



ORIGINAL ARTICLE

Rattan Industry: An Economic Study to Set up Raw Materials Processing, Fibre Sustainability, and Estimation on Furniture Products Development

*^{1,2}Mohamad Saiful Sulaiman, ^{1,2}Sofiyah Mohd Razali, ^{1,2}Taharah Edin, and ^{1,2}Nasihah Mokhtar, and ^{1,2}Ellisha Iling

¹Centre of Excellence in Wood Engineered Products (CeWEP), University of Technology Sarawak, 96000 Sibul, Sarawak, Malaysia

²School of Engineering and Technology, University of Technology Sarawak, 96000 Sibul, Sarawak, Malaysia

ABSTRACT - Rattan is a cellulosic material from a non-timber forest product that has become the predominant commodity in the tropical country. Rattan is often associated with luxury items, commonly used as a material for basketry, furniture and handicrafts. The processing of rattan into furniture and related products generates about 40-50% waste. This study examines three main stages of the rattan industry to reduce waste. The waste can be utilised and converted into other products that can provide additional income to the industry. The projections for the three main rattan industries showed that 18.0%, 23.0% and 16.5% of monthly profit could be generated from the rattan processing, rattan core and skin and rattan furniture industries respectively. Malaysia is the second largest rattan industry after Indonesia and plays an important role in the country's economic growth.

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INTRODUCTION

Native to tropical regions, rattan is the most important renewable non-timber forest product in Malaysia and is also widely used in Malaysia, Indonesia, the Philippines, China, Bangladesh, Sri Lanka, Myanmar and India [1],[2],[3]. Rattan is known for a variety of industrial and domestic applications. Especially the design of rattan furniture with lounge or swing in the early 1960s to the late 1990s is very attractive. It has become a symbol of traditional homes in Malaysia, regardless of race [4]. It has long been associated with the liveliness of the rural population and has undoubtedly become an essential non-wood product manufactured in Asia. With its good strength and flexibility, it is a material of choice for making furniture and handicrafts [2],[5]. The production of rattan is mainly about the development of the product design, the production methods and the people involved in the production. The items are a real issue as resources for production activities are limited [6]. In terms of properties, rattan is a versatile material for the further development of products [7]. Larger diameter rattan is used for making furniture, carpet beaters and walking sticks, while smaller diameter rattan is used for making mats, baskets, traps, animal cages and coarse wickerwork [1],[8].

The price of rattan raw materials has risen by up to 30% since 1985 [9]. From 2005 until today, bamboo was not a significant source of income for the community. It was then replaced by oil palm and rubberwood as more important sources of benefits to the community [10]. The trend has shown that community income has decreased to 62.5% between 2004 and 2011 due to the global economic crisis, higher transaction costs, lack of information or research for rattan processing, and poor linkages between rattan producers and local rattan consumers [1].

The economic aspect of the growth rate of income from rattan in the communities is related to the fields of academia, private and state enterprises [11]. Academics should be concerned with the content, research, workshops, patterns and technical basis of rattan, while industry is expanding support through the international market, collaboration, design, trade and management. Nevertheless, the government

*Corresponding Author: Mohamad Saiful Sulaiman. University of Technology Sarawak (UTS), email: saiful.sulaiman@uts.edu.my

plays an important role by providing training, establishing guidelines and regulations, and organising competitions and exhibitions. However, the main problem for rattan is the unstable price trend [1]. The rattan-based industry has contributed not only to social and economic development domestically, but also internationally. Competition in the business world is inevitable; the industry faces various opportunities and threats both externally and internally. In order to compete with similar sectors, it is necessary to understand what is happening in the market, what consumers want and what changes there are in the business environment [12].

The design of rattan furniture is inspired by the expertise of furniture makers; it is uniquely created through skill and passed down from generation to generation [13]. The ideas for the design of rattan furniture usually come from nature, and the concept of weave is also used. It also depends on the experience of the manufacturer and the unprecedented flexibility of the selected rattan species [4]. The aim of the research was to gain as much information as possible for the rattan industry, which is mainly concerned with the processing of rattan, the sustainability of rattan fibres and also rattan furniture. It focused on the technology of the monitored business, starting with fixed costs, material costs, labour costs, administrative costs and ending with profit.

MATERIALS AND METHODOLOGY

Rattan Processing Industry

The study focuses on the basic processing of rattan, i.e. rattan oil curing, bleaching and preservation, according to the review of processing in the rattan industry using the method of Sulaiman *et al* [13]. Some techniques were discussed and explained, such as oil curing in a 2 to 4 mm thick steel container (0.75 m x 0.75 m x 3.5 m) where a diesel solution is used to cure the rattan. The heat sources can be firewood, paraffin or LPG (depending on convenience). The immersion time is 20 to 45 minutes at a temperature of 90 to 140°C, depending on the size and type of rattan. The process was stripped of waxy materials, gums and resins by rattan itself. At the same time, the appearance of the rattan was improved and the durability of the materials was increased. A 1% solution of sodium hypochlorite and hydrogen peroxide was used for bleaching. The sample was soaked in a tank for 1 hour (depending on the rattan diameter). Prolonged soaking affects the strength of the rattan. It must be ensured that the treated materials are sufficiently loaded with chemical preservatives. Based on a survey of the rattan processing industry, boron formulations are recommended for the treatment of rattan. The treatment has been tested as per Indian Standard ISO: 401 - 2001.

Rattan Fibre Sustainability Industry

Based on an industry survey, the fibre sustainability industry focuses on the production of rattan core and rattan skin. The industry, which divides rattan into diameter classes, splits rattan, crushes it and peels and polishes the skin. Furthermore, the rattan skins were divided into three (3) grades of quality, namely high, medium and low. Each grade was marketed with different prices and the prices also depend on an additional process (either bleached or natural).

Rattan Furniture Industry

The production of rattan furniture is a process of transforming rattan materials into value-added products, namely furniture. The model was developed based on the data and information collected from a recent survey conducted in some rattan furniture factories in Malaysia. From the survey, it is highly recommended that rattan furniture manufacturing be run by an individual or a partner who oversees the overall operation of the business. In the rattan furniture industry, a number of operations are required before the products are completed, namely, selection of rattan, straightening of rattan poles, measuring of poles, cutting to size, bending, shaping, drilling, creasing, finishing and finally assembly. To improve the appearance, quality and strength of the furniture, it is bent, woven, assembled, scraped, sanded and finished.

RESULTS AND DISCUSSION

Rattan Oil Curing, Bleaching and Preservation Industry (Processing)

Cost Structure

To commercialize the production of rattan-based products, the firm needs to take into account the expenses when manufacturing a product or providing a service known as cost structure. The common cost structure incurred in production namely; fixed cost, materials cost, administrative cost, etc. The fixed cost can be defined as expenses that e bear by the company to fund it, which not related to their production level. The fixed cost incurred in setting up a rattan oil curing mill, bleaching, and preservation of a small scale depicted as in Figure 1. This table showed that total fixed cost is USD 53,950.00, which are 48.2% for land, 25.3% for building, 19.3% for machines and equipment, and the rest 7.2% for utilities and other miscellaneous matters.

The major raw materials used in rattan oil curing, bleaching and preservation industry represented in Figure 1. The total raw materials cost for one month supply incurred in this industry is USD 14,690.00 which are 88.5% for raw rattan, 8.8% for chemicals, and the rest 2.7% for treatment process.

Instead of fixed cost and materials cost, labour cost is also a vital cost that needs to be considered by the entrepreneur. A percentage of labour-force to all levels, nameless in processing industry which are manager (14.6%), supervisor (10.4%), clerk (4.2%), skilled workers (31.2%), general workers (30.2%), guard (4.2%) and driver (5.2%). In this industry, around 19 full-time employees are needed, indicating the total cost of USD 6,235.00 per month. The details of the calculation shown in Figure 1.

Meanwhile, the percentages of administrative cost such as licenses, logistics, utilities, maintenance, and others cost with 8.7%, 17.4%, 13.0%, 13.0%, 26.2%, and 21.7%, respectively also needs to be covered by the business. The total administrative cost incurred in this industry is about USD 1,495.00 monthly. The summary of the administrative cost incurred represented in Figure 1.

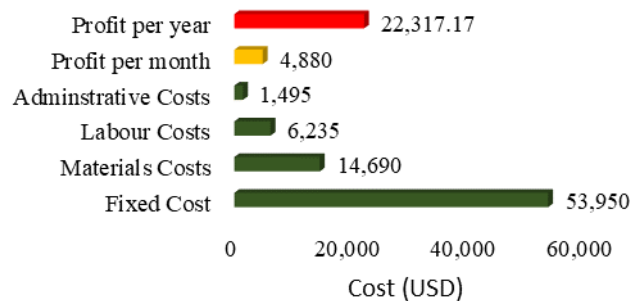


Figure 1. Costs and profits overview on rattan processing industry.

Estimation of Profit

According to the cost structure, the profit can be translated as the difference between the purchase price and the costs of bringing to market. The profit calculated based on formula 1;

$$\text{Profit } (\pi) = \text{Total revenue (TR) / total sales (TS)} - \text{Total expenses / total cost (TC)} \dots\dots\dots (1)$$

The profit of processing industry represented that an assumed as USD 27,300.00 of total revenue from selling of oil cured rattans with various species. The calculation of profit value is exclusive the amount of fixed cost. As a result, this industry is estimated can generate monthly profit around USD 4,880.00. The details calculation displayed in Figure 1.

Eventually, this industry is projected to generate profit approximately USD 22,317.17 per year by considering the finance for fixed asset and government tax. The calculation details regarding the estimation of profit from year 1 to year 3 demonstrated in Figure 1.

Estimation of Profit Margin

Profit Margin, net margin, net profit margin or net profit ratio is a measure of profitability. Based on net profit per sales, the net profit ratio for rattan processing industry was calculated. The percentage highlighted that from USD 27,300 of total sales per annum can generated 17.88% profit.

Rattan Core and Skin Industry

Cost Structure

In an industry of core and skin, highlighted that the rattan was selected according to the species and diameters. Typically, it was segregated to the two sections which are diameter below than 20 mm and with a diameter above to 20 mm. The forward process included boiled rattan with a diesel (preservation), cleaned with pressurized, dried, and sorted. Furthermore, the classes of rattan core and skin were graded (under six grades) and ready for commercialization. The common cost structure incurred in the production of rattan core and skin industry is fixed cost, materials cost, administrative cost, etc.

The fixed cost or namely fixed assets incurred in the production of rattan core and skin industry such as land area (24.5%), building (20.4%), machines and equipment (40.8%), also hand tools (4.9%). The rest others cost was covering an overhead expense included the cost for electrical, wiring, water, and telephone installations and also miscellaneous with 9.3% from total fixed cos. Fixed cost for rattan core and skin industry illustrated as in Figure 2, indicated the total fixed cost incurred USD 79,560.00.

The curing oil process is mean an immersing the large diameter rattan in hot oil or oil mixtures (using specially designed curing tank) for the specified duration just below the boiling point and subsequent cleaning and drying yield an ivory white colour and better appearance. The process to protect a rattan itself from attacked by fungal and at the same time not effect to the physical – mechanical properties. In fact, oil cured rattans have a great domestic as well as export demand and is fetching more price.

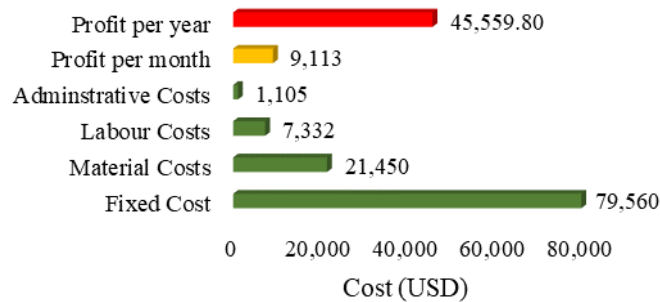


Figure 2. Costs and profits on Rattan Fibre Sustainability Industry

In this study, a major raw material used in rattan core and skin industry are oil cured rattans and respective chemicals with cost around 90.9% and 6.1%, respectively against a total materials cost. However, the firm also needs to consider the cost for miscellaneous matters as a back-up with 3.0% from total cost. Figure 2 enlightens the raw materials cost for one month supply in this industry. It shows that total cost incurred is around USD 21,450.00. To managed an operational system, highlighted that the rattan core and skin industry employed the labour-force such as manager, supervisor, clerk, skilled workers, general workers, guard and driver with respectively accumulative percentages which are 12.4%, 17.8%, 3.5%, 26.6%, 25.7%, 6.2%, 3.5%, and 4.4%. In this industry, around 21 full-time employees are needed. Hence, the 100% total monthly labour cost incurred USD 7,332.00. The further information of the calculation shown in Figure 2. Apart of labour cost, an administrative cost also one of an important things in rattan core and skin industry. There are included an expense of licenses with 11.8%, utility bill with 23.5%, logistics with 17.7%, stationery equipment with 17.6%, and so forth with estimation 29.4%. The total administrative cost incurred in this industry is approximately USD 1,105.00 per month. The summary of the administrative cost incurred exemplified as in Figure 2.

Estimation of Profit

As discussed in the rattan processing industry, the profit can be calculated by total revenue or total sales minus total expenses or total cost (TR-TC). Thus, for calculation purposes, the rattan core and skin

industry is assumed to can generate USD 39,000.00 total sales from selling of oil cured rattans of various species and sizes. As a result, this industry is estimated to can generate monthly profit around USD 9,113.00 excluding the fixed cost. The details of the calculation illustrated in Figure 2.

Nevertheless, the rattan core and skin industry were forecasted to generate net profit around USD 45,559.80 per year by considered the cost of fixed asset financing and government tax. The details calculation of estimation of profit for year 1 to year 3 is demonstrated in Figure 2.

Estimation of Profit Margin

Every business needed to estimate the amount by which revenue from sales exceeds costs in a business as namely as profit margin. Based on net profit per sales, the net profit ration for rattan fibre sustainability industry was calculated. Thus, net profit ratio for this industry was highlighted in formula 3 and the percentage indicated that from USD 39,000 of total sales per annum can generated 23.37% profit.

Rattan Furniture Industry

The largest rattan product industries in the world ranked as the furniture industry. In the process, rattan was selected according to grades to ensure the quality of materials in furniture making. Typically, rattan poles were bent out of shapes, and a straightened process is needed. A selected rattan pole was measured and cut into various sizes according to the design and suitability of furniture products. Rattan was heated or steamed to soften a fibre and bent to the desired shaped applied.

Furthermore, most of the rattan component was drilled, grooved, and assembled. For an aesthetic value on the products, a process of binder, weaver, and jointed was applied. The accessible materials used in the process are rattan cores and skin from the previous industry. To smooth the surface of the products, a scraped and sanded operation applied and also the crucial stages are finishing to the products that using coats of wax, shellac, drying oil, lacquer, varnish, or paint.

The element such as workforce, raw material acquisition, tool and machine is an important thing to growth and sustained the stability of industry. Moreover, to make an estimation of profit the variable like fixed cost and operational cost compulsory to consider as major part for setup the industry.

Workforce

For sustained the furniture industry, there are proposed set-up to a small-sized factory with employment around 42 full-time employees accordingly five main stages which are managerial, clerical designer and marketing with estimated with 23.4% from total workforce cost. Followed by cut, drilled, bent, and assembled process with 27.2% and also conformed to the stage 3 (scraped, sanded, and filled), stage 4 (binder and weaved), and stage 5 (finished) with 15.3%, 27.2%, and 6.9%, respectively. The presence of skilled and experienced workers plays an integral part in the daily operation. The detailed distribution of the workforce and the wages have shown as in Figure 3. This table indicated that the total cost for workforce distribution in the model factory is about USD 16,965.00.

Raw Material Acquisition

Moreover, to complete a product's development in industry, the major raw materials and the cost to produce a proposed capacity of the rattan furniture depicted as in Figure 3. There are three main classes of peeled rattan poles which are grade A, grade 1/3, and grade C. Every grade considers in different price per unit. In one cycle production estimated about 73.7% of total raw material cost needed to spend for grade A rattan poles and followed by 12.4% and 2.1% material cost for grade 1/3 and grade C, respectively. The rest 11.8% are considered for finishing and jointing purpose. Peeled rattans poles are used for making essential frame components and additional components, respectively. Rattan splits (without skin – grade C) are bought in bundles to be used as the binding materials. The total cost for major raw material requirements for the model factory is around USD 42,350.00.

Tools and Machines

Apart from raw materials, tools and machines are essential things in the manufacturing industry. The tools and machines can either be imported from Japan, China, Taiwan or fabricated locally whenever practical and economical. Due to their lower prices, Taiwan made machines are selected to perform less critical jobs such as cross-cutting and drillings. Meanwhile, for assembly, binding, weaving and spraying processes, it is recommended Japan made pneumatic hand tools are used. Japan made that have a good

reputation regarding longer service life, and lesser breakdowns would ensure the manufacturing processes are done smoothly without frequent disturbances caused by jammed parts of the tools. The quantity and price of the tools and machines required to set up the factory presented as in Figure 3. To wrap up, the overall cost incurred for buying several machines is USD 23,375.00.

Maintenance of Tools and Machines

The requirement for the maintenance of machines and tools used in rattan furniture manufacturing is not critical. However, since compressed air powers, most of the machines and tools, the compressed air generation and distribution systems must be carefully designed and maintained to ensure that the air produced is clean and free from moisture and debris. Many factories have neglected these requirements. As a result, the moving parts in the machines and tools get rusted quicker than they are supposed to be. Consequently, these will degrade the performance and shorten the service life of the machines and tools.

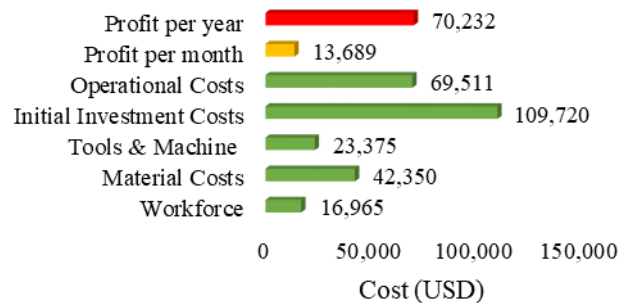


Figure 3. Costs and profits on rattan furniture industry.

Cost Analysis

The overall furniture manufacturing industry highlighted that the cost analysis could be done by calculating the initial and operational cost. The initial investment costs of rattan furniture manufacturing shown in Figure 3. The initial investment is the cost to acquire fixed assets such as a land area with 23.7% of the total cost, building with 29.7%, vehicles with 11.8%, tools and machines with 25.3%, and the rest 9.5% to the installation and equipment. The total initial investment incurred is USD 109,720.00.

Same with previous industry involved, the operational cost is a critical thing to running a business — the exact operational costs per month in furniture industry shown in Figure 3. The total expenses of operational expenses are considered for per month. It is consist of expenditure on raw materials with 53.7% of total operational cost, utility bills with 1.6%, salaries with 22.3% and the rest 22.4% for hardware, rental and miscellaneous. The table indicates the total monthly operational cost is USD 69,511.00.

Profit Estimation Analysis

Profit projection analysis can be done by calculating profit and profit margin. The monthly profit calculated by subtracting the operational cost excluding the initial investment cost of the monthly sales. Assumed that free on board (FOB) values is USD 20,800.00 per container and one-hectare areas of rattan can produce four containers. Thus, the monthly profit was represented USD 13,689.00 with net profit ratio (monthly profit per sales) at 16.45%.

From the formula 5 calculation, it could be concluded that one hectare of rattan can convert 16.45% into profits. Figure 3 indicated that the rattan furniture industry was generated net profit around USD 70,232.07 in year 1 and USD 69,226.30 in year 2 according to the annum profit after excepted depreciation value of 1/3 per cent of fixed asset and 45% of government tax. Depreciation value means decreasing in the value of the asset over it is useful life. A decrease in an asset's value regularly occurred during unfavourable market conditions. Hence, the profit value estimates will decrease over time. The detailed calculation of profit per year was highlighted in Figure 3.

CONCLUSION

In summary, the rattan-based industry helps not only the domestic economy but also the international economy to develop socio-economically. It can also be commercialized by entrepreneurs or SMEs. In order to capitalize on the rattan-based industry, every entrepreneur needs to plan the cost structure and estimate the profit. The typical cost structure involved in production consists of fixed costs, material costs, and administrative costs. In addition, labor costs are also important costs that the entrepreneur must consider. Other administrative costs such as licenses, logistics, utilities, and maintenance must also be borne by the company. To forecast the profitability of this industry, calculation of estimated profit for years 1 to 3 and estimation of profit margin must be done - the feasibility of rattan furniture manufacturing as a business is determined through cost and profit analysis. The cost analysis can be done by calculating the initial and operating costs. Then the profit analysis can be done by calculating the profit and profit margin. These calculations can then be used as a reference for commercialization.

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