REBUTTAL

To:
David Hui
Editor-in-Chief
Journal of the Mechanical Behavior of Materials

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled *Mechanical properties of laminated bamboo composite as a sustainable green material for fishing vessel: correlation of layer configuration in various mechanical tests* (Manuscript ID: JMBM-D-22-00075) by Parlindungan Manik, Samuel Samuel, Tuswan Tuswan, Sarjito Jokosisworo, Rossy Kristia Nadapdap for consideration for publication in the Journal of the Mechanical Behavior of Materials. We appreciate the time and effort you and the reviewers have dedicated to providing your valuable feedback on my manuscript. We are grateful to the reviewers for their insightful comments on my paper. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. We have highlighted the changes in blue font colour within the revised manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

Best regards,

Dr. Eng. Samuel

REVIEWER 1

1. Abstract: give 1-2 results (in form of number) of your test conclusion in the end of abstract. Keywords in the text and system are different. Fix this.

   Author response: We have added quantitative result in the revised abstract. The keyword is also updated. The revised version is as follow:

   With the increased emphasis on the need to use recyclable bio-based materials and a better understanding of the mechanical properties of laminated bamboo, there is currently a great deal of interest in developing a new generation of low-cost bamboo-based composites for use in fishing vessels. Laminated bamboo composites (LBCs) comprised of Apus bamboo (*Gigantochloa apus*) and fibreglass mats were investigated to obtain the mechanical characteristics. The LBC with $45^{o}/-45^{o}$ cross-fibre directions combined with chopped strand mat fibreglass was developed under different layers and mass fractions with the same composite thickness. The influence of a different number of laminated bamboo layers (3-7 layers) on several mechanical testing, including impact tests using ASTM D256, bending tests using ASTM D7264, tensile tests using ASTM D3039, V-notched beam test using ASTM D7078, and lap shear tests using ASTM D5868 standard, were carried out. The result showed that strategy in improving the strength properties of LBCs could be achieved by using a thinner bamboo lamina with a higher number of bamboo layers. It was found that bamboo composites with 7 layers with a higher epoxy mass matrix had superior mechanical properties than those with 3 and 5 layers at the same thickness. Another finding revealed that adding fibreglass mat to current LBCs improved mechanical properties compared to previous research, explicitly bending strength increased by about 4.02-7.56% and tensile strength in the range of 12.44-17.73%. It can be found that only specimen with 7 layers fulfills the Indonesian Bureau Classification's bending and tensile strength threshold.

   Keywords: Laminated Bamboo, Composite, Fibreglass mat, Mechanical testing, Fishing vessel

2. Section 1: well done

   Author response: Thank you for the comment

3. Section 2: previous works must be re-arranged in form of table to provide milestone of the pioneer works. Also, based on that, state your state of the art in the end of Section.

   Author response: We have added research landmark in the development of mechanical testing on laminated bamboo in Table. The state of the art is also revised. The updated version is as follow:

Furthermore, based on the past research, it can be inferred that producing LBCs under the BKI standard is crucial in improving the use of bamboo as a green material for the traditional fishing vessel in Indonesia. Based on the review, bamboo types, the number of laminas, material configurations, and adhesive types are critical parameters for achieving a high strength of LBCs. Besides that, combining LBCs with other material combinations to achieve better mechanical strength is interesting to be studied. To further investigation, incorporating fibreglass mat layer into LBCs established earlier by Manik et al. [1] needs to be analyzed using a similar specimen arrangement and testing approach. This study is crucial to increasing the mechanical properties of LBCs to achieve the minimum threshold given by the BKI standard. In this case, adding a fibreglass mat layer to the mechanical behavior and characteristics of LBCs with $45^o/-45^o$ layer orientation will be examined by employing a variety of layer numbers and mass fractions. Several mechanical tests will be employed to conduct a comparative analysis of mechanical behavior due to adding the fibreglass mat layer under three layer configurations with different mass fractions.

Table 1. Research landmark on the experimental testing development of laminated bamboo composites (LBCs)

Milestone	Author(s)	Material selection	Notable remarks
2012	Verma & Chariar [5]	Green bamboo - epoxy resin	• Tensile and compressive properties of LBCs decreased with an increase in lamina angle.

		adhesive material	
2014	Rassiah et al. [17]	Buluh semantan bamboo - unsaturated polyester	• When pure bamboo and laminate composition were combined in a composite with unsaturated polyester, the mechanical qualities of the inner, middle, and exterior portions improved. • The middle bamboo part's performance improved when the thickness was increased. • The strength increases as the bamboo strip thickness increased. The laminated unsaturated polyester/bamboo strip composite offered better mechanical qualities than pure bamboo.
2015	Supomo et al. [11]	Ori bamboo - polyamide epoxy adhesive material	• With increasing height, the stalk diameter and thickness of the bamboo skin decreased. • As the material obtained higher up the stork, the bending strength of the laminated slats decreased.
2018	Supomo et al. [15]	Betung laminated bamboo – four adhesive layer types	• The strength level of adhesiveness in manufacturing bamboo laminate composite used four types: Resorcinol Phenol Formaldehyde, Epoxy Polyamide EWA120, Urea Formaldehyde UA-181, Epoxy Polyester 157 BQTN

			• Based on the tape test methods A & B and pull-off test, the highest strength was Epoxy Polyamide EWA120
2018	Manik et al. [18]	Apus bamboo-Meranti wood – epoxy resin adhesive material	• Variations in a material percentage had a significant impact on tensile strength but not compressive strength. Mechanical properties decreased as the decrease of percentage of meranti wood.
2019	Manik et al. [7]	Apus and Betung bamboo – epoxy resin adhesive material	• Betung bamboo laminates had higher tensile and compressive strength than Apus bamboo laminates.
2019	Amatosa et al. [16]	Dragon bamboo – epoxy resin adhesive material	• The interaction of laminated bamboo composites with sea water affected their physical and mechanical properties. The mechanical properties of laminated bamboo composites degraded as the time spent immersed in seawater increased. • The percentage of water content in the composite specimen increased, causing the interface bond between the fibre layers that held the composite together to weaken.
2020	Rindo et al. [19]	Betung bamboo – polyvinyl	• The glue interface affected the bond strength of the laminated bamboo interface at each cm^2. Bamboo with

		acetate adhesive material	perpendicular direction array fibres, rather than parallel arrangement, brick, or woven, had the highest glue interface value per cm^2 with the same total volume of composites in each specimen.
2021	Manik et al. [8]	Apus bamboo – epoxy resin adhesive material	• The increase in the duration of immersion in seawater caused a decrease in the mechanical strength of laminated composites
2021	Manik et al. [1]	Apus bamboo – epoxy resin adhesive material	• LBC with thinner bamboo lamina reinforcement and more layers had the highest tensile and bending strength. • The tensile and bending strengths of LBCs with laminates oriented 0° were higher than those of LBCs with laminates structured 45°/-45° and 0°/90°.

4. Avoid & in the text. This is informal, except it is part of trademark etc.
   Author response: We have changed "&" with "and" in entire manuscript

5. Section 3: Authors have to clarify how the bamboo is obtained? is it from wild forest? farmer? it has to be provided to ensure credibility of specimen resources.
   Author response: We clarify the bamboo is harvested from existing natural forests in Getasan Area, Salatiga Regency, Indonesia. We have updated in the Section 3.1.1.

   Bamboo was collected and harvested from existing natural forests in Getasan area, Salatiga Regency, Central Java, Indonesia

6. Be consistent when you write degree symbols. Some of them correct, and some of them using 0 and apply superscript on it.

   Author response: We have fixed degree symbol from " ^{0} " replaced with " ^{o} ". The changes have been highlighted in blue.

7. Check how kilo was written. Kilo is shortened into k not K.

   Author response: We agree with your suggestion. We have changed "KN" with "kN".

8. What is Justus Kimiaraya? All substances have to be clarified where they were obtained. Location is including city and country name.

   Author response: We have changed into: Justus Kimiaraya, Semarang, Indonesia.

9. What is UNDIP? All abbreviations must be clarified before they are used.

   Author response: We have changed into: Diponegoro University, Indonesia

10. Make sure to put details of the testing instrument, including series, manufacturer, city and country.

    Author response: We have added the testing instrument with series, manufacturer, and city. The changes are as follow:

    Universal Testing Machine (UTM) type WE-1000B, Yufeng, Zhejiang, China

    The Charpy impact machine Model DB-300A, Dongguan Hongtuo Instrument Co., Ltd, Dongguan, China

11. Section 4: Some place using comma (,). Is it correct? International standard uses (.) as comma to note the decimals.

    Author response: We have revised all decimal number use International standard uses (.)

12. In Figure 9, the test results show that acceptance criterion are not fulfilled. How the authors explain this negative results?

    Author response: This study aims to improve the mechanical characteristic of 45^{o}/-45^{o} layer orientation bamboo-composite by adding fibreglass mat. In a previous study, as depicted in

Figure 8, only specimens with 45°/-45° layer orientation did not fulfill the BKI threshold. Based on this investigation, the mechanical testing, in this case, is focused only on 45°/-45° layer orientation. Figure 9 shows the result of tensile strength due to the addition of fibreglass mat layer at 45°/-45° layer orientation. It was analyzed that the highest tensile strength was found in the laminated bamboo specimen with 7 layers at a value of 98.1 MPa (above threshold). Specimens with 3 and 5 layers had a tensile strength of about 84.92 MPa and 91.08 MPa (lower threshold). Adding fibreglass mat layers into a bamboo composite with 7 layers improves tensile strength and achieves the tensile strength threshold.

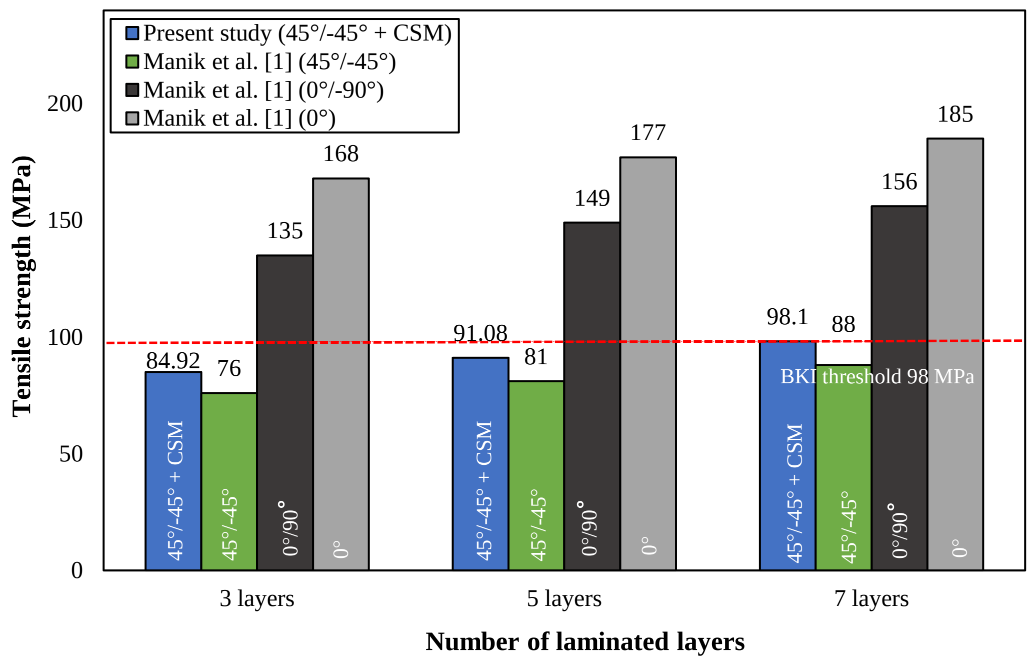

Figure 8. Comparison of tensile strength results under a different number of layers.

13. Criteria is plural. In this context, authors only used one criterion, i.e., tensile criterion. Re-check the English writing to the professional proofreader, and provide certificate as proof that this manuscript has been checked.

Author response:

Thank you for your valuable comment. We have changed with singular noun: criterion. Besides that, we have rechecked the grammatical structure and error of the whole revised manuscript by professional English services. The authors ensure the readability of the article has improved. The proofreading certificate is as follow:

CERTIFICATE OF PROOFREADING

NO: 072/ER/PR/06/2022

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Manuscript Title:

Mechanical Properties of Laminated Bamboo Composite as a Sustainable Green Material for Fishing Vessel: Correlation of Layer Configuration in Various Mechanical Tests

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Date Issued:

June 25, 2022

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14. Are there no criteria for shear and impact test? if BKI does not provide it, authors can adopt other classifications regulations.

Author response: We have added the acceptance criterion of the impact test based on the BKI standard (150 MPa). However, we assume there is still no available criterion for V-notched beam and lap shear tests for laminated bamboo available for ship structure. The available foreign bureau classification has not yet regulated bamboo laminate for ship structure. In this case, we have added a lap shear test to determine the bonding behavior of the adhesive layer. V-notched beam and lap shear tests are conducted only to evaluate the shear behavior of composite. The updated impact testing result with the given BKI threshold is depicted in Figure 10, and lap shear is depicted in Figure 11.

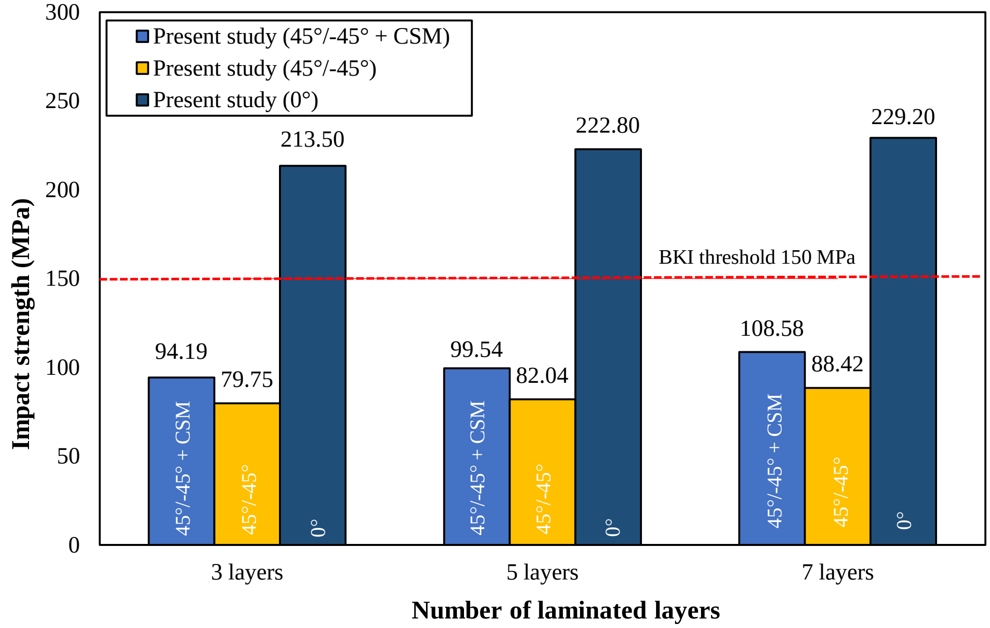


Figure 10. Comparison of impact test results under different laminated layers.

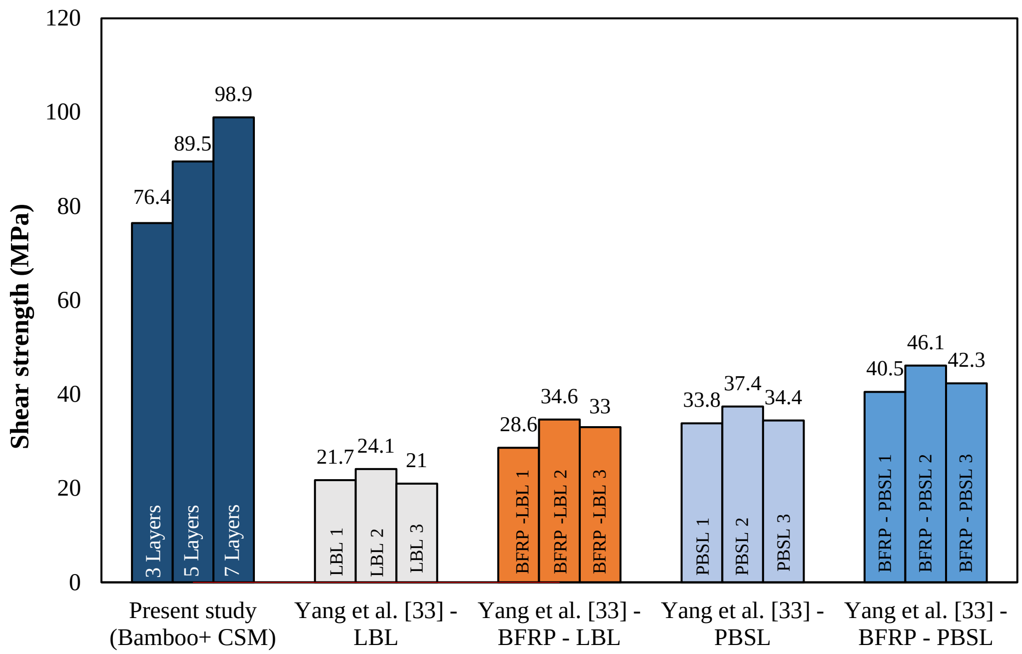


Figure 11. V-notched beam test results under a different number of layers.

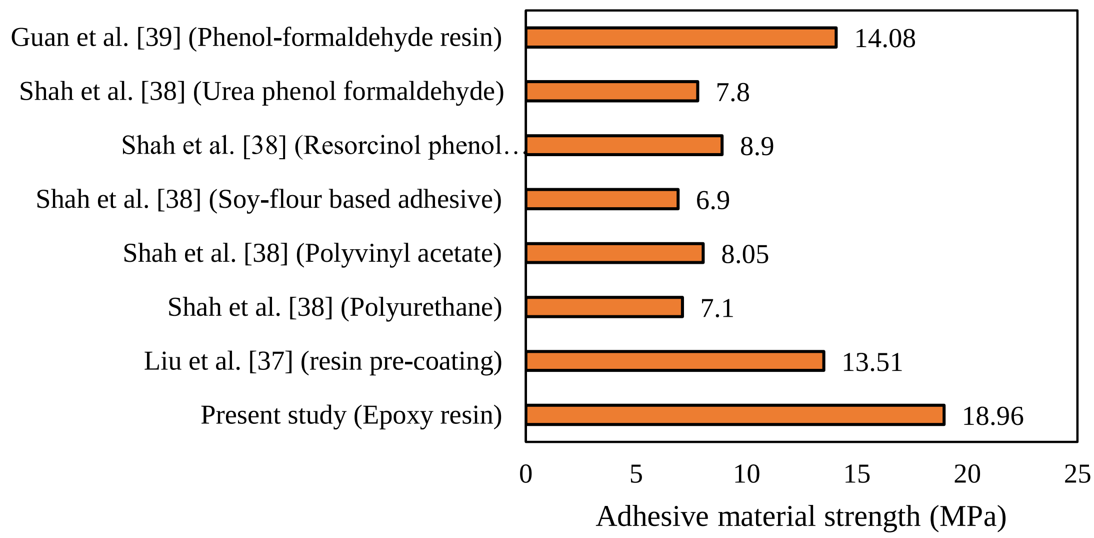


Figure 12. Lap shear test results under a different type of adhesive material.

15. Section 5: Add recommendation for future works regarding findings of your work.

 Author response: We have added a recommendation for future works in the conclusion. The updated conclusion is as follows:

 Based on this study, it is presumed that this work could become a topic for future research. One possibility is to conduct an experimental study to determine the effect of various adhesive or glue types/specifications and joint types on adhesive strength. A scantling calculation and economical aspect for build fishing vessel is also an option that should be considered in future work.

16. References: Cite papers from JMBM.

 Author response: We agree with your suggestion. We have cited 4 papers from JMBM which support our literature study and research methodology.

 - Akinyemi, BA, Omoniyi TE. Effect of experimental wet and dry cycles on bamboo fibre reinforced acrylic polymer modified cement composite. J Mech Behav Mater. 2020;29(1):86-93.

- Hassoon O, Abed M, Oleiwi J, Tarfaoui M. Experimental and numerical investigation of drop weight impact of aramid and UHMWPE reinforced epoxy. J Mech Behav Mater. 2022;31(1): 71-82.
- Prabowo AR, Tuswan T, Adiputra R, Do Q, Sohn J, Surojo E, Imaduddin F. Mechanical behavior of thin-walled steel under hard contact with rigid seabed rock: Theoretical contact approach and nonlinear FE calculation. J Mech Behav Mater. 2021;30(1):156-170.
- Kathavate V, Amudha K, Adithya L, Pandurangan A, Ramesh N, Gopakumar K. Mechanical behavior of composite materials for marine applications – an experimental and computational approach. J Mech Behav Mater. 2018;27(1-2):20180003.

REVIEWER 2

1. The author needs to explain some of the questions and recommendations that have been written in the attached file.

   Author response: Thank you for your valuable comments and reccomendations in order to improve our manuscript. We have tried our best to revise our manuscript according to the comments.

2. Previous research procedures should be explained to be able to compare with the results of this paper.

   Author response: We have conducted the study based on the problem stated in a previous study by Manik et al. [1]. A previous study analyzed the influence of mechanical behavior of different layer orientations (0^o, 90^o, and 45^o) using three compaction pressure (1.5 MPa, 2 MPa, and 2.5 MPa). They found that only 45 ^{o} layer orientation can not fulfill the BKI threshold. So, we focused our research on the effect of adding fiberglass mat (CSM) in specimens with 45^o layer orientation. We confirm that the material manufacture and testing procedure used in this study is similar to Manik et al. using the compaction pressure method.

   The comparative analysis of tensile and bending test results between the present study and the previous study is depicted in Figures 6 – 9.

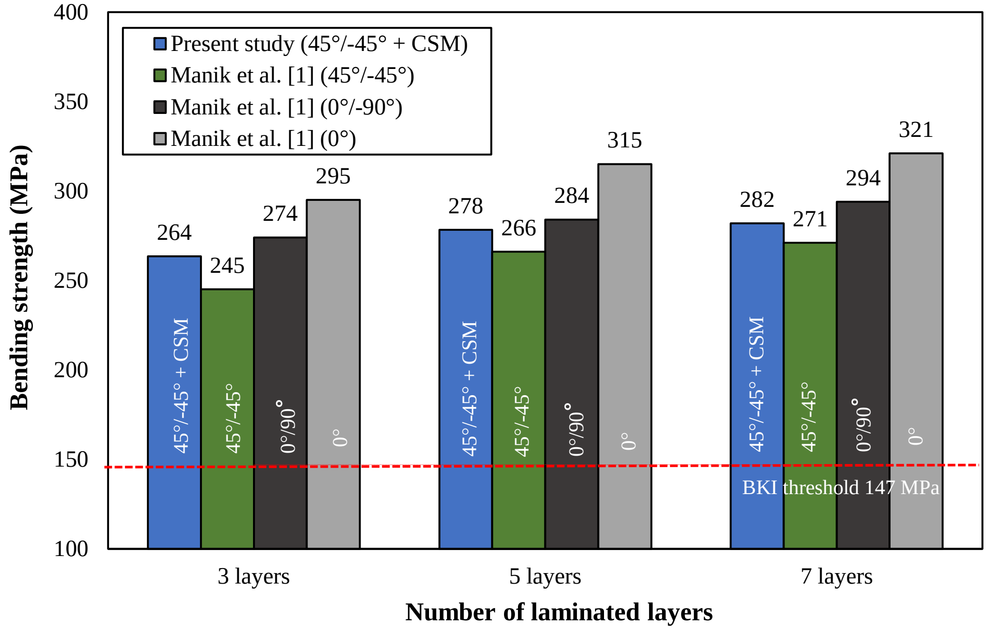


Figure 6. Comparison of bending strength under a different number of layers.

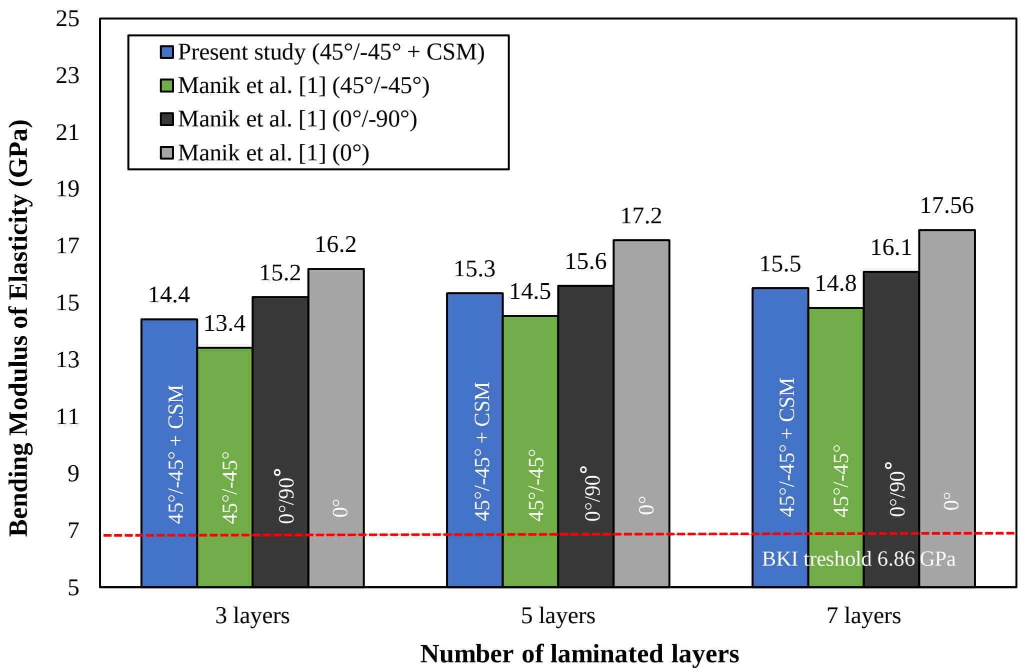


Figure 7. Comparison of bending modulus under a different number of layers

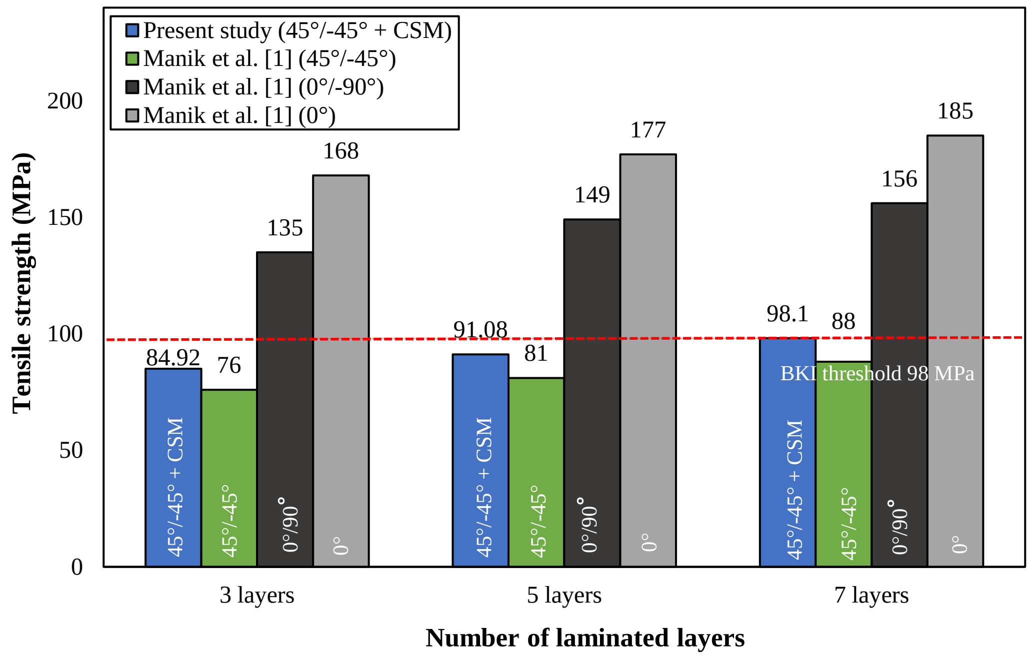


Figure 8. Comparison of tensile strength results under a different number of layers.

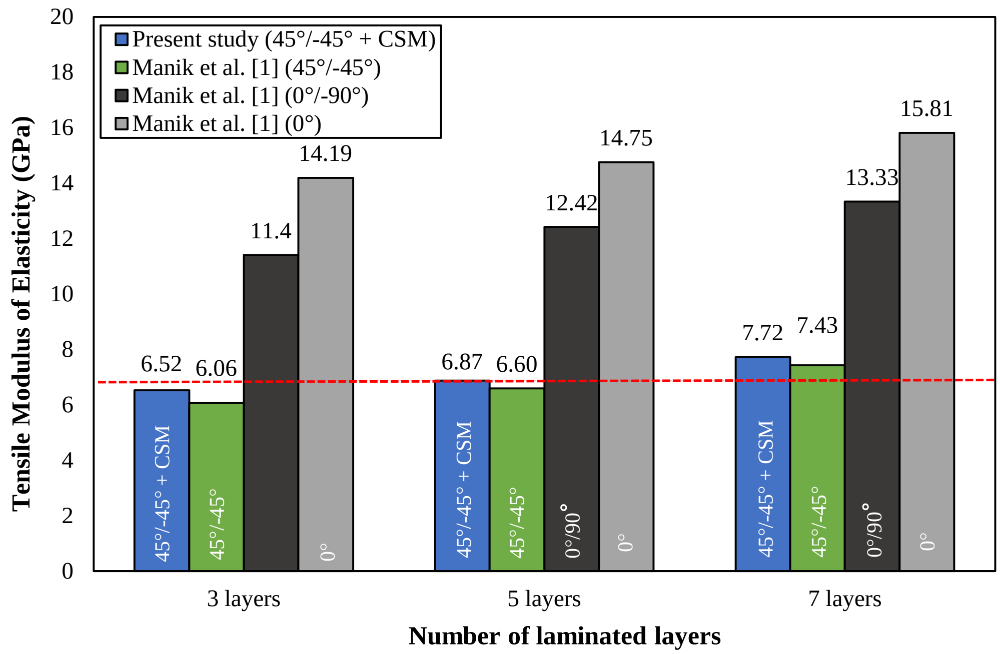


Figure 9. Comparison of modulus of elasticity (MOE) results under a different number of layers

3. In addition to mechanical properties, the author must explain in detail its implementation for the manufacture of a ship.

   Author response: We agree with your good idea. The implementation for manufacturing a ship is vital to be briefly highlighted in Section 4.6.

4.6 Future studies suggestion on the manufacture strategy for fishing vessel structure

Following a series of mechanical tests to develop the basic mechanical properties of laminated bamboo composite, the implementation for manufacturing a ship structure must be investigated. The compaction pressure method is used to manufacture laminated bamboo. This method employs thin laminated bamboo that is arranged and glued together to create a bamboo board of a specific dimension and thickness. To improve adhesive strength between layers, a cold press machine was used to press bamboo board. Based on the findings of this study, it is possible to conclude that laminated bamboo has greater strength.

Several bamboo boards can be joined together using mechanical joints to produce a large panel in the ship structure manufacturing technique. Laminate joints are divided into two types: solid jointed boards and connecting boards made of intact sawn wood. A non-solid jointed board is a connecting board made up of joined connecting slats or short sawn wood. There are five different types of connecting blades and connecting boards: butt joints, finger joints, scarf joints, tongue and groove joints, and desk joints. Figure 13 depicts five different types of joints. Future investigation on the joint strength of laminated bamboo composite is a crucial aspect.

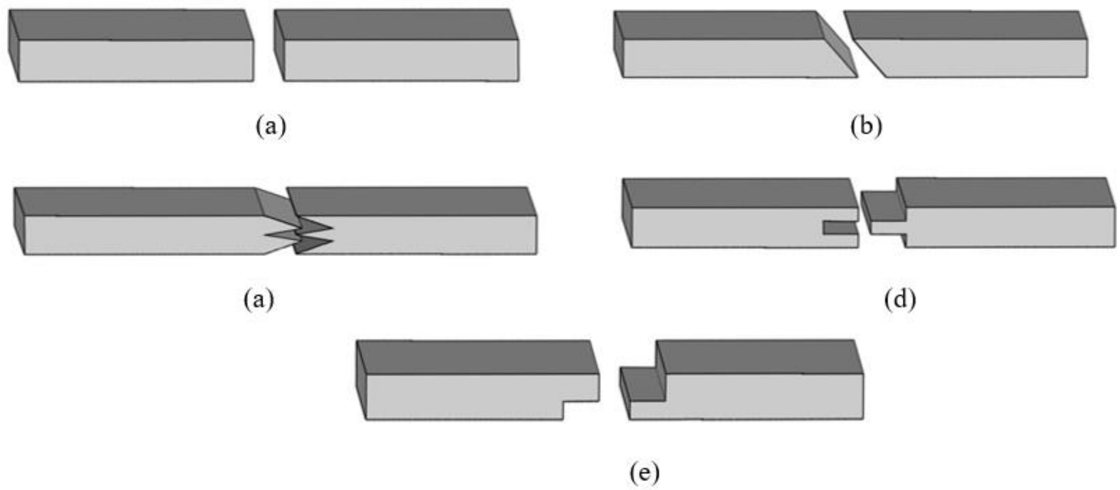


Figure 13. Joint types of laminated composite (a) butt joint, (b) scarf joint, (c) finger joint, (d) tongue and groove joint, (e) desk joint

In the early stages of development, flat-based typical structures such as decks, walls, and superstructure members, among others, are better suited to this manufacturing technique. Further, developing curved-based bamboo boards can be a more difficult process with complex manufacture technique. For example, flat bamboo boards can be arranged and then joined together to create a deck with specific scantling calculation. The values of tensile strength, flexure, and modulus of elasticity collected from mechanical testing are variables in determining the size of the fishing vessel construction components in the scantling calculation. The size of ship construction components such as the shell, deck, wall, stiffener, and et al. is determined using the BKI standard [40].

4. The number of code must be stated

   Author response: We have added the ASTM code for each testing in abstract. The updated abstract is as follow:

   With the increased emphasis on the need to use recyclable bio-based materials and a better understanding of the mechanical properties of laminated bamboo, there is currently a great deal of interest in developing a new generation of low-cost bamboo-based composites for use in fishing vessels. Laminated bamboo composites (LBCs) comprised of Apus bamboo

(*Gigantochloa apus*) and fibreglass mats were investigated to obtain the mechanical characteristics. The LBC with $45^o/-45^o$ cross-fibre directions combined with chopped strand mat fibreglass was developed under different layers and mass fractions with the same composite thickness. The influence of a different number of laminated bamboo layers (3-7 layers) on several mechanical testing, including impact tests using ASTM D256, bending tests using ASTM D7264, tensile tests using ASTM D3039, V-notched beam test using ASTM D7078, and lap shear tests using ASTM D5868 standard, were carried out. The result showed that strategy in improving the strength properties of LBCs could be achieved by using a thinner bamboo lamina with a higher number of bamboo layers. It was found that bamboo composites with 7 layers with a higher epoxy mass matrix had superior mechanical properties than those with 3 and 5 layers at the same thickness. Another finding revealed that adding fibreglass mat to current LBCs improved mechanical properties compared to previous research, explicitly bending strength increased by about 4.02-7.56% and tensile strength in the range of 12.44-17.73%. It can be found that only specimen with 7 layers fulfills the Indonesian Bureau Classification's bending and tensile strength threshold.

Keywords: Laminated Bamboo, Composite, Fibreglass mat, Mechanical testing, Fishing vessel

5. The explanation of the use of CSM in this composite material must be given technical reasons, mainly about the rigidity of the composite matrix

   Author response: We have added technical reasons and mechanical properties of CSM used in this study. The updated Section 3.1.2 is as follows:

3.1.2 Fibreglass chopped strand mat (CSM)

Chopped Strand Mat, also known as fibreglass mat, comprises short fibre strands held together by a resin binder. It is inexpensive and frequently used in moulding construction and parts requiring thickness. CSM easily conforms to tight curves and corners. The random orientation of the fibres provides equal stiffness in all directions. This material is relatively lighter than wood (72% compared to wood), more straightforward, non-corrosive, and easy to maintain. In this case, the selection of this material is intended to increase the mechanical strength of laminated bamboo without increasing the density excessively. CSM is a non-woven mat composed of glass filaments that consist of chopped fibres that are randomly and equally oriented. The randomly distributed fibres have an average diameter of approximately 13-15 μm, around 5 cm in length, and an area density of 450 g/m^2. The specification of CSM fibre is presented in Table 2. The CSM fibres were covered with a silane coupling agent and kept together with an emulsion binder. The type used was a fibreglass CSM collected from Justus Kimiaraya, Semarang, Indonesia. CSM fibres are especially well-suited for hand lay-up processes employing Thermoset resin systems to produce a wide range of ship materials.

Table 2. CSM fibre specifications [23]

Parameter	Value
Fibre diameter (μm)	10–20
Fibre length (mm)	25–50
Tensile modulus (GPa)	71
Aspect ratio	2500

6. The adhesiveness of epoxy resin should be expressed dan proven (MPa)

Author response: We have conducted additional mechanical testing to measure the bonding strength of the Epoxy adhesive layer. We have conducted a lap shear test based on the ASTM D5868 standard. The results of the present lap shear test and previous work are presented in Section 4.5 as follows:

4.5 Result of a lap shear test under a different number of bamboo layers

Adhesive bond strength is one of the most critical measures when comparing different formulations of LBCs. In this case, a lap shear test was conducted to measure the bonding strength of the epoxy adhesive layer. Based on data in Figure 12, the bonding strength of the epoxy adhesive joint between two engineered bamboo was 18.96 MPa. In the previous investigation by Liu et al. [37], the bonding properties between engineered bamboo and steel substrates had a lower value of about 13.51 MPa. They used Commercial Selleys Araldite Super Strength bicomponent epoxy (New South Wales, Australia) as adhesive material. Shah et al. [38] compared five commercial adhesive materials for adhesion testing of laminated bamboos, such as polyurethane (PU: Purbond, Henkel, Switzerland), polyvinyl acetate (PVA: Lumberjack wood adhesive, Everbuild, UK), soy-flour based adhesive (Soy: Soyad, Solenis, USA), resorcinol phenol formaldehyde (RPF: Polyproof, Polyvine, UK), and urea phenol formaldehyde (UPF: Cascamite, Polyvine, UK). The investigation showed that the resorcinol phenol formaldehyde adhesive type had the highest bonding strength of other adhesive types. Moreover, Guan et al. [39] explored another type of resin and analyzed the bonding strength of laminated bamboo using phenol-formaldehyde resin with a maximum bonding strength of about 14.08 MPa. Based on this investigation, it can be summarized that each adhesive/ glue type for bamboo joint has different bonding strength.

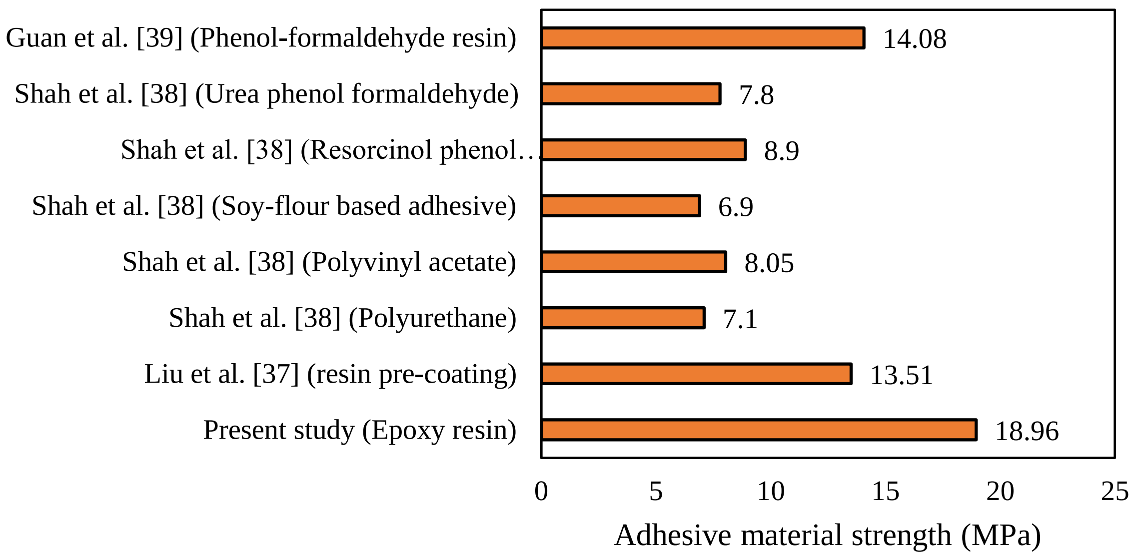


Figure 12. Lap shear test results under a different type of adhesive material.

7. According to my research experience, variations in the direction of bamboo fiber have no effect on tensile strength, flexure, and impact. Logically 45 degree of bamboo fiber direction will not increase the mechanical properties. How the lamination configuration in previous studies needs to be compared with this study.

   Author response: Based on our knowledge and opinion, we assume that the direction of bamboo fibers/ layer orientations influences the strength of laminated bamboo. The laminated composite bamboo structure is regarded as orthotropic material, whose mechanical properties are mutually independent in the three orthogonal directions. Unlike many other isotropic materials, the polymers do not demonstrate the same deformation characteristics for tension and compression.

So comparative assessment on the strength of different layer degrees needs to be addressed. Based on our previous investigation by Manik et al. [1], the strength of laminated bamboo depends on the testing scheme/ direction. The tensile and bending strength has a different value depending on layer orientation/ axis (0 degree, 45 degree, 90 degree). In previous study [1], we found that the LBCs with laminates oriented 0° exhibited greater tensile and bending strengths than the LBCs with laminates structured –45°/+45° and 0°/90°. Also, fracture mechanism has different behavior. The LBCs with the 0° laminates direction have matrix fracture followed by lamina fracture. In contrast, fracture in the matrix is followed by delamination in the 90° and 0° laminates direction.

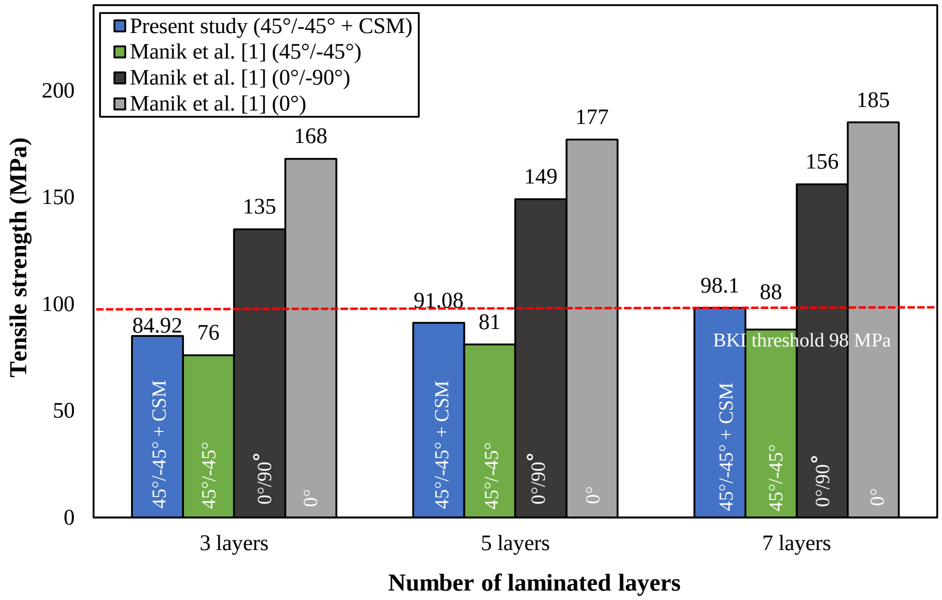
In addition, in the revised manuscript, we compare the bending and tensile tests with the previous study which is depicted in Figures 6 -9.

8. Having seen the results of this material test, I was amazed and suspicious at the same time. Is it true that the tensile strength of this composite is that high?

   Author response: We assume that the strength of laminated bamboo is different based on the type of bamboo and configuration, mass fraction and manufacturing technique. We use Apus bamboo and fiberglass mat with epoxy adhesive layer in this case. The manufacturing technique is also different, and we use compaction pressure at 2 MPa to increase the bonding between bamboo lamina. The result of tensile strength is depicted in the Figure below. As seen in the figure, the tensile strength varies with layer configurations. Rassiah et al. reported using the red semantan (*Gigantochloa scortechinii*) bamboo species, woven bamboo fibre was able to produce a maximum tensile strength of 89 MPa. Supomo et al. [1] also studied the mechanical properties of different types of bamboo (Arudinacea, asper, and apus bamboo). They found that the bending strength value is in the range of 117 – 158 MPa).

   Source: Supomo et al.: https://iopscience.iop.org/article/10.1088/1755-1315/972/1/012040

   Rassiah et al. : https://www.sciencedirect.com/science/article/abs/pii/S0261306914000089

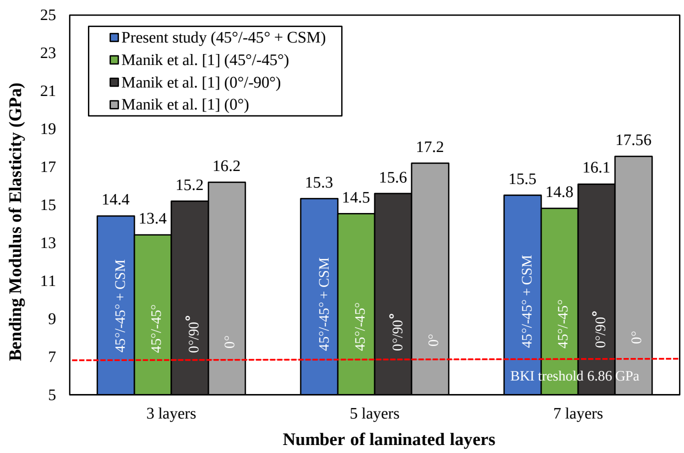


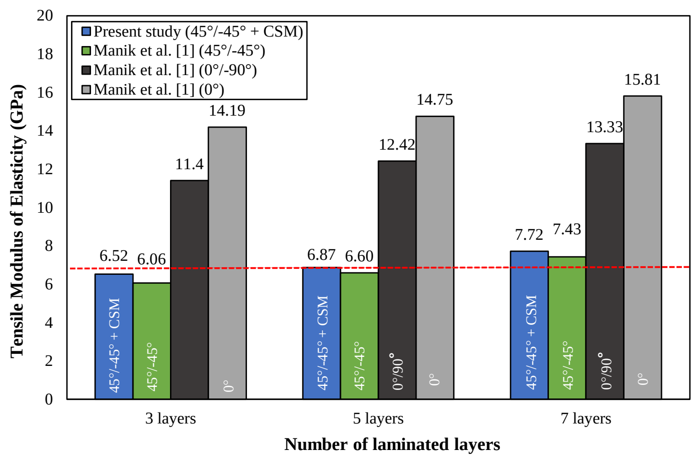
9. Tensile modulus and bending modulus should not be much different. Why are the results of this experiment so much different? Please explain in detail!

   Author response: We assume the laminated composite bamboo structure is regarded as orthotropic material whose mechanical properties are mutually independent in the three orthogonal directions. Unlike many other isotropic materials, the polymers do not demonstrate the same deformation characteristics for tension and compression. Based on Mujika et al. One of the basic hypotheses of the Classical Beam Theory (CBT) is that the tensile and compressive moduli are the same. In fiber-reinforced composites, tensile and compressive moduli are different. The difference between tensile and compressive modulus results in the neutral surface in bending not being in the centre area of the cross-section. Therefore, strain and stress distributions in flexure vary with respect to CBT.

   Source: https://www.sciencedirect.com/science/article/abs/pii/S0142941806000948

   The comparison of tensile and bending modulus of the present study is depicted below:





In the investigation by Supomo et al., who analyze the strength behavior under different types of bamboo, the bending modulus and tensile modulus are also different. The comparison is stated below:

Source: https://iopscience.iop.org/article/10.1088/1755-1315/972/1/012040

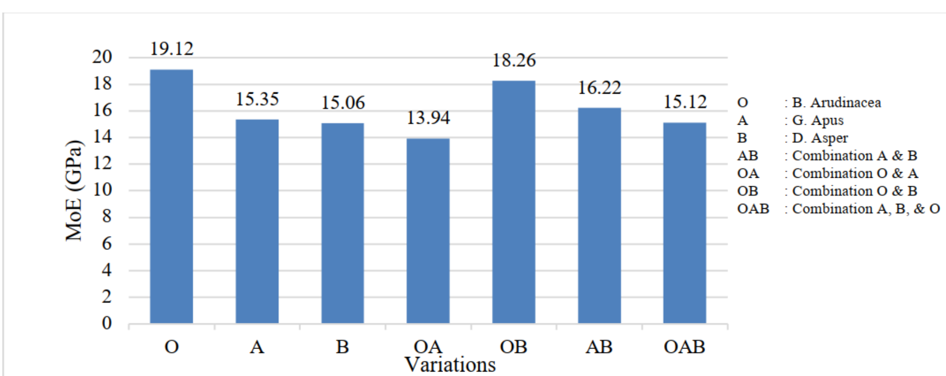


Figure. Tensile modulus

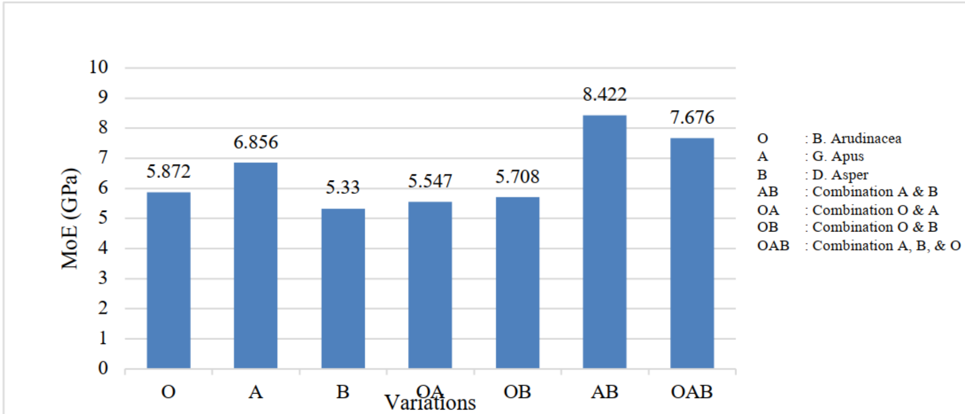


Figure. Bending modulus

10. Therefore, the glue specification must first be proven for its adhesive strength before conducting experiments on composite materials.

Author response: We definitely agree with your suggestion. We have conducted a lap shear test to measure the bonding strength of the adhesive layer. The result can be seen in Section 4.5. Figure 12 shows lap shear test result.

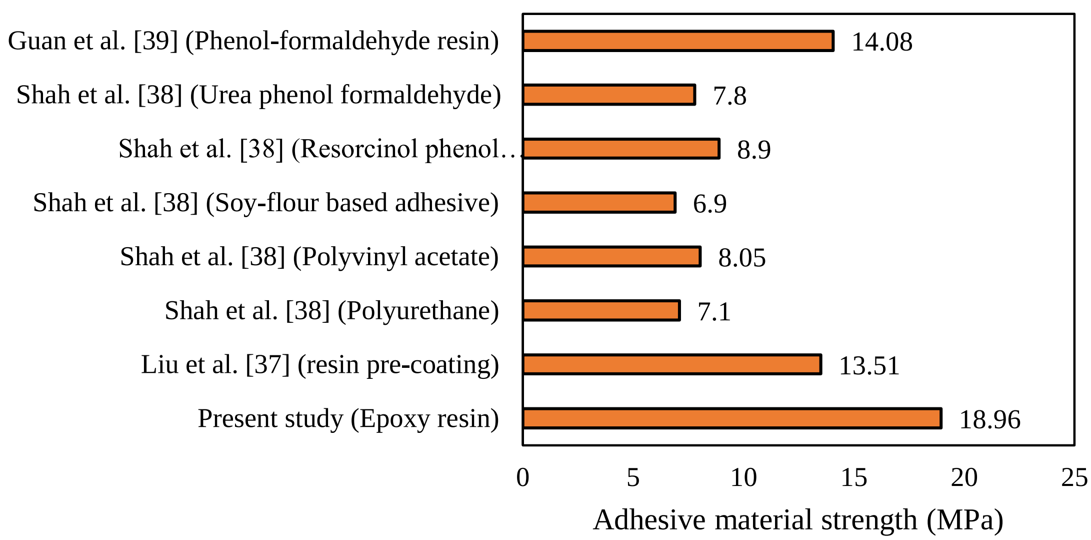


Figure 12. Lap shear test results under a different type of adhesive material.

11. What is the function of impact strength and shear strength in ship construction, please explain their relationship with loading on the ship!

Author response: Thank you for your valuable recommendation. Impact test is used when ship structure experiences impact load due to ship collision, ship-jetty collision, ship-bridge collision, slamming phenomenon etc. Moreover, lap shear test is used to measure bonding strength of epoxy adhesive layer. It is important to be investigated since the epoxy adhesive is the weakest material in laminated bamboo composite. When ship structure under tension load. The bonding strength is a crucial parameter in order to define the integrity of the structure. We have added the those explanation in the revised version.

12. It should also be noted in the case of boat construction with bamboo composite materials. If the layer thickness is only 2mm, it will be very difficult to apply and require very large production man-hours. In addition, it should also be explained that this material will be more suitable for which ship construction member?

    Author response: We realize that our research development is still in the basic study. In the research, we have characterized the laminated bamboo composite to measure the physical and mechanical properties under different types of bamboo, layer configuration, lamina thickness, etc. The research regarding how manufacturing techniques are to be applied in ship structure and production cost becomes our further research in the near future. For further study, we stated the recommendation in Conluding Remark section. The explanation of the suitable structure for this developed method is stated in Section 4.6 Future studies suggestion on the manufacture strategy for fishing vessel structure