

Potential Use Of Bamboo To Support Village Independence

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Abstract: Bamboo has become an important part of the life of the Indonesian people, from an perspective of economic, social and cultural. It is especially seen in rural communities. The potential for bamboo use needs to be explored from various aspects (availability of resources, social and economic) so that its role can be increased to support village independence. This research aims to examine the potential of resources, social and economic of bamboo use. The study showed that bamboo has a very wide distribution, especially in the Southeast Asian region. Availability of bamboo is abundant, especially in rural areas. Bamboo also has high adaptability and ecological value, and has superior physical and nutritional properties. Socially, human resources could further enhance their local wisdom for sustainable use of bamboo, as well as the value and social status of bamboo for the community. Economically, bamboo has great potential for increasing economic value through the use of all parts of the plant into various products for meeting community needs. The use of bamboo was sources of livelihood for rural communities that were financially feasible.

Key word: use of bamboo, resource potential, social potential, economic potential, village independence

1 Introduction

Bamboo is one of Indonesia's biological wealth. Hidayat (2012)[1] said that Indonesia is the third largest bamboo producing country after China and Thailand. Around 125 types of bamboo among 700 species of world bamboo are scattered in Indonesia's geographical area, especially in rural areas. Therefore bamboo has become a part of Indonesian people's lives for generations, as well as in Southeast Sulawesi Province. Bamboo is often a source of fulfilling the needs of people who live in the vicinity of bamboo plants. It was in accordance with Lebang (2016)[2] which said that all parts of bamboo plants (roots, stems, leaves, flowers to bamboo shoots) can be used for various needs. The Republic of Indonesia Law number 6 of 2014 concerning Villages has developed a new paradigm and concept for professional and independent village governance. One of the objectives is to encourage initiatives, movements and community participation in developing village potentials and assets to achieve mutual prosperity. It can be achieved by using potential natural resources, such as bamboo plants. Thus, it is very important to study the potential use of bamboo to support village independence.

The extraordinary potential of bamboo cannot only be explored in the local life of Indonesian people, but it can be developed to an international scope. The potential of bamboo will be studied in various aspects, such as resource, social, and economic aspects. It was in accordance with Abdullah et al. (2015)[3] that resource, social and economic aspects are very important to be explored to optimize the potential of commodities to be developed.

2 Material and Method

Qualitative methods were used in this research. This research was a field research and literature research. Data collection was carried out by survey techniques in four regions in Southeast Sulawesi Province, namely in South Konawe District, Bombana, Muna, and Kolaka, also by library techniques. Qualitative methods were used in this research.

3 Results and Discussion

Bamboo is a commodity of non-timber forest products but it is very popular as a substitute for wood. Bamboo has basic wood properties even though bamboo belongs to a type of grass (Gramineae family) (Arsad, 2013)[4]. Actually, the potential of bamboo is still very much untapped. TBamboo plants are very widely spread in the territory of Indonesia, as well as in the Southeast Sulawesi Province, especially in rural areas. Bamboo has long been used as a source of fulfillment of needs for the community. However, there is still a lot of potential for bamboo that needs to be explored to further increase its usefulness in improving community welfare and as an effort to support village independence according to government programs. The potential use of bamboo was analyzed from the aspects of resources, social, and economics.

3.1 Bamboo resource potency

The potential of bamboo resource was described by the spread of bamboo plants, the advantages of physical, ecological, and nutritional properties.

Spread of bamboo plants

TBamboo plants are woody non-timber species which are very adaptive to their growth so they have a very wide

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distribution area. It was in accordance with Arsad's research (2015)[5] that bamboo is cosmopolitan, which can survive in all weather conditions, both in hot and cold areas, in the lowlands, cliffs and in the mountains. Dransfield and Widjaja, (1995)[6], Serekat Hijau Indonesia, (2017)[7] said that bamboo plants spreads widely in the tropics, also in subtropical Asia. Furthermore, they also said that around 200 species of 20 genera of bamboo plants were found in Southeast Asia. The total number of bamboo species in the world is 1,000 species from 80 genera. It was in line with what was said by Shenzhen Minshunlong Trading Co. Ltd (2018)[8] that the largest bamboo area in the world is in the Asia-Pacific region, starting from southern New Zealand with latitude 42° South, north to 51° north of central Sakhalin, east to the Pacific Islands, and west to southwest the Indian Ocean. The main bamboo producing countries include China, India, Myanmar, Thailand, Bangladesh, Cambodia, Vietnam, Japan, Indonesia, Malaysia, the Philippines, South Korea, and Sri Lanka. Previously, Bystriakova, et al. (2003)[9] also conveyed the results of their study that over 6.3 million km of Asian forest potentially contains bamboo, with highest densities indicated from northeastern India through Burma to southern China, and through Sumatra to Borneo. The highest figures for potential species richness (144 spp per square km) were recorded in forests of south China, including Hainan Island. Actually, Indonesia has the large potential for the availability of species and the number of bamboo plants. Hidayat, (2012)[1] said that 125 types of bamboo were in Indonesia and 50 of them had enormous potential to be developed as craft and industrial materials. However, according to the Ministry of Forestry and Plantation, (1999)[10] that only 20 types of bamboo have been used and cultivated by the community, including: apus bamboo, ater/apple bamboo, andong bamboo, betung bamboo, yellow bamboo, black bamboo, talang bamboo, spotted bamboo, cendani bamboo, cangkoreng bamboo, perling bamboo, tamiang bamboo, loleba bamboo, stone bamboo, belangke bamboo, sian bamboo, Japanese bamboo, drum bamboo, bali bamboo and bamboo fence. Furthermore, it was also said that bamboo plants in Indonesia are mainly spread in the region of Java, Bali, South Sulawesi. There are not many studies regarding the potential of Bamboo plants in Southeast Sulawesi Province. Actually, Southeast Sulawesi was also very potential as a bamboo production center. This plant was mainly spread in the districts of Kolaka, South Konawe, Bombana, and Muna. Based on the survey results it was known that Southeast Sulawesi has a total of 13 types of bamboo, where each region has 5 to 8 types of bamboo. The thirteen types of bamboo include: Gigantochloa apus, Bambusa blumeana, Bambusa arundinacea wild, Bambusa atralindl, Dendrocalamusasper Schult. F. Backer, Bambusa vulgaris vittata, Bambusa multiplex, Melocanabaccifera, Asparagus cochinchinensis, Bambusa vulgaris, chizostachyummosum. Dinochloamalayana, Gigantochloa atter. The biological wealth could be a source of sustainability innovation to empower the villages as the production centers of bamboo and its processed.

Advantages in physical properties

Bamboo plants with their main function as wood substitution have many advantages in physical properties. It was

acknowledged by the community at the research location. They said that bamboo has very good properties to be used as a substitute for wood or other building materials because the trunk character is straight, hard, strong, flat, easy to split, easily shaped, and easy to work with. It was as stated by Arsad (2015)[5] that bamboo has a small shrinkage ratio, can be curved or has a high elasticity and decorative value. Another advantage of bamboo was that bamboo has a fairly short harvest period which ranges from 1-3 years and can be harvested throughout the year, (Dransfield and Widjaja, 1995)[6]. It was also stated by Sulastiningsih and Santoso (2005)[11], Febrianto, (2014)[12] that bamboo has a fast growth rate, short cycle, easily cultivated, and easily processed. Bamboo was different from woody trees where the wood can be used after reaching decades of growth. Thus, bamboo has the potential to be a substitute for woods. According to Raj, et al (2014)[13] that the use of bamboo as a substitute for wood can save forest resources to protect our ecological environment as a substitute for wood. Then, this study examined the type of bamboo that has the fastest growth as a potential availability of bamboo resources to support the sustainability of village independence. It was observed in the 5 main types of bamboo that were most widely used by rural communities in the Southeast Sulawesi region under 3 weeks after planting conditions. It could be seen in Table 1. Table 1 proved the rapid growth rate in bamboo plants. Based on Table 1, it was known that growth was the fastest for each main bamboo species in Southeast Sulawesi, as follows:

- The fastest growth of Apus bamboo (*Gigantochloa apus*) was found in Apus bamboo species originating from Bombana District with the highest number of shoots.

Table 1. Test Results of Growth Speed in 5 Main Bamboo Types in Southeast Sulawesi

Kinds of Bamboo	Growing Speed Indicator	Source (District)			
		South Konawe	Bombana	Muna	Kolaka
Bambu Apus (<i>Gigantochloa apus</i>)	Number of Buds (cm)	3	3	2	180
	Diameter of Buds (cm)	4	4	4	172
	The length of buds (cm)	180	172	188	146
Bambu Petung (<i>Dendrocalamus asper</i>)	Number of Buds (cm)	4	4	0	5
	Diameter of Buds (cm)	3	4	0	4
	The length of buds (cm)	56	164	0	100
Bambu Kuning (<i>Bambu vulgaris</i>)	Number of Buds (cm)	3	4	2	3
	Diameter of Buds (cm)	4	4	4	4
	The length of buds (cm)	180	172	188	136
Bambu Atter (<i>Gigantochloa atter</i>)	Number of Buds (cm)	2	5	2	2
	Diameter of Buds (cm)	2	5	1	1
	The length of	23	16	12	33

	buds (cm)				
Bambu Duri (Bambusa blumeana)	Number of Buds (cm)	3	4	2	2
	Diameter of Buds (cm)	7	5	5	3
	The length of buds (cm)	218	49	135	93

- The fastest growth of petung bamboo (*Dendrocalamus asper*) was found in petung bamboo species originating from Bombana District.
- Atter bamboo growth (*Gigantochloa atter*) which was the fastest found in atter bamboo species originating from the Kolaka District.
- The fastest growth of yellow bamboo (*Bambusa Blumeana*) was found in the type of yellow bamboo originating from the Muna District.
- The fastest growth of spines bamboo (*bambusa blumeana*) was found in the type of spines bamboo originating from South Konawe District. The spines bamboo was the fastest growing in observations for 3 weeks growth compared to the other four types of bamboo.

The other advantages physical properties of bamboo plants as stated by Febrianto (2014)[12] that bamboo has a very good tensile strength so that it can be used as a raw material for various building products, and it has proven to be resistant to earthquake shocks. It was also supported by the results study of the Adejoba, et al (2016)[14] that the impact bending of bamboo gluelam compares favourably with tropical timber species such as *Milicia excelsia*, *Nauclea diderichi* and so on. It was also discovered that every part of bamboo can be used in production of whatever furniture. Furthermore, Abdullah, et al. (2018)[15] conducted tests on the characteristics of superiority of flexural power, tensile strength, and compressive strength of the 5 types of bamboo in Southeast Sulawesi which were most widely used by rural communities, as follows:

1. Flexibility of spines bamboo (*bambusa blumeana*) was good with the highest flexural strength reaching 150.74 Nmm^{-2} . Therefore it was potential to use for a building frame, the buffer in the process of building a building.
2. The flexural strength of atter bamboo (*Gigantochloa atter*) was very good with the highest flexural strength value of up to 159.72 Nmm^{-2} . Therefore, it was potential to use for crafts or woven.
3. The tensile strength of Apus bamboo (*Gigantochloa apus*) was good with the highest tensile strength of 182.65 Nmm^{-2} . Therefore, it was potential to use for handicrafts.
4. The tensile strength of yellow bamboo (*Bambusa Blumeana*) was very good with the highest tensile strength up to 256.3 Nmm^{-2} , parallel compressive strength of 69.93 Nmm^{-2} , and the highest perpendicular fiber strength to 10.81 Nmm^{-2} . Therefore, it was potential to use for building materials. Yellow bamboo (*Bambusa Blumeana*) was also good for use as an ornamental plant or fence because of its beauty.
5. The compressive power of petung bamboo (*Dendrocalamus asper*) was very good with the highest compressive value of 22.34 Nmm^{-2} . Therefore,

it was potential to use for building materials and crafts.

Ecological advantages

Bamboo has been known as a conservation plant. According to respondents that bamboo often grows and or is planted in riverbanks, and sloping lands to prevent soil erosion. It was in accordance with Suriani's statement (2017)[16] that bamboo grows well on steep hillside, road embankments, gutters or on river banks. Ecologically, the potential for bamboo was very large, namely in terms of erosion prevention, maintaining water availability, and preventing air pollution. It has been extensively studied before, such as by Ben-zhi, et al (2005)[17] that said that ecological functions of the bamboo forest on soil erosion control, water conservation, land rehabilitation, and carbon sequestration. PThe ecological potential of bamboo was also suggested by Bharati et al. (2002) in Yeny et al. (2015)[18] that bamboo plants have fiber roots that can be useful for soil protection in preventing erosion. This can maintain even increase water storage capacity, reduced runoff, infiltration and groundwater storage. Furthermore, the research results of Nirala, et al (2018)[19] that bamboo can be included in profitable agroforestry system because of its shorter harvesting time and excellent growth and survival on any type of soil strata. Nirala, et al (2018)[19] also said that bamboo can play important role in soil and water conservation as well as significant impact on various features of physical and chemical properties of soil, also helps in better carbon sequestration and adding of various types of nutrient through its litter fall to soil. BBased on the results of interviews at the study sites, the respondents said that the bamboo clumps that grew around their homes could contribute to the prevention of landslides, floods and erosion. However, there is still a lot of bamboo that has not been cultivated because many are naturally grown. Many other countries have seriously cultivated bamboo plants because they have realized the benefits from an ecological and economic perspective. The greatness of bamboo in preventing erosion is mainly due to the superiority of the root system and its rhizomes. It was suitable with result study of Ben-zhi et al (2005)[17] that around 80% of roots and rhizomes were present in the upper 0-30 cm soil layer that is the area where roots and rhizomes serve best in controlling soil erosion. Therefore Brazilians plants *Bambusa blumeana* and *Phyllostachys pubescens* bamboo to control soil erosion, prevent soil nutrient loss and improve soil structure. Ben-zhi, et al (2005)[17], Suriani (2017)[16] give explanation the valuable features of bamboo for controlling soil erosion are its extensive fibrous root system, connected rhizome system, the leafy mulch it may produce on the soil surface, its comparatively dense foliage which protects against beating rains, and its habit of producing new culms from underground rhi- zomes which allows harvesting without disturbing the soil. Root fibers from bamboo plants also have other advantages, which have the ability to filter water exposed to toxic waste (such as mercury). It was in line with Serekat Hijau Indonesia (2017)[7] which said that the roots of bamboo plants can play a role in handling toxic waste due to mercury poisoning, can also provide spring storage so that it is useful as a source of well water supply. The ecological advantage of bamboo plants is also seen in its function in maintaining the stability of the hydrological cycle of water.

Dransfield and Widjaja (1995)[6] said that bamboo planting, especially rope bamboo species, can maintain the stability of the hydrological cycle of water in the surrounding area. Furthermore, Bharati et al., (2002) in Yeny, et al. (2015)[18] said that generally, bamboo plants produce much more litter than other vegetation, so it is very useful in improving soil hydrological properties. Another ecological advantage of bamboo was suggested by Leelatanon et al. (2010)[20] that bamboo can reduce environmental pollution because it absorbs high amounts of nitrogen (N) and carbon dioxide (CO₂). Artiningsih (2012) [21] added that bamboo is known as an efficient fresh air filler because the CO₂ that could be absorbed by bamboo reach 12 tons per hectare, while oxygen (O₂) gas produced is 30% higher than O₂ produced by trees.

Nutritional Advantage

The resources potential of bamboo was also indicated by its nutritional advantage so that it was useful for meeting the nutritional needs of the community, especially in the bamboo production center. The respondents often use young bamboo (bamboo shoots) as vegetables. Young bamboo or bamboo shoots that could be consumed usually at the age of 1-5 months. Febrianto, et al (2012) [22] said that young bamboo is a source of nutrition that is very beneficial for health. Previous nutritional content of bamboo has been suggested by Dharmananda (2004)[23] who said that bamboo has high levels of acetyl choline which is useful for improving brain function, especially in some parts of the plant (for example the top of bamboo shoots). The nutritional content of bamboo, especially the type of rope bamboo completely described by Sujarwo (2010)[24] that in the root and stem part of the rope bamboo contains protein 2.02 and 4.72%; fat 7.78 and 6.71%; ash 11.21 and 4.05%; water 8.51 and 8.51%; carbohydrates 70.49 and 76%; starch 13.07 and 12.18%; fibers 62.67 and 59.21%; and antioxidants 29.91 and 42.88 ppm. Sujarwo (2010)[24] also stated that rope bamboo also contains fatty acids, both saturated fatty acids (palmitic acid, myristic acid, stearic acid) and unsaturated fatty acids (oleic acid) and other compounds (curcumin, limonene). Aromatic compounds such as toluene, naphthalene and 1,3,5-trimethyl benzene were also found.

3.2 Social potency of bamboo

The social potential of the use of bamboo was analyzed by describing the local wisdom of the community about the use of bamboo, as well as the status and social value of bamboo.

Local wisdom about the use of bamboo plants:

Communities around bamboo production centers usually have knowledge and skills that are obtained from generation to generation. Respondents explained that they knew the technicality of bamboo cultivation and the use of bamboo as a food source as well as building materials, and tools inherited from previous parents. Most respondents cultivate bamboo naturally, without using chemicals or using wildy grown bamboo. Hanafi, et al. (2017)[25] suggested the local wisdom of the community in harvesting bamboo where bamboo harvested from mature bamboo, alternately harvested, bamboo was be cut from segment 4, not spent up to the roots so that bamboo can grow back in

a long time. Furthermore, Hanafi, et al. (2017)[25] said that bamboo farmers allow bamboo to grow on their own without fertilizer because they assume that the bamboo produced is stronger, better quality, and resistant to pests. The other use of bamboo which also takes place for generations was the use of bamboo as a natural medicine ingredient. Tengah, et al. (1995)[26], Sujarwo (2010)[23] stated that one of the local wisdoms in Bali Province is the use of rope bamboo types as medicinal ingredients, mainly the roots and stems because they contain carbohydrates, fiber, starch, ash, fat, protein and antioxidants, and water. Other social potential of bamboo plants was to strengthen friendship, and as a source of employment. It was because the use of bamboo as a means of worship and traditional ceremonies, especially for Hindus, (Jong, 2018)[27]. The results study of Yeny, et al. (2015)[18] also showed that socially bamboo management in Bangli District, Bali Province had a strategic role in absorbing employment and regional income by absorbing more than 45% of the workforce and contributing 40% to Gross Regional Domestic Income. Something interested that even though bamboo plants were populist plants, bamboo in the form of building materials and or furniture shows the status and social value of the community. It was stated by Batubara (2002)[28] that bamboo has a status and social value that have deep meaning. It could be explained that the use of home walls and furniture made from bamboo but without a touch of art and high creativity will be considered as a middle to lower class community (the poor group). Meanwhile, if the bamboo diola was made into the walls of the house and the furniture got a touch of art and high creativity and modern technology, it will have the value of eksklusivism so that it was considered as a middle to upper class society (rich group).

3.3 Economy potency of bamboo

The economic potential of the use of bamboo was described as increasing the added value of bamboo plant parts, and the financial feasibility of bamboo products. Based on the survey, it was known that the price of bamboo raw materials was cheaper than wood. However, bamboo could have high economic value if it was used for various needs of life with a touch of modern art and technology. It was in accordance with the results study of Febrianto et al. 2012)[22] that the sustainably managed and use of low-priced bamboo will provide high economic value. Lebang 2016)[2] stated that all plant parts from roots, stems, leaves, flowers, even bamboo shoots can be used for various needs. Thus, bamboo can be used as an alternative even as a main source of livelihood for rural communities in general. Southeast Sulawesi Province as one of the regions in Indonesia with a biological wealth of bamboo, there have been several patterns the use of bamboo that have taken place for generations and have the potential to increase the economic value of bamboo. It could be seen in Table 2.

Table 2. Pattern the use of bamboo, Type of Bamboo, and originating Location

No	Use	The type of bamboo	Originating Location
1	Jampa (Tobacco Drying Tools)	Gigantochloa apus	Paria, Poleang Tengah, Kabupaten. Bombana
2	Chicken confinement	Gigantochloa apus	Tampabulu, Poleang Utara, Kabupaten. Bombana
3	filter, sieve and container for rice	Gigantochloa apus	Welala, Ladongi, Kolaka Timur
4	Curtain and Stalk Broom Stick	Gigantochloa apus, Bambusa blumeana	Wundulako, Kolaka
5	Woven and Binder	Gigantochloa apus	Kondongia, Lohia, Kab. Muna
6	Chicken confinement and Bubu	Bambusa blumeana, Dendrocalamus asper Schult. F. Backer	Anduna, Laeya, Kab. Konawe Selatan
7	Bamboo and Roof Houses	Dendrocalamus asper Schult. F. Backer, Gigantochloa apus	Mata wolasi, Wolasi, Kab. Konawe Selatan
8	Fan, Trash Can and Basket	Dendrocalamus asper Schult. F. Backer, Gigantochloa apus	Telutu Jaya, Tinanggea, Kab. Konawe Selatan
9	filter and woven hat	Gigantochloa apus, Bambusa blumeana	Temporombua, Basala, Kab. Konawe Selatan

Various patterns of existing bamboo use need to be continuously developed with the involvement of various parties. It must be supported by intensive bamboo cultivation to ensure the availability of bamboo raw materials. Thus, the potential of bamboo can be truly explored to realize the sustainable village independence. The pattern of bamboo utilization in the region of Southeast Sulawesi was in accordance with various previous studies. There have been many studies investigating various uses of bamboo for various household, office and industrial purposes. Various uses of bamboo, among others: as building construction materials (walls, roofs, plywood raw materials, bamboo cement boards, wood pellets/bio pellets), household furniture and tools (such as bamboo tables, chairs, beds, dining tables, decorative cupboards and closets, curtains, home decorating accessories, wall, trim, pole, and floor), handicrafts (such as pens, key chains, lamp cups, baskets, bags, hats, Supit), traditional musical instruments (such as flutes, angklung, gambang, calung, kentongan), foodstuffs (such as: beverages, vegetables, chips, flour), also bamboo can be used for the manufacture of charcoal, containers, pulp and paper, food packaging equipment, medicinal raw materials, as well as water transportation (rafts), (Dransfield dan Widjaja 1995)[6], Batubara (2002)[28], Sulastiningsih dan Santoso dkk (2005)[11], Kusuma, (2006)[29], Febrianto, dkk. (2012)[22], Sunardiyanto, (2012)[30], Arsad (2015)[5], Serekat Hijau Indonesia (2017)[7]). The economic potential of bamboo as a construction material was also conveyed by Raj Raj, et al (2014)[13] that bamboo is the best building material for cost

effective housing need. Some processed bamboo products that have the potential to increase the economic value of bamboo but were not yet widely known, among others, were biomass of renewable energy sources, biopesticides, and composite sound absorbers. According to Wang, et al (2011)[31] that the present study demonstrated bamboo biomass in Taiwan was a source couldn't be ignored for bioethanol production. Bamboos are some of the fastest growing plants in the world. While, Sritong, et al (2012)[32] said that bamboo can be an alternative raw material for producing electricity for biomass power plants in Thailand. The use of bamboo as a biomass wa also supported by the results study of Engler, et al (2012)[33] that given the widespread abundance of bamboo, biomass from bamboo might contribute significantly to more sustainable and environmentally friendly alternatives for energy production in China. Increasing the economic value of bamboo through its use as a biopesticide put forward by Frihantini, Increasing the economic value of bamboo through its use as a biopesticide put forward by Frihantini dkk (2015)[34], Cahyanti, dkk (2015)[35] that spring bamboo (Gigantochloaapus Kurz) leaves have allelo chemical compounds such as phenol and flavonoid that able to obstruct other plant growth, so that they have potentiality to be used as bioherbicide. Furthermore, increasing the economic value of bamboo through its use as a composite silencer is based on the results of the Mutia study (2014)[36] which states that epoxy or bamboo fiber composites are able to reduce sound to 97% (at a frequency of 2500 Hz) and lighter (density 0.686 gcm⁻³). Bamboo fiber composite was more environmentally friendly, because it can reduce the use of synthetic fibers and resins. Various Indonesian processed bamboo products not only meet local market demand but have been able to meet international market demand. According to Krisdianto, et al (2014) in Arsad (2015)[5] that bamboo shoots have become international commodities in the global market, such as Japan, Britain, South Korea, Hong Kong and Slovakia. Meanwhile, Bisnis UKM (2012)[37] reported that Indonesian bamboo handicraft products were in great demand by the world market, including Malaysia, Jeddah and Saudi Arabia. Financial feasibility of cultivating bamboo and its processed The economic potential of bamboo plants could be shown from the results of a financial feasibility analysis in terms of bamboo cultivation and processed. The results study of the Khotimah and Sutiono (2014)[38] on bamboo cultivation show that all financial aspects (NPV, Net B/C, IRR, and Payback Period) of bamboo cultivation is feasible. The bamboo cultivation business promises profit, and returns on business capital that can be achieved in the 9th year with a project life of 15 years. Likewise in the business of bamboo use as furniture showed feasibility. According to Adejoba, et al (2016)[14] that the rate of return on bamboo furniture is highly encouraging, this is even slightly above 60% and the Cost Benefit Ratio is above 1, therefore, bamboo furniture production is a laudable and a viable project and a veritable means of employment for youth in the country. Also, Hasamnis, et al (2017)[39] said that the investments of bamboo furniture can be paid back with a year and half if made of order 1 crore, provided all the design factors are favourable. In general, it could be said that bamboo was one of the natural resources that has the potential to be developed to support the village independence. It was

because bamboo was a multi-use and fast-harvesting plant, having various ecological, social and economic advantages. Bamboo was very possible to replace wood or at least can substitute commercial wood for both current and future needs. It was in accordance with the results study of Prajwal, et al (2016)[40] that bamboo is widely recognized as one of the most important non-timber forest resources because of its high tensile strength and socioeconomic benefits with bamboo based products. construction material to reduce the growth of energy consumption. One of the possible solution is to replace steel with bamboo.

4 Conclusion

Based on the result of the research and discusion could be concluded that follows:

- a) Potential use of bamboo from the resources aspect: bamboo has a very wide distribution, especially in the Southeast Asian region. Availability of bamboo is abundant, especially in rural areas. Bamboo also has high adaptability, ecological value, and advantages of physical and nutritional properties.
- b) Potential use of bamboo from the social aspect: human resources can further enhance their local wisdom for sustainable use of bamboo, as well as the value and social status of bamboo for the community.
- c) Potential use of bamboo from economic aspect: bamboo has great potential for increasing economic value through the use of all parts of the plant into various products for meeting community needs. The use of bamboo is a source of livelihood for rural communities that are financially feasible.

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