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UTILIZATION OF SMALL DIAMETER LOGS FROM SUSTAINABLE SOURCE FOR BIO-COMPOSITE PRODUCTS
PROJECT CODE: CFC/ITTO 62 – PD 40/00 REV 4(1)

TECHNICAL REPORT

Assess market needs

Determine where potential for future market growth for bio-composite products exists

By:

Dwight A. Eusebio
Carolyn Marie C. Garcia
Grecelda A. Eusebio
Norma K. Toreta

FOREST PRODUCTS RESEARCH AND DEVELOPMENT INSTITUTE
Department of Science and Technology
PHILIPPINES

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Introduction

Bio-based composites is any combination of two ore more resources held together by some type of mastic or matrix system (R.M.Rowell 1998). Composites on the other hand are materials that have the commonality of being glued together or bonded together (T.M.Maloney 1996) or a combination of two or more materials bonded together and performing a single unit (A.A.Marra 1992)

Bio-composite products manufacture and trade play a major role in the economic development of the Philippines. With the increase in the housing needs brought about by the increase of population, demand of bio-composites is also increasing particularly for plywood, particleboard, fiberboard, cement bonded board. The Philippine population would continue to grow, increasing from 76.5 million, as of the latest population census conducted in May 2000, to 141.7 million in 2040, according to the Medium Series of the 2000 Census-based population projections. This means that 65 million people would be added to the nation's population between 2000 and 2040, which is a span of 40 years, even if the average annual growth rate is projected to drastically decline from 2.34 percent during the 1990-2000 period to around 1.0 percent during the 2030-2040 period. The population is projected to grow by 1.95 percent in the 2005-2010 period, from 85.3 million in 2005 to 94.0 million in 2010 (NSO). The annual housing backlog from 2005 to 2010 is 195,133 or a total of 3,756,072 units (HUDCC).

However, production of bio-composites is coupled with problems on raw material in terms of supply and cost. In addition, intensified local production is being hampered by some technical and environmental constraints.

Among the bio-composites, plywood, sourced from local and import, still dominates the market. Local production of particleboard and fiberboard is very insignificant relative to demand thus the country has been importing most of its requirement. Furniture and cabinet manufacturers use particleboard and medium density fiberboard in large volumes.

Some of the data sources for this Project Component are similar to Component 1.1.1 which is the review market data and examine trends to understand what bio-composite products are sold today and where they are sold.

BIO-COMPOSITES DEMAND AND SUPPLY

PLYWOOD

Plywood is still the most common type of bio-composite used. On the average, about 66% of bio-composites used in construction projects of contractor-respondents is plywood, which is used as ceilings and interior walls.

Domestic demand for plywood is met by local production and augmented by imports. It is noted that export remarkably increased from 2006 to 2008 while import decreased from 2006 to 2007 (Fig. 1). Based on these figures, 89% to 98% of total supply went to the domestic market (Table 1).

Table 1. Production, trade and consumption of plywood.

PLYWOOD, cubic meters							
Year	Prodn.	Imports	Supply	Exports	%	Available for Domestic Use	%
2001	292,294	8,242	300,536	6,834	2	293,702	98
2002	350,353	24,847	375,200	21,909	6	353,291	94
2003	350,891	48,557	399,442	16,637	4	382,811	96
2004	385,570	42,045	427,615	47,731	11	379,884	89
2005	314,182	78,005	392,187	40,015	10	352,172	90
2006	316,922	75,135	392,057	19,952	5	372,105	95
2007	281,457	58,517	339,974	37,000	11	302,974	89
2008	*	*	*	39,000		*	

Source: Philippine Forestry Statistics
Note: Data for 2008 are not yet available except for export

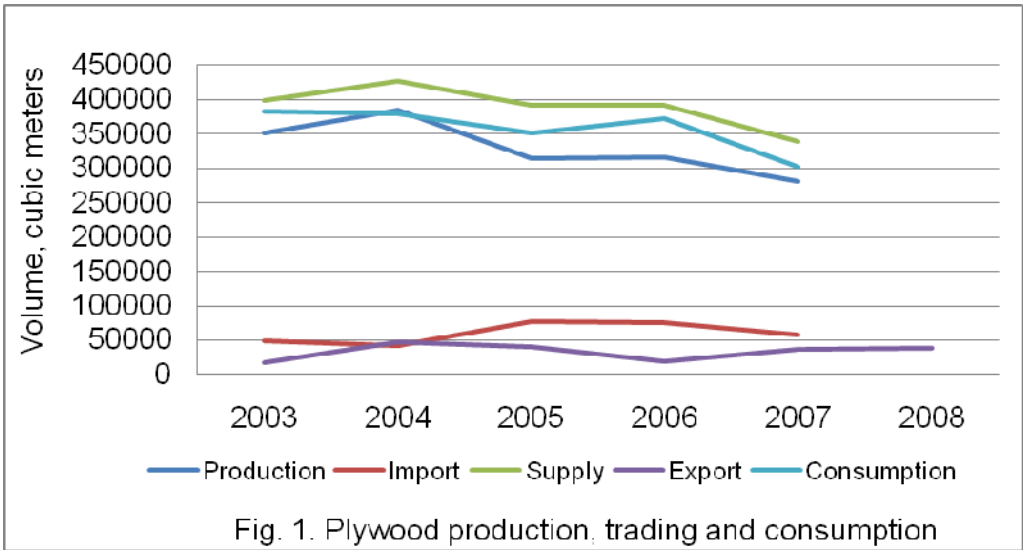

Fig. 1. Plywood production, trading and consumption

FIBERBOARD

Compared to plywood, local production of fibreboard is minimal falling on or around 50 thousand cu m per year (Table 2). Locally produced fibreboards, also called "*lawanit,"* are high density fibreboards (HDF). In construction, they are used as ceilings and interior walls.

The Philippines does not produce medium-density fibreboards (MDF). Demand for MDF and HDF boards and final products are filled in by imports.

Imports of fiberboard were highest in 2004 but re-exports showed an increasing trend from 2004 to 2006. Domestic consumption, however, decreased from 48 million kg. in 2002 to 30 million kg. in 2006.

Table 2 Production, trade and consumption of fiberboards

FIBERBOARD					
Year	Production '000 metric tons	Imports '000 net kg	Supply '000 net kg	Exports '000 net kg	Domestic Consumption '000 net kg*
2001	5	44,292	44,292	28	44,269
2002	4	48,478	48,478	113	48,369
2003	7	29,315	29,322	5,367	23,955
2004		not available		9,798	*
2005	8	47,937	47,945	10,226	37,719
2006	5	47,981	47,866	1,795	46,191
2007	6	39,546	39,552	558	38,994
2008	**	34,336	**	**	**

Source: Philippine Forestry Statistics

Note: *Data for 2004 is not available except for export

**Data for 2008 are not yet available

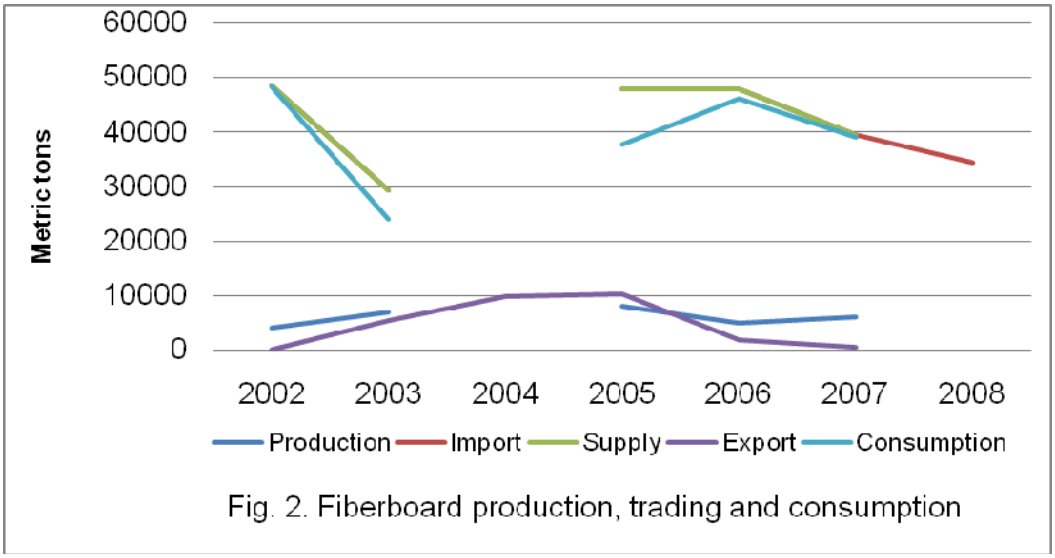

Fig. 2. Fiberboard production, trading and consumption

PARTICLEBOARDS

The Philippines has three particleboard plants but as of 2009, only one is operating. The plant can produce 1,000 high density particleboards per day but on average produces only 650 panels a day. It uses tops and branches of *gmelina arborea* as raw material and prides itself in using formaldehyde-free glue in their products. In its early operations, the plant used sugarcane bagasse as raw material but due to the poor quality of sugarcane bagasse that adversely affected the finished product, the company opted to use *gmelina arborea*.

Their boards are shipped direct to furniture makers in Cebu and Manila. Twenty percent of their market is in Cebu, 70% in Manila and 10% goes to the local market in the plant's hometown in Ozamiz. Because the plant is operating below capacity, the country still imports a sizeable quantity of particleboards (Table 3). Imports increased from around 3 million net kg in 2001 to 31 million net kg in 2007. Only less than 2 percent is exported. Although no data are available at the Philippine Forestry Statistics in 2008, actual visit and interview shows that there is a production at the Particleboard Plant in Ozamiz City. The production output may be too small compared to import thus the output of 650 panels per day is insignificant.

One particleboard commercial plant that has stopped operating in 1999 is in the process of reconditioning the machineries/equipment in order to produce boards using coconut coir fiber as raw material.

Table 3 Production, trade and consumption of particleboard.

PARTICLEBOARD, in '000 gross kg					
Year	Production	Imports	Supply	Exports	Domestic Consumption
2001	No data	2,948	2,948	-	4
2002	n.d.	3,674	3,674	-	3,674
2003	n.d.	7,162	7,162	-	7,162
2004	n.d.	6,173	6,173	-	6,173
2005	n.d.	4,249	4,249	175	4,074
2006	n.d.	8,478	8,478	140	8,338
2007	n.d.	31,412	31,412	6	31,406
2008	n.d.	34,480			

Source: Philippine Forestry Statistics and National Statistics Office

CEMENT BONDED BIO-COMPOSITES

Other bio-composites in the market are agri-based cement bonded (CBB) boards and fiber cement boards (FCB). There are only two agri-based cement board plants in the country and one large fiber cement board plant. One CBB plant specifically wood wool cement board is owned and managed by an architect. Instead of using only *gmelina arborea* as raw material, it also uses other wood that are available in their vicinity such as fruit trees that do not bear fruit anymore. To save on production cost, waste bamboo fibers from furniture makers are mixed with wood wool. WWCBs produced are used in the housing and construction projects of the manufacturer. The other CBB plant uses abaca fiber wastes as raw material since the location is noted as abaca producing region of the Philippines. The finished products do not reach the market because these are used in their housing projects.

Fiber cement (fiber reinforced cement composite) was originally developed by James Hardie in 1980. One of the main ingredients of fiber cement products is cellulose fibers from wood or non-wood sources which are added to reinforce the cement composite. Also, small amounts of chemical additives are utilized to help the process, or provide products with particular characteristics (Golbabaie, M 2006). There is only one producer of fiber-cement board in the country which is traded under the brand Hardiflex. This uses imported virgin pulp fiber.

A new company has started with the commercial production of fiber cement sheets (Solidflex Brand) and fibers cement roofing (Mightyflex Brand) in 2009. Product thickness range from 4 – 15 mm with densities ranging from 0.95 – 1.05 g/cm^3.

BIO-COMPOSITES IN CONSTRUCTION

Bio-composite products have found increasing applications in housing construction compared to other industrial applications (Table 4). Plywood is still the

Table 4. Uses of bio-composites in construction

Product	Application
Plywood	Ceilings, interior walls
Fiber-cement board	Ceilings, interior and exterior walls
Blockboard	Interior walls
High density	Ceilings, interior walls

fiberboard	
Particleboard	Ceilings
Cement-bonded board	Ceilings, interior walls

most common type of bio-composite used by building contractors. All respondents have used plywood and fiber cement boards in their projects, while 50% and 25% have used particleboard and blockboard, respectively, in their projects. These were used as ceilings and interior walls; but only fiber cement boards were used as exterior walls.

In terms of the product mix, an average of 66% of the bio-composites used in their construction projects is plywood. However, fiber cement boards, which were introduced in the country ten years ago have eaten into the market share of the more "traditional" panel products. An average 23% of bio-composites used by the respondents is fiber cement boards (Table 5.).

Table 5. Extent of use of bio-composites.

Product	Average % Share Used in Projects
Plywood	66
Fiber-cement board	23
Blockboard	15
High density fiberboard	13
Particleboard	7
Cement-bonded board	2

Table 6. Attributes considered in choosing type of bio-composite used.

Attribute	Importance 1=most important
Suitability	1.6
Durability	1.8
Quality	2.5
Availability	4.0
Specification	4.6
Price	4.8
Appearance	5.6

Suitability to the structure being built, durability of the material and quality seems to be the most important attributes considered by the respondents when choosing the

type of bio-composite material to use (Table 6). One implication here is the importance of durability as an attribute. Taken in
conjunction with the findings that fiber cement boards have eaten into the share of plywood, this again reflects the perception that wood is not as durable as say, cement. Price is also a less important consideration than durability or suitability to specific use.

GROWTH AND RESOURCE SUSTAINABILITY

Bio-composites will always be acceptable materials for construction and furniture. However, new bio-composite products that substitute directly with another bio-composite, affect how market shares are re-aligned. The introduction of fiber-cement boards for instance has cut into the market share of plywood, although it is still the most popular bio-composite material used in construction. On the other hand fiber cement boards and fiberboards have different applications. Thus, market share of fiberboards basically remain unaffected by fiber cement boards.

The growth of the bio-composites industry will depend on the growth of industries dependent on it and on the introduction of new products, technologies and new applications. Fiber-cement board, introduced ten years ago, is the latest bio-composite to be introduced in the market and has managed to carve a niche in the construction sector. Eighty nine percent of plywood producers and users believe that usage rate for this product will increase significantly in the next three years (Table 7). This reflects the perception that fiber cement boards are a threat to the plywood market. On the other hand, only 54 percent of the respondents are optimistic that there will be a significant increase in demand for plywood; 31 percent believe that demand will remain basically unchanged. There has also been a surge in the use of fiberboards, as seen in the increase of fiberboard imports. About 80 percent of the respondents think that in the next three years, fiber board usage will increase.

Of the bio-composites in the country, plywood is perhaps the most challenged in terms of raw material sustainability. Unlike new composite products which use smaller elements, plywood production still relies on whole timber. Although these

Table 7 Respondents' perceived trend in demand for bio-composites

Product	% of Respondents				
	Increase		Decrease		No change
	Sig.	Not Sig	Sig	Not sig	
Plywood	53.8	7.7	-	7.7	30.8
Fiber cement board	88.9	-	-	-	11.1
Blockboard	42.8	28.6	-	-	28.6
Particleboard	33.3	22.2	11.1	11.1	22.2
MDF	50.0	33.3	-	-	16.7
HDF	14.3	14.3	14.3		57.1

are sourced from plantations rather than from natural forests, very few (30%) bio-composite producers think that there are enough raw materials to sustain production (Table 8. In contrast, 70% of the respondents think otherwise --there will not be enough raw materials to sustain production.

Reasons given by both sides are conflicting. Those who believe that there will be enough resources consider *falcata* as fast-growing and sustainable and thus see no reason why difficulties in supply should occur. On the other hand, most producers believe that replanting efforts fall short of expectations because of lack of

Table 8. Perceptions on raw material sustainability

YES, there will be enough raw materials to sustain operations within the next five years	**NO, there will NOT be enough raw materials to sustain operations within the next five years**
30%	70%
• **"Falcata is a sustainable plantation species"** • **"Replanting of falcata is continuous"**	• "no reforestation; no government support" • "Yearly consumption exceeds replanting" • "Most local farmers do not want to replant due to the many restrictions (*regulations*) imposed…in cutting their own trees" • "less attention given to replanting"

government support. These conflicting perceptions actually point to geographical differences in the supply of raw materials. Those who don't find it difficult to source raw materials are actually located in a region where replanting efforts are relatively strong and their proximity to plantations make it easy for them to acquire raw materials. Apparently, there is no timber surplus to meet the requirements of plywood producers located farther away.

Supply difficulties limit production. One respondent operates for only three days a week due to lack of veneer logs. Often, they have to buy veneer from veneer plants located

CONCLUSION AND RECOMMENDATIONS

There will always be demand for bio-composites because of the increasing housing backlog and its wide range of application in the housing and furniture industries. This demand is met through local production and importations. Although the country produces plywood, HDF, blockboard, particleboard, fiber cement boards and wood/agri-based cement bonded boards, sizeable importations indicate that local production could not satisfy the volume requirements, and most probably the quality requirements of the local market.

To ease market share competition within the traditional construction industry, new markets should be developed. This requires exploring new applications for existing bio-composites such as in packaging, and developing products that will serve the non-traditional wood markets. This also necessitates that the industry keep pace with developments in bio-composite research to ensure its viability.

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