
<tr>
<td></td>
<td>Broken rice (14%)</td>
</tr>
<tr>
<td></td>
<td>Brewers rice (2%)</td>
</tr>
</tbody>
</table>

Figure 3.2. Cross-sectional view of paddy rice and the composition of by-product by weight. (Source: Celsias, 2014).

3.1 Innovation

1. Quotation 1: “The company concern in green environment by using rice husks as bio-fuel substitute for drying paddy”.
2. Quotation 2: “The company produces energy efficient fuel from rice husk to operate IBD which reduces the carbon footprint to preserve environment”.
3. Quotation 3: “We used rice husk as alternative fuel to generate energy for paddy drying machine”.
4. Quotation 4: “Our strategy to ensure sustainable production in compliance with ISO 14001”.

The above remarks reflect the element of “innovation” in the Blue Economy. The company practices the Blue Economy in reusing the husk to generate energy to operate the IBD machine – Inclined Bed Batch Dryers (see Figure 3.3); for paddy drying process. The rice husk is the alternative fuel to generate energy. This practice is intended to reduce carbon foot-print, improving overall energy efficiency in the mill’s operation, and recycling and reuse operational by-products. This innovation is very effective to reduce the level of air pollution that concerned the public.

In addition, the company has generated an additional income which includes the scrap value benefit from the result of selling brewer rice, broken, and chip to their subsidiaries. This initiative is in line with the concept of the Blue Economy which encourages entrepreneurship, competitiveness and employment.
The company maintained their practice of ISO 14001 in the effort at preserving the environment. One of the strategy is using rice husk as substitute to operate the IBD machines. This practice reduces the consumption of fuel in the boiler machine and carbon footprint to preserve the environment from global warming and pollution.

The innovation practice in the company is vital in the view of the Blue Economy because the Blue Economy defined every by-products can be reuse to produce something new without any negative effects. To make this possible, innovation must be emphasised and exercised in the company’s operation.

3.2 Market

1. Quotation 1: “Our market share of product is high as we are the major producer of rice in the country”.
2. Quotation 2: “The uniqueness of our product is in sustaining high quality rice produced based best practices in manufacturing”.
3. Quotation 3: “We sell broken and brewer rice to our subsidiaries to produce other product”.

The above remarks reflect the element of “market” in the perspective of the Blue Economy. The market share of their product is high because they are the major producer of rice in Malaysia. However, the growth rate of the company is quite stable. They do not have much development in terms of product variety. This is due to government regulations in controlling their productions. The company is required to produce “super rice 15%” only (the quality of the rice is determined by the standard level of water contains in it).

In addition, they also produce by-product from rice processing. Except bran, by-products such as rice husk, brewers rice and broken rice are used to produce other products without any wastage and generate further income. This is one of the practices of the Blue Economy because the company reuse the by-products by selling as scrap value to their subsidiaries or to Small and Medium Enterprise (SME) companies.

Rice husk is used as fuel to operate the IBD machine which is used for paddy drying process. Although the rice husk were used to replace the total electricity consumption on the IBD, it is still the Blue Economy practice in reusing waste to generate power. The rice husk is also sold to a subsidiary to produce sugar “1Malaysia”. However, the company still did not utilize the bran to generate other valuable output.
However, the rice mill collaborate with Universiti Putra Malaysia (UPM), a public university, to foresee the potential and future development to produce larger variety in by-products. Consequently, UPM proposes the development of rice-based by-products such as ice-cream, biscuit, rice crackers and noodles, and rice husk used to make salted eggs and also bricks.

3.3 Cash flow

1. Quotation 1: “We utilise rice husk as alternative fuel has reduced our cost to power up the IBD”.
2. Quotation 2: “We sell broken and brewers rice to subsidiaries as scrap and generate some income”.
3. Quotation 3: “We did not utilise the broken and brewers rice but sell to subsidiaries which indirectly increase the scale of production”.

The above remarks reflects the element of “cash flow” in the perspective of the Blue Economy. In generating the first cash flow, the Blue Economy forged the practice of converting zero-value by-product to valuable new product. The company did well in utilizing by-product e.g. rice husks as a substitute to fuel which help the company reducing the production and operating cost. Although it does not generate new cash flow but the saved cost can be invested in other profitable operations that can benefit product developments.

However, the rice mill do not really benefit much from the profit generated by reusing of by-product. The by-product mostly sold to subsidiaries to produce their own product. For future development planning, the brewer rice, broken, chip and bran can be reuse by the company to develop their own product variety to increase profit and cash flow. By-product utilization is a way forward to produce product variety for the company. Thus, they are collaborating with UPM researchers to develop the by-products to generate a better cash flow for the company.

3.4 Potentials

1. Quotation 1: “Our plan is to collaborate with UPM to improve production variety and sustainability”.
2. Quotation 2: “We do not have any other by-product except husk, bran, broken and brewers”.
3. Quotation 3: “We believe the Blue Economy practice will generate opportunities to SMEs because variety of value added products can be produced from the by-products”.
4. Quotation 4: “We would like to inspire other companies to adopt the Blue Economy as the best practice since it can generate many potentials and cash flow”.

The above remarks reflected the element of ‘potentials’ in the perspective of the Blue Economy. The Potentials results from the Blue Economy practice is an important aspect compare to the other three elements in the Blue Economy. The Blue Economy practice is intended to stimulate source of entrepreneurship, competitiveness and employment.

The company is working with UPM to improve production efficiency and develop and research product across entire value chain of rice business. In the value chain, there must have value-added opportunities being created directly or indirectly. The company contribute in entrepreneurial opportunities by selling their by-product to the subsidiaries provides potentials among the SMEs in Malaysia to produce variety products from by-products (this effort is in line with the government policy to encourage more SMEs, which potentially boost the economy in Malaysia).

From the perspective of company, the Blue Economy is the best practice to sustain businesses because it could generate high profit, increase market share, reduce waste pollution problem, and lastly stimulate and increase potentials in business, jobs, etc.

4. Recommendation and Conclusion
This study investigates the concept of the Blue Economy and how a rice mill practiced the Blue Economy by utilization of by-products. The by-product includes rice husk, bran, brewer rice, and broken. The husk produced for many years as alternative fuel for IBD machines in paddy drying processing. The brewer rice and broken rice has not been utilised but sold as scrap to produce other products. However, the company did not consume the bran, trashed after rice milling process.

Bran is the most valuable part in the composition of rice. Bran contains high fibre and it can reduce cholesterol in the human body (webmd, 2014). Rice bran can be used for treating diabetes, high blood pressure, cholesterol, and obesity; preventing stomach and colon cancer; for preventing heart and blood vessel (cardiovascular) disease; for strengthening the immune system; for increasing energy and improving athletic performance; for improving liver function; and as an antioxidant. Bran can be used to produce oil, poultry feed, bakery products, fertilizer and medicinal use (webmd, 2014) as shown in Figure 4.

Figure 4. Product produced by bran.

Based on this information, the company can leverage the bran in an innovative way to produce variety and profitable products which can generate new cash flow and creates jobs opportunities.

As described earlier, the Blue Economy is a concept and practice that generate revenues rather than expenditure to businesses, government and the community. In conclusion, this study showcases the concept and practices of the Blue Economy which actually ongoing in our daily life.

References