

Developing More Green Agribusiness: The Case for Exploiting Malaysia's Under-Utilised Rice Straw

Rosmiza MZ

Universiti Kebangsaan Malaysia; Royal Agricultural University, United Kingdom
Email: miza@ukm.edu.my

Davies, WP

Royal Agricultural University, United Kingdom

Rosniza Aznie CR

Universiti Kebangsaan Malaysia

Jabil MJ

Universiti Malaysia Sabah

Mazdi M

Universiti Pendidikan Sultan Idris

Wan Toren WY

Brunel University London, United Kingdom

Che Rosmawati CM

Brunel University London, United Kingdom

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Abstract

Developing more potential green business is at the heart of sustainability. As an important third engine of economic growth Malaysia's agriculture not only needs to grow, but also more importantly to grow sustainably. Rice provides staple food and abundant potentials for rice-based products, but it also produces abundant post-harvest wastes in the form of straws which do pose some environmentally serious disposal problems. Developing rice straw as raw materials in agri-based enterprises would only strengthen Malaysia's rice sector through the development of value-added industrial chains while reducing the environmentally less friendly impact of the straw disposal. This paper examines factors that influence entrepreneurs' decision to utilize rice straw as raw material for agribusiness development. The study involved in-depth interviews of 44 entrepreneurs located in the two largest granary area in Malaysia of the Muda Agricultural Development Authority (MADA) region (24 entrepreneurs) and Sekinchan (20 entrepreneurs) in the Integrated Agricultural Development Area (IADA) in North-West Selangor. Results showed that straw availability, straw prices, straw potentials, government supports, and government environmental policies were all factors that may motivate or discourage agripreneurs in Malaysia to utilize rice straw as raw materials in for up-stream or down stream enterprises.

Keywords: agribusiness, agripreneur, environmental impact, green agribusiness, rice straw, sustainable agriculture

1. Introduction

Cereal crops such as rice, wheat, barley, oats and rye are extensively grown as staple food crops for grain and not mainly for other prospective uses. Handling of the cereal crop residue remains a challenging problem for most farmers. Dumping

in landfills and straw-burning openly threatens the environment and can contribute to global warming (Mantanis et al., 2000; Zhang & Jenkins, 2004; Sariam, 1996). In a review of literature, straw has various potential uses that can be exploited and developed. In many Asian countries such as China, Thailand, Indonesia, and Vietnam (Sarnklong et al., 2010), they have typically utilised rice as a double-purpose crop, of grains for human food and straw for livestock feeding (Dong et al., 2013). In China and India, with highly populated rural area and high rates of poverty, they have also developed electricity energy, biogas and biofuel using straw residue. In China, around 53.6% of straw is used for electricity and 28.0% for biogas in India (Gadde et al., 2009).

Realizing straw has high potential for agribusiness development and, probably, at the same time reducing negative effects from field burning activity, new entrepreneurs could have important roles by better responding to new market opportunities (Korsgaard & Anderson, 2010). Exploitation of the whole straw potential could be capable of creating a much stronger industrial chain, also overlapping other economic sectors. This industrial chain could then become an alternative method for straw disposal towards greater economic competitiveness in a more green agribusiness manner.

2. Straw Management for Green Agribusiness

Developing more potential 'green business' is at the heart of sustainability. Linking more sustainable management also with entrepreneurship could provide new commercial ventures towards 'greener' straw management (Zhang & Jenkins, 2004). Green entrepreneurship could provide new opportunities and build momentum for wider changes in the whole transition for straw management to a more sustainable value-added agriculture business paradigm.

Researchers have used various terms for green business concept such as sustainable entrepreneurship (Koe & Majid, 2014; Bergh, 2013; Korsgaard & Anderson, 2010; Dean & McMullen, 2007), green entrepreneurship (Taylor & Walley, 2003; Schaper, 2002), ecopreneurship (Gibbs, 2009; Schaper, 2002) and environmental entrepreneurship or enviropreneurship (Moghimi & Alambeigi, 2012; Dean & McMullen, 2007). All these concepts focus on three pillars of sustainability of the environmental, economic and social dimensions of the system. It is a process in which entrepreneurs combine environmental awareness, and also exploit the business opportunities in more innovative ways at the same time. Such entrepreneurs trying to achieve economic prosperity, society equity, environmental quality and cultural preservation (Koe & Majid, 2014; Gibbs, 2009; Dean & McMullen, 2007; Elkington, 1997).

According to Dean and McMullen (2007), "sustainable entrepreneurship is a process of discovering, evaluating and exploiting economic opportunities that are present in market failures which detract from sustainability, including those that are environmentally relevant. It focuses on the resolution of market failures which can result in environmental degradation. Hence, such entrepreneurs must overcome by marketing environmentally products to serve environmental market niches". Crals and Vereeck (2004) defined "sustainable entrepreneurship as the continuing commitment by businesses to behave ethically, and contribute to economic development. While it should also improve the quality of life for the workforce, their families, the local and global communities as well as future generations".

Turning straw into value-added product for agribusiness and industrial usage will be markedly influenced also by government policies and support; incentives and regulation and developing new market products that need more comparative advantages than existing products (Zhang & Jenkins, 2004). The propensity of straw as a raw material also depends on availability and potential; geographical distribution; economic and operations cost; market demand; technologies via research and development will also influence an entrepreneurs to green business (Matsumura et al., 2005; Li, et al., 2012; Roy et al., 2012). However, many entrepreneur's are passionate about the environment; and the desire of using a natural raw material, strongly relates the 'greening' objective to business goals (Kirkwood & Walton, 2010).

Commercialization of straw as a renewable energy is seen to affect demand for straw on a huge scale (Binod et al, 2010; Iye & Bilborrow, 2013). At the same time, generating employment opportunities in the agribusiness sector featuring environmentally-friendly approaches for straw management (Delivand et al., 2012). Among developed countries, such as the United States, United Kingdom and European Union many have shown interest in using biomass energy. Straw and other crop residue have been developed as alternatives to reduce fossil fuel combustion (Lal, 2005). These show support for reducing the greenhouse gas emissions through straw open-burning, by utilising the biomass energy resource for improving energy efficiency.

As a part of these worldwide efforts, policies and guidelines with legal restrictions from federal and local government have been developed to achieve these goals (Lal, 2005; Chen et al., 2009; Fan et al., 2011). For example, as the largest region of rice production in Unites States, the California Air Resources Board has developed several policies and programmes to reduce straw open burning and encourage more beneficial uses for profitable business. Some programmes include the Sacramento Valley Basinwide Air Pollution Control Council 2013 Conditional Rice Straw Burning

Permit Program; Rice Straw Diversion Plan; Rice Straw Project Grant Fund; Rice Straw Utilization Tax Credit Program; Agricultural Biomass to Energy Incentive Grant Program to 2015; The Rice Straw Burning Reduction Act and Smoke Management Guidelines for Agricultural and Prescribed Burning (California Environmental Protection Agency, 2014).

Developing straw for livestock feeding business also depends on straw quality and availability; the nutrient it contains; weather conditions; condition and expected performance of the livestock enterprise (Drake et al., 2002); the cost opportunity; and implementation of sustainability objectives (Final & Lesschen, 2013). However, straw nutritive quality can depend on collection time; rice fertilization management on nitrogen-use and the location of rice growing regions. For getting suitable nutritive and quality value for ruminants, straw must be baled within one to three days after harvesting for improving the palatability such as flavour, smell and colour (Drake et al., 2002). In addition, high fiber in rice straw provides the main source of energy for ruminants (Devendra, 1989). To meet nutritional requirements, straw needs more improvement of physical, chemical and microbial treatments (Dong et al., 2013). Supplying a highly quality of straw, would, therefore, increase market demand of straw as a more widely used livestock feed.

The high nutrient content of straw also makes it suitable for compost (Ismail et al., 2013) (Table 1). This potential could provide methods for quantifying reductions in methane emissions, when straw is left in the field after harvesting (Silalertruksa & Gheewala, 2013; Mandel et al., 2004). It can improve the soil quality by building-up soil carbon; reduce soil acidity; reduce the risks of soil erosion (Roy et al., 2012); enhancing activity of micro-organism (Matsumura et al., 2005); stabilizing soil structure and improving tillth; species diversity of soil fauna and improving water retention (Lal, 2005). Utilisation of straw as compost could also enhance agronomic productivity; increasing global food security and return organic compound to the ecosystems (Lal, 2005). Thus, farmer's income would increase as well as strengthening of the straw compost demand in the market.

Nutrients in straw also make it suitable for the production of some edible mushrooms, with added small quantity of fertilizers. According to Zhang et al. (2002), mushroom yield with the rice straw as a substrate is better by at least 10% higher than wheat straw depending on mushroom type and environment condition. Therefore, mushroom cultivation could become the best and most profitable agribusiness and a highly efficient method for managing straw in a more sustainable manner.

Table 1. Nutrient content in rice straw (%)

Nutrient content	Percent (%)	Nutrient content	Percent (%)
Silicon (Si)	5.5	Magnesium (Mg)	0.20
Nitrogen (N)	0.65	Calcium (C)	0.30
Phosphorus (P)	0.10	Iron (Fe)	0.035
Potassium (K)	1.40	Manganese (Mn)	0.045
Zink (Zn)	0.003	Copper (Cu)	0.0003
Sulphur (S)	0.075	Boron (B)	0.0010

Source: Ismail et al., 2013

3. Research Methodology

Utilisation of straw as a raw material in agribusiness could be considered a much better way of straw management in agriculture. Therefore, an evaluation of on entrepreneurs willingness to utilise rice straw as a main material for their business is particularly important to highlight. To achieve this aim, in-depth interviews and surveys by using semi-structured questionnaire was used for primary data collection.

The study compared agribusiness entrepreneurs in two major granary areas in Malaysia namely MADA, Kedah and Sekinchan in Integrated Agricultural Development Area (IADA) North-West Selangor. It involves 24 entrepreneurs in the MADA region, Kedah and 20 entrepreneurs in the Sekinchan, Selangor.

4. Results and Discussion

4.1 Entrepreneur's profile

The survey was conducted with 44 enterpreneurs using straw as a raw material for agribusiness. The study found that there are seven types of enterprises operating in this agricultural region including livestock feed, composting, and craft

paper making, which is mainly conducted on a small scale only (Table 2).

Table 2. Enterprises using straw as raw materials in agribusiness development

Type of enterprise	MADA region, Kedah		Sekinchan, Selangor	
	Frequency (n=24)	Percentage (%)	Frequency (n=20)	Percentage (%)
Livestock feed	9	37.5	6	30.0
Compost	6	25.0	9	45.0
Craft paper making	4	16.6	-	-
Mushroom growth medium	3	12.5	3	15.0
Energy power plant	1	4.2	-	-
Nursery mat	1	4.2	1	5.0
Erosion control mat	-	-	1	5.0

Table 3 shows that most all respondents were relatively new in commercializing straw-uses, of less than 10 years. The study found that nine entrepreneurs have many experiences of using straw as a raw material in their business activities, and have done so for more than 16 years. They were small farmers, who also raise cattle as a business activity. Most of entrepreneurs such as those involved in craft paper making, compost and mushroom are new in this agribusiness, of less than 15 years (Table 3).

Table 3. Duration of using rice straw in agribusiness

Duration (years)	MADA Region, Kedah		Sekinchan, Selangor	
	Frequency (n=24)	Percentage (%)	Frequency (n=20)	Percentage (%)
Less than 5 years	5	20.8	9	45.0
6 - 10 years	11	45.8	5	25.0
11 -15 years	2	8.3	3	15.0
16 – 20 years	3	12.5	1	5.0
More than 21 years	3	12.5	2	10.0

4.2 Rice straw as raw materials in agribusiness

There are several factors that influence entrepreneurs for choosing straw as the basis for their enterprise such as availability and price; straw potential; policies and support from government for using agricultural by-products; environmental consciousness on straw burning and dumping, and to highlight the Kedah state identity as the largest rice producer in Malaysia.

Table 4. Factor influencing entrepreneurs in choosing straw as a raw material in agribusiness

Factor influenced utilising straw as a raw material	Greatly influence		Influence		Less influence	
	Frequency	%	Frequency	%	Frequency	%
Availability and cheap resource	34	77.3	6	13.6	4	9.1
Potential resource	32	72.7	8	18.2	4	9.1
Supporting policy and incentives	24	54.5	15	34.1	5	11.4
Concerning of the environmental	10	22.7	12	27.3	22	50.0
Symbols of state identity	8	18.2	11	25.0	25	56.8

4.2.1 Straw availability and cheaper price as raw materials

Rice is a staple food crop of Malaysia. As a national food security, government has initiated various programme and strategies to increase the productivity, cropping intensity prediction and crop acreage (Chamhuri et al., 2014). This situation will ensure that the straw supply is likely to always increase and be in continuous supply for many years to come.

As a rice bowl of Malaysia, straw is widely available throughout Kedah and some other growing areas in Selangor after harvesting. This is stated by most entrepreneurs (77.3%) choosing straw as a raw material in their business (Table 4). Interviews revealed that straw is abundantly available in surrounding areas of these regions and at a cheap price. This

would, understandably continue to encourage entrepreneurs to choose straw as raw materials in their business. Thus, it would reduce the cost of production because the raw materials are readily available around their business location, especially for cattle feed and compost. Interviews also found that most of the livestock entrepreneurs also operate as mixed farmers. These farmers often released cattle on paddy fields after harvesting for feeding directly on the field or alternatively in cowsheds. This has also helped to reduce the costs of their livestock feed, and could do so more.

According to the craft entrepreneur, straw is readily available on the field, particularly if required in small quantities. Typically, farmers often just let entrepreneurs collect their straw without charge. Farmers consider straw as a waste and should be cleared from the field for the next cultivation. This gives an advantage to entrepreneurs for free access to raw materials. Sometimes, though, a few farmers are charged, but at relatively low prices between 50 cents to RM2.00 (Malaysian Ringgit) per sack. With lower production costs, straw products could even be sold at a lower price. This is one of the strategies to compete with existing products. This would bring profits to the entrepreneurs and will create more comparative advantage for straw product in the market.

4.2.2 Straw potentials in agribusiness and industrial usage

Entrepreneurs confirmed that straw has considerable potential and is very useful for making certain products (72.7%), encouraging them to choose straw as a raw material for their enterprise (Table 4). For example, straw composting as an organic matter has several advantages over many chemical fertilizers. Straw compost can be an agent for natural soil enrichment; reducing the acidity of paddy field; boosting production in the long term; and is generally considered more user-friendly in the environment. This could give comparative advantages for straw compost in local markets, but is not known to attract a price premium.

Interviews also revealed that straw is continuous to be useful (traditionally) as livestock feed, especially for the fattening process because of the high fiber content. In fact, the use of straw as livestock feed is also driven by the increase in the price of animal feed imports. To an extent, straw is capable of replacing in-part some more livestock feeds, in the face of rising animal feed import prices. However, other supplements are still needed for livestock growth. Studies elsewhere have highlighted the potential of alkali-treated straw to break-it-down for better digested animal feed utilisation (Sarnklong et al., 2010).

All craft entrepreneurs reported the advantages of straw, continues encourage them to choose straw as a raw material. The nature of straw is relatively short, fine and fibrous in nature, compared to other local raw materials such as banana stem, kantan stem, mengkerai stems and pandan leave. Thus, straw paper production is more easiers and the texture is more refined. Using others local raw materials would produce rougher paper, because the fiber is longer and coarser. In fact, the straw paper products also have more natural color and different texture of each sheet, making it very attractive. This gives an advantage to the production of straw-based craft paper products.

Interviews with renewable energy entrepreneurs revealed that high potential of straw to replace fossil fuel energy and electricity is the main factors for choosing straw as a raw material for biomass energy development. Recent work in Ireland revealed the straw wheat could be more easily digested into sugars could much improve the biofuel potential (BBSRC, 2014) Mushroom entrepreneurs also acknowledged that straw as a mushroom growth medium would gain a higher yield, because its contain several nutrients that are very effective for mushroom growth.

4.2.3 Government policy and support for straw by-product development

Policies and support from government are more likely to focus on the conservation of the enterprises environment; the re-use of waste and using environmentally-friendly products. Interviewees with straw compost entrepreneur reported existing policy on using agricultural by-products as well as the advantages of compost in plant growth and yield improvement, encourage them to further develop straw-uses. Government has also been promoting policies towards using organic fertilizers, to mitigate the effects of chemical inputs on the environment.

Interviews with craft entrepreneurs and government, through the Malaysian Handicraft Promotions Board and MADA, provide an advisory services, training, marketing and the promoting of crafts. This support straw agribusiness and encourages users to be more efficient, competitive and profitable.

Interviews revealed the initiative to develop straw as biomass energy because of the government's encouragement of using crop residues. Straw is available abundantly and using only very small quantities in livestock feed, compost and crafts, will still make this resource under-utilised. According to many straw entrepreneurs, problems from open burning had always been a major issue during the harvest season. Interviews revealed that straw could be used on a much larger scale as a source of biomass energy. This proposed project is expected to utilise the entire straw produced in the MADA

region, if further developed.

4.2.4 Environmental impact

Local environmental problems; a series of road accidents; several cases of farmers' deaths in the field effects from straw open-burning and perceived adverse effect of chemical fertilizers, has particularly prompted some entrepreneurs (22.7%) to develop more products based on rice straw (Table 4). Instead of straw burning, entrepreneurs state that this initiative would bring awareness to farmers and community on the importance of preserving the environment by better using such agricultural residues. Their desire to make money, but grounded in ethical reasoning, could be expected to change market needs and structure with such 'green' value products.

4.2.5 Symbols of Kedah State identity

Showing the potential and uniqueness of rice straw in highlighting the identity of Kedah State, had prompted entrepreneurs (18.18%) to use straws as raw materials in making more crafts (Table 4). According to MADA (2014), straw craft was created to symbolise the Kedah State's identity as a major granary region in Malaysia. Kedah does not have a product yet to reflect its unique local culture. For example, Kelantan and Terengganu are famous for its '*batik*' identity while 'labu sayong' symbolizes Perak. Thus, entrepreneurs felt that straw crafts need to be promoted so as to highlight the Kedah state's identity as the national rice bowl. Similarly, in the Inagaki District of Japan, rice straw were used in craft-making to promote the district's cultural heritage as a rice-growing region for the benefit of future generations. This is the concept of rice straw-based regional development where resource recycling and environmentally-friendly processes are integrated (Suzuki & Miyazaki, 2008).

5. Conclusion

The survey findings pointed to the fact that straw-based agribusiness development is still low in Malaysia. Almost all rice-entrepreneurs in the study area operated in a small business capacity. Government support through effective R&D policies and strategies are very important to expand the rice straw potentials in developing more diverse and competitive straw-based products, and in promoting the consumer community's awareness of the importance of using straw by-products for more environmentally sustainable development. Such awareness would further help entrepreneurs to secure on-going demand for their environmentally-friendly products. Changing consumer attitudes and passion for green values and green products in favour of environmental sustainability would contribute to a more profitable green agribusiness development in the country. Emphasis should also be given on the yield and productivity aspects of the primary rice crops especially those related to production planning, commitment and management which involve all stakeholders including farmers and entrepreneurs.

Although straw agribusiness is very slow in both regions, its development, nevertheless, is expected to grow following the government's rejuvenation policy of the agriculture sector. This rejuvenation will improve not only the environmental impact by reducing straw open burning but also increase farmers' and the local community's socio-economic wellbeing through additional job creation in straw agribusiness and integration with agro-tourism.

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