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Opportunities and Barriers to Wood Pellet Trade in the Philippines

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ABSTRACT

A survey was conducted to determine the current perception of market players on opportunities and barriers to the use and commercialization of wood pellets in the Philippines. Power generating companies and processing plants using coal to generate heat and electricity were selected as respondents in this study. Policy makers, NGOs and experts from academia were also included in the survey. Questionnaires on economic, technical, logistics and ecological barriers were formulated and asked to each respondent. Data and comments from the respondents showed that the main barriers to wood pellet commercialization in the Philippines were unreliable biomass feedstock supply, high cost of investment and competition from fossil fuel (coal). Bad roads and insufficiently developed infrastructure would hamper attempt to commercialize wood pellets in the country. Many respondents indicated that technical and logistical barriers are challenges that can be overcome. Majority of the respondents recognized the environmental benefits of using biomass but they deemed it necessary for government to provide subsidies and incentives to mitigate high investment cost and improve return on capital.

Keywords: *biomass, pellets, renewable energy, trade barrier*

INTRODUCTION

In recent years, the use of wood pellets for the production of heat and electricity has increased rapidly in many countries (Lamers *et al.* 2012). The threat of climate change and emission of greenhouse gases (GHG) from the use of fossil fuel will likely increase wood pellet utilization even further. Wood pellets are compressed solid fuel generally made from sawdust. Its high density and combustion efficiency makes it suitable for both industrial and residential heating applications (Thek & Obennberger 2004). The geometry and cylindrical form of wood pellets also facilitates transport over long distances, compact storage and control feeding to furnace and boilers (Hartmann & Lenz 2012). These attractive properties have resulted in soaring demand for wood pellets in Europe and North America (Heinimo & Junginger 2009; Stahl & Wikstrom 2009).

The supply of wood pellets is mainly from the United States of America, Canada, Germany, Sweden, and Russia. Global production has increased from 7 to 19 million tons during the period 2006 to 2012 and demand is growing exponentially (FAO 2012). Leading consumers of wood pellets are the European Union (EU) 27 countries including Belgium, Denmark, the Netherlands, Sweden, the United Kingdom, and Italy. Most pellets have been burned in residential heating, followed by district heating and co-firing in power generation plants using industrial type boilers (Sikkema *et al.* 2011). Limited amounts of wood pellets are produced in Japan, South Korea, Australia, New Zealand, Chile, Argentina, China, Malaysia, Indonesia and Vietnam. Traditionally, wood pellets are produced from sawdust. To date fuel pellets can be manufactured from a variety of ligno-cellulosic materials including forest and agricultural residues. Pellet quality varies from premium to utility grade. Premium pellets are made from high quality, low-ash sawdust for residential heating. Utility or industrial grade pellets are from bark and lower quality feedstock for power generation. Recently, the EU adopted EN 14961-2 (2011) for specifying origin, technical classification and properties of pellets traded in the European Union. The standard is expected to guarantee high quality of pellets being sold in the EU market. The Philippines generates millions of cubic meters of woody biomass and forest residues that can be converted to heat and power (Samson *et al.* 2001). These residues are usually discarded or inefficiently used as boiler fuel in many processing plants. However, despite the high demand of wood pellets abroad, the abundance of potential biomass feedstock and availability of pelleting technology, wood processing companies and local investors remained cautious to enter the wood pellet market. The present study sought to identify possible explanations for the slow development and use of wood pellets in the Philippines. It reports on what market actors currently perceive as constraints and barriers to wood pellets trade in the Philippines.

METHODOLOGY

An online survey was designed to obtain response from stakeholders and potential users of wood pellets in the Philippines. Trade barrier categories were formulated based on published scholarly literatures on biomass utilization (Becker *et al.* 2009; Nielsen-Pincus and Moseley 2009; Junginger *et al.* 2011). Economic, technical, logistical, environmental and ecological barriers were considered in the study. For each category, a number of questions with predefined answers were

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asked to each respondent. The questionnaires also contained open-ended questions where the respondent could indicate their comments on specific question. The questionnaire was pre-tested and reviewed by a number of colleagues before sending electronically to all respondents. After pre-testing, the questionnaire was uploaded to a commercial survey platform and implemented in July to December 2014 following a modified Tailored Design Method (Dillman 2000). The invitation to participate to the online survey was emailed to all respondents with the weblink to the survey site. Survey respondents were selected from companies and processing plants using biomass and/or coal as fuel to generate heat or electricity. Respondents were selected from the Department of Energy (DOE) database of power generating plants and registered coal end users, members of the Philippine Wood Products Association (PWPA) and the Chamber of Furniture Industry of the Philippines (CFIP). The last two associations include sawmill, plywood, and furniture manufacturing companies. The questionnaire was also sent to policy makers, NGOs, and experts from academia. Non-respondents were subsequently contacted by phone or registered mail after eight weeks of initial invitation to participate.

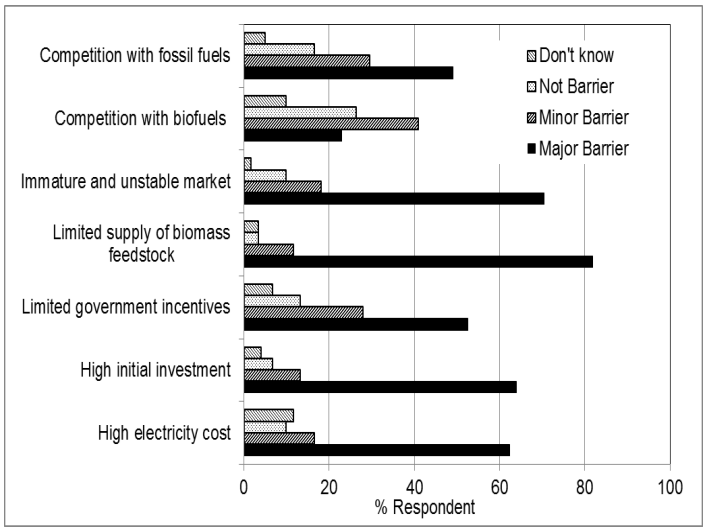

Figure 1. Survey responses to questionnaires on economic barriers.

RESULTS AND DISCUSSION

A total of 185 individuals were sent weblink via email or regular mail to participate in the online survey, however, only 71 respondents (38%) completed the questionnaire. Although the total number of respondents who completed the survey was lower than anticipated, the results were sufficient to identify and draw significant conclusions. The majority of respondents had technical background (87%) with contributions from the academe (9.8%), policy makers (3.1%), and other groups (0.1%). Many (87.5%) of the respondents are familiar with wood pellets and showed knowledge of the questions. The survey results are presented for each of the possible trade barriers with an overview of the comments by individual respondents. For the purpose of this paper, a barrier would be taken as any issue that either directly or indirectly hinders the use or commercialization of wood pellets in the Philippines.

Economic Barriers

The respondents were asked whether a number of economic barriers constitute hindrance on their use of wood pellets as fuel to generate heat or electricity (Figure 1). Majority (82%) of the respondents indicated that lack of sustainable supply of feedstock is a major barrier for use of wood pellets in the Philippines. Woody biomass and agricultural residues are widely available in the country (Samson *et al.* 2001). Sawdust and planer shavings can be sourced from furniture making provinces of Pampanga, Bulacan, and Cebu while agricultural residues such as corn stover, sugarcane bagasse, and rice hull are widely available in Pangasinan, Ilocos region, Leyte, *etc*. However, these sources of biomass are located far apart from each other and transport of bulky materials is too expensive. Consequently, wood pellet plants must be located close to the source of the biomass to be competitive. In addition, the high cost of electricity in the Philippines was pointed out by respondents (62%) as a major barrier. For instance, a small pelleting plant (1 t hr^{-1} capacity) may require about 794,935 kwh yr^{-1} to run machineries to compress sawdust into pellets (Jara *et al.* 2015). Hence, the costs to gather, transport, and compress the feedstock are the limiting factors and require investment. Sixty four percent (64%) of respondents indicated that high investment cost is one of the barriers to commercialization. Capital for investment in the Philippines is limited and many respondents (70%) deemed that the market is risky and still immature. Some commented that signs of long-term stability and growth must be present before people can start investing in the bioenergy market. In contrast, respondents were divided on the feasibility of using wood pellets *vis-a-vis* traditional fossil fuel (coal and oil) as furnace and boiler fuel. Most (49%) believed that the relatively low price of coal in the world market (Table 1) would prevent wood pellets from being used by processing and power plants in the Philippines. Reports (Junginger *et al.* 2006; Lamers *et al.* 2012) also showed that the prevailing low price of oil in the international market has seriously eroded the financial viability of many renewable systems (*e.g,* bioethanol, *etc.*).

Table 1. Prices of energy commodities in the world market.

Commodity	Estimated Price (as of June 30, 2015)	Source
Wood pellets (premium)	179 USD t^{-1}	Argus 90 day wood pellet index (cif ARA)
Wood pellets (utility)	90-120 USD t^{-1}	China
Coal (thermal)	60.6 USD t^{-1}	Australian Coal Price
Oil (Brent)	63 USD bbl^{-1}	Nasdaq
Natural gas	2.77 USD $mm\ BTU^{-1}$	Nasdaq
Bioethanol	1.58 USD gal^{-1}	The Chicago Board of Trade (CBOT)

Source: Argus Wood Pellet Index 2015

To mitigate high investment cost, respondents (53%) indicated that adequate government incentives (*e.g.* feed-in-tariff, tax credits, *etc.*) are necessary to encourage investment in wood pellets and other renewable energy. These types of subsidies have the effect of both lowering the fixed costs and risk of investor and of improving the return on investment.

Technical Barriers

Biomass is inherently variable in physical and chemical properties (*e.g.* high bulk density, ash content, moisture content, *etc.*). These properties make it difficult and expensive to transport and unsuitable for direct use. Moreover, power and processing plants are generally reluctant to experiment with new fuel that could potentially damage their installation (*i.e.* boilers). However, respondents (47%) indicated that this is only a minor barrier. Similarly, lack of technical personnel, equipment manufacturer, standards, ash disposal, and health issues were deemed minor or not barriers at all to pellet commercialization in the Philippines (Figure 2). Respondents did not indicate explanation for the above responses. However, availability of technology to deal with variable biomass properties (*e.g.* fluidized bed boilers, emission scrubbers, *etc.*), liberal emission guidelines, ability to learn new technology quickly and fabricate equipment may have contributed to these responses.

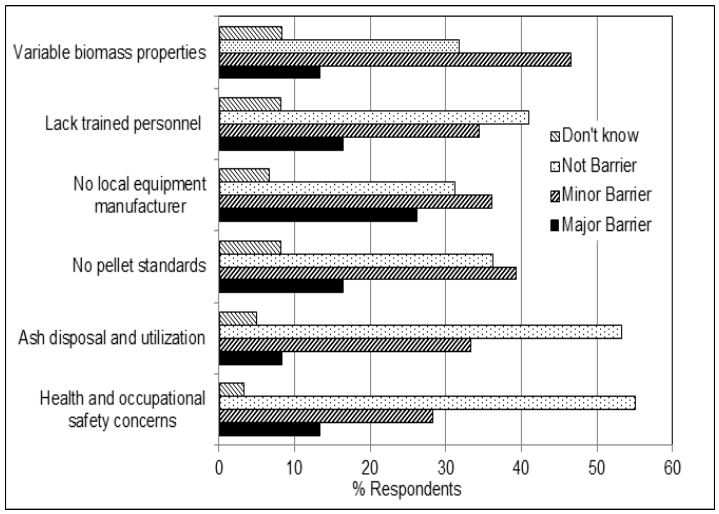

Figure 2. Survey responses to questionnaires on technical barriers.

Logistical Barriers

Survey respondents deemed that logistics is an important factor in a successful wood pellet supply chain. Many (58%) believed that bad roads and insufficiently developed port infrastructures would hamper attempt to commercialize wood pellets in the country (Figure 3). The state of infrastructure in the Philippines is the second worst among countries in the Association of Southeast Asian Nations (ASEAN) (The Global Competitiveness Report 2013). In addition, majority of the respondents (78%) believed that the inherently bulky and large volume of biomass would result in high transportation cost and difficulty in handling and storage of biomass in ports. Wood pellets are relatively sensitive to changes in humidity and difficult to handle and manage without proper infrastructure. Also, the risk of contamination with decay fungi, molds, and wood boring insects (*e.g.* termites and beetles) are present. Consequently, quarantine treatment (*e.g.* ISPM 15) may be necessary especially for export and international trade.

Improvement in biomass handling facility would require specific investment. However, respondents (45%) felt that potential handling and storage problems are minor or not a barrier. Sustainability of feedstock could also hamper logistics. In order to achieve low cost of production, large volumes of biomass need to be available and transported on a regular basis. If this can be assured, many respondents (58%) believed that investments will be forthcoming.

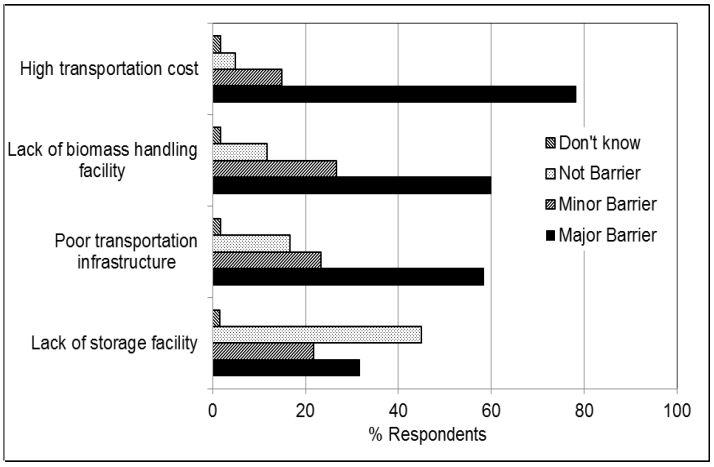

Figure 3. Survey responses to questionnaires on logistical barriers.

Ecological and Environmental Barriers

Most respondents (60-75%%) indicated that pellet production would pose limited or no environmental effect provided that feedstock are from waste materials or residues of wood processing operations (Figure 4). Emissions from burning of wood pellets during thermal conversion are also believed by respondents (51%) to be a non-barrier to commercialization. Although thermal conversion of biomass results in the emission of NO_x and SO_x, these pollutants are relatively very small in quantity in comparison with coal and oil (Acda & Devera 2014). Similarly, if feedstock is obtained from large industrial plantations dedicated for energy production, respondents (45-52%) believed that issues such as monocultures and loss of biodiversity, soil erosion, fresh water use, nutrient leaching and pollution from chemicals, *etc.* maybe significant. Many respondents (35%) pointed out that the fuel versus food dilemma could be a barrier to pellet production.

Other Barriers

To realize sustainability of feedstock and assure sufficient volume of regularly available biomass, many experts believed that dedicated tree plantations for short rotation tree species must be established to support potential demand for raw materials (Matzenberger *et al.* 2015). However, environmental issues become barriers for the establishment of such plantations for energy production (Figure 4). Other constraints such as access to large tracts of land (*e.g.*, ancestral or public lands), where securing a permit or entering into a lease or joint venture is very challenging. In addition, most large tracts of land in the Philippines have unstable peace and order situation (*e.g.* due to the presence New People's Army, Moro Islamic Liberation

Front (MILF), *etc.*). Changing policies concerning forest products utilization is another aspect that needs to be addressed. The support of end users and stakeholders is critical to the success of wood pellets as an alternative source of fuel in the Philippines. Both the benefits of sustainable biomass energy in general and specifically the need for biomass trade are still largely unknown to many stakeholders such as industrial companies, policy makers, NGOs, and the general public. Active dissemination of information by the national government and other organizations is required.

Opportunities for Trade

Respondents were asked what they thought would be the biggest opportunities and drivers for wood pellet use in the Philippines (Figure 5). In general, all respondents recognized the positive impact to the environment of using biomass as source of energy. Majority (88%) of the respondents agreed that the use of wood pellets could help ease energy independence to high priced fossil fuels and help mitigate effects of GHG emissions. Marginal or degraded lands and underutilized residues can also be put to more productive use. However, many (87%) also agreed that the opportunity for international trade and export is very attractive. The demand for wood pellets is growing exponentially and economic return of investments is significant in the long term. Furthermore, government policies (*e.g.* Republic Act 9513) in support of renewable energy and concerns regarding climate change are likely to improve the prospects of biomass energy technologies in the future.

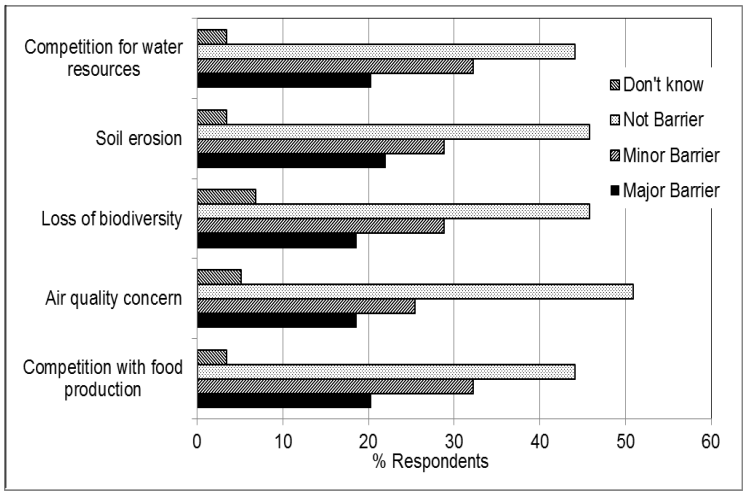

Figure 4. Survey responses to questionnaires on ecological and environmental barriers.

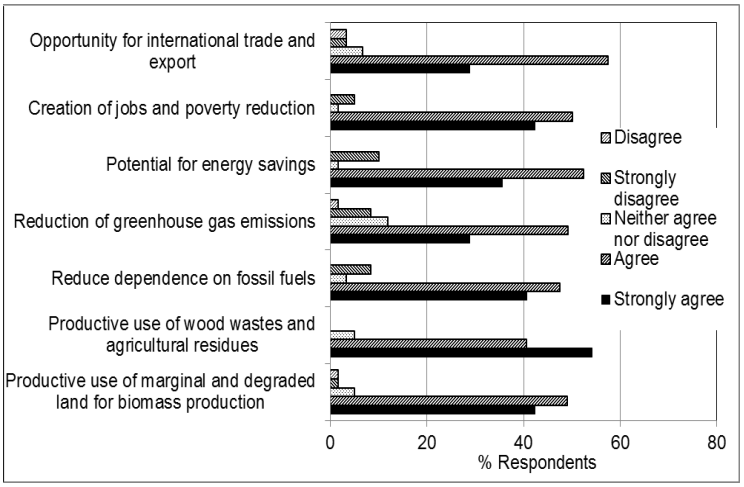

Figure 5. Survey responses on opportunities of wood pellets production in the Philippines.

CONCLUSIONS AND RECOMMENDATIONS

In general, survey data and comments from the respondents indicated that the main barriers to wood pellet commercialization in the Philippines include lack of sustainable supply of biomass feedstock, high cost of investment and competition from fossil fuel (coal). Bad roads and insufficiently developed infrastructures would hamper attempt to commercialize wood pellets in the country. Many respondents indicated that technical and logistical barriers are not a constraint. Majority of the respondents recognized the environmental benefits of using biomass but deemed it necessary for government to provide subsidies and incentives to mitigate high investment cost and improve return on capital.

To help improve the prospects of wood pellet in the Philippines there should be more policies (e.g. Republic Act 9513) in support of renewable energy and concerns regarding climate change. Extensive partnerships and collaborative efforts are also needed to overcome barriers to trade. Significant additional increase in biomass energy supplies should be possible through plantation development, probably in degraded land.

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a b

Photo of wood pellets sample made from (a) Bayog and (b) Giant Bamboo.

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