

Sustainable Design As An Effort To Develop Bali Special Woven-Bamboo Packaging

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The Bali Provincial Government through PERGUB (Governor Regulation) Number 97 of 2018 has regulated the Limitation of Disposable Waste Generation. The implementation of these regulations has been implemented among Small and Medium Industries (IKM) that produce Balinese souvenirs. The IKM sector has begun to switch to using bamboo packaging, which is commonly used to package *banten pejati* (Balinese traditional offerings) sold in traditional markets. However, this condition causes the appearance of food packaging designs that package Balinese souvenirs to look uniform, lacking a touch of local Balinese culture that can be used as an identity for Bali's superior products branding to tourists. This creation aims to design bamboo packaging as Balinese souvenir packaging which has the concept of eco-friendly design. The research method was used to formulate the motif design concept and the method of creation to design the bamboo packaging design by adopting the woven bamboo technique at the bamboo craft center in Bali. The novelty of this bamboo packaging design can be seen in the motif design inspired by *Geringsing Cemplong* weaving motif which is formed with the woven bamboo technique. This motif has never existed before and is able to represent the identity of the local Balinese culture. The color material used as paint is a natural color material. Derived from mixing mango leaves and strobilanthes/indigo leaves through an environmentally friendly process to produce a green color. The creation of environmentally friendly bamboo packaging is expected to inspire woven-bamboo craftsmen to start switching to environmentally friendly products that are safe to use in food packaging.

Keywords: Bamboo Packaging, Sustainable Design, Woven, Bali

Desain Berkelanjutan Sebagai Upaya Pengembangan Kemasan Anyaman Bambu Khas Bali

Pemerintah Provinsi Bali melalui PERGUB Nomor 97 Tahun 2018 telah mengatur tentang Pembatasan Timbulan Sampah Sekali Pakai. Implementasi peraturan tersebut sudah diterapkan di kalangan Industri Kecil Menengah yang memproduksi makanan oleh-oleh khas Bali. Sektor IKM mulai beralih menggunakan kemasan besek bambu yang biasa digunakan untuk mengemas *banten pejati* dijual di pasar-pasar tradisional. Namun kondisi ini menyebabkan tampilan desain kemasan makanan untuk mengemas oleh-oleh khas Bali terlihat seragam, kurang ada sentuhan budaya lokal Bali yang dapat dijadikan identitas sebagai branding produk unggulan Bali kepada wisatawan. Penciptaan ini bertujuan untuk merancang desain kemasan bambu sebagai kemasan oleh-oleh khas Bali mengusung konsep eko desain yang ramah lingkungan. Metode riset digunakan untuk merumuskan konsep desain motif dan metode penciptaan untuk merancang desain kemasan bambu dengan mengadopsi teknik anyaman bambu di sentra kerajinan bambu yang ada di Bali. Novelty dari perancangan kemasan bambu ini dapat dilihat dari desain motif dengan sumber inspirasi motif tenun *geringsing cemplong* yang dibentuk dengan teknik anyaman bambu. Motif ini belum pernah ada sebelumnya dan mampu mewakili identitas budaya lokal Bali. Bahan warna yang digunakan sebagai cat adalah bahan warna alam. Berasal dari pencampuran daun mangga dan daun strobilanthes/indigo melalui proses ramah lingkungan sehingga menghasilkan warna hijau. Penciptaan kemasan bambu ramah lingkungan diharapkan dapat menginspirasi para perajin anyaman bambu untuk mulai beralih ke produk ramah lingkungan yang aman digunakan mengemas makanan.

Keywords : Kemasan Bambu, Desain Berkelanjutan, Anyaman, Bali

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Received: August 6, 2022; Accepted October 20, 2022; Published October 27, 2022

<https://doi.org/10.31091/mudra.v37i4.2112>

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INTRODUCTION

Policies to reduce waste generated from the use of packaging materials and improve resource efficiency have been targeted by governments around the world through the 17 sustainable development goals set by the United Nations (UN) in 2015 (Schmidt Rivera et al., 2019). UN Sustainable Development Goal 12 with the title responsible consumption and production specifically highlights that efficiency in the responsible use of natural resources and recycling of waste is an important target to be achieved (<https://sdgs.bappenas.go.id/tujuan-12>). The use of plastic waste as packaging has produced 8.3 billion tons of plastic since the 1950s, 9% has been recycled, 12% is burned and the remaining 79% pollutes the environment (Zaman & Newman, 2021). Food packaging made of plastic is the largest contributor to waste, but on the other hand, the use of plastic packaging has the potential to protect and prolong the packaged food product (Schmidt Rivera et al., 2019). Based on a study by Sustainable Waste Indonesia on the value chain and recycling in 2017 in connection with the condition of Indonesia's waste flow, it was found that the second largest percentage of waste components is plastic waste at 14%, organic waste at 60%, paper waste at 9%, metal waste at 4.4 % and other waste such as glass, wood, and other materials at 12.7% (Kubonbody, 2019).

The phenomenon of the use of plastic waste as a packaging material is currently a global issue in the midst of the many negative impacts it causes, giving rise to policies for implementing a sustainable packaging system, in order to achieve a free-from-plastic-waste environment and to preserve a maintained environmental ecosystem (Trubetskaya et al., 2022). The world community is starting to think of various solutions to problems as a result of the use of plastic packaging materials. Environmentally friendly packaging materials that can be decomposed into alternative packaging materials are being developed and are becoming a current trend (Granato et al., 2022). The use of environmentally friendly and biodegradable packaging materials has received a positive response from consumers compared to single-use flexible packaging (Steenis et al., 2018). Environmentally friendly packaging according to consumer perception can be classified into three groups as follows: packaging materials, technology in the manufacture of environmentally friendly packaging, and visual appeal through packaging design elements. Therefore, this category can be used as a foothold in developing a sustainable packaging

design strategy (Nguyen et al., 2020). The use of environmentally friendly packaging materials has an important role in shaping consumer perceptions, especially regarding the concept of sustainable design, and is able to influence the taste quality of packaged products. The packaging is designed not only to fulfill the function to protect the product, but it is necessary to pay attention to the design of the packaging graphic element as an identity to function as a means of product information (Steenis et al., 2017). However, environmental issues as a result of the disposal of plastic packaging waste are a common issue that must be solved by the world community. This is because single-use plastics are responsible for environmental damage and produce waste, which takes a long time to decompose. Therefore, this problem must be handled properly through efforts to improve packaging design towards zero plastic waste and to limit the use of single-use plastics in various lines of life (Zeng et al., 2021).

The Government of Bali through PERGUB (Governor Regulation) Number 97 of 2018, concerning Restrictions on the Generation of Single-Use Plastic Waste has already regulated this. The public is advised not to use the three types of single-use plastic (PSP) in various activities. PERGUB Number 97 of 2018 in Bali has begun to be applied by the IKM (Small and Medium Industries) sector in the process of producing food as Balinese souvenirs. The IKM sector has begun to switch to using environmentally friendly packaging such as *besek* made of bamboo. The presence of *besek* (basket) packaging is very familiar to the Balinese because it is often used to package *yadnya/banten pejati* (Balinese traditional offerings) in traditional markets. PERGUB Number 97 of 2018 in Bali has been running for four years, the decline in the use of plastic waste has been reported, but in fact, in traditional markets, many still use single-use plastics.

Bali Governor, Mr. Koster, claims that with this policy, the Bali Government is able to reduce plastic waste in Bali by 90% (news.detik.com, 2021). The use of bamboo basket packaging as Balinese souvenir packaging is quite representative, giving a natural, environmentally friendly impression and as a substitute for plastic packaging, previously widely used by the IKM sector. *Besek* packaging has the ability to inhibit the growth of anaerobic bacteria because the woven fiber is porous, causing better air circulation (goodnewsfromindonesia.id, 2021). Bamboo has advantages as an ideal raw material because it has elasticity, can be processed into various forms, and has low carbon emissions so that

it does not have a negative impact on the environment (Xu et al., 2022). The advantage of *beseke* with bamboo material as food packaging is that it has the opportunity to be developed into sustainable packaging, of course by definition, it can be used to package Balinese souvenirs. However, the packaging used by the IKM sector to package Balinese souvenirs needs to be designed taking into account the packaging design aspects (Andrean et al., 2017). Based on the description above, this creation is a solution to make the *beseke* packaging appear more classy as Balinese souvenir packaging and make the product display a high selling value. The *beseke* packaging is designed not only to fulfill the function to protect and easily carry the product but also is designed to fulfill the information and convenience aspects, by highlighting the Balinese identity as an attraction (Wiyancoko et al., 2018).

Making this happen requires collaboration between visual communication designers, woven bamboo craftsmen and the IKM sector to create bamboo *beseke* packaging designs by highlighting Balinese local cultural identity as an attraction. The presence of *beseke* as Balinese souvenir packaging can be used as sustainable packaging and tourism promotion ambassadors to tourists so that they can generate the community's economy, especially the IKM sector which produces Balinese souvenirs, as well as bamboo craftsmen affected by the COVID-19 pandemic. The purpose of this creation is to design bamboo packaging designs as environmentally friendly Balinese souvenir packaging and to develop various forms of bamboo packaging designs by considering packaging design aspects, and aesthetics, through the development of shapes and packaging motif designs that carry environmentally friendly concepts. Collaborating with woven craftsmen to produce bamboo packaging that is different and represents the identity of the local Balinese culture. The originality of this creation is highlighted by the shape of the woven motif, and the use of natural colors as packaging dyes so that the packaging design meets the criteria for environmentally friendly products and is safe to use to package Balinese souvenirs in the form of food that can be used for holiday gifts. This creation is important to do because Bali as an international conference destination requires products that also serve as global solutions regarding environmental issues, which can be used as cultural ambassadors by highlighting Balinese local cultural identity in it. The packaging design of bamboo baskets as an eco-design product with the concept of sustainable packaging is useful to help reduce the environmental burden due to landfills while also having economic value. The bamboo packaging created can minimize

the use of water resources, and material energy, reduce the dangers of heavy metals, and can be reused, and recycled to reduce waste (Chengcheng, 2022).

RESEARCH METHODOLOGY

The design method of bamboo packaging design is focused on three groups consisting of materials, manufacturing processes by always prioritizing environmentally friendly principles, and the visual design elements as an attraction functioned as the local cultural identity of the Balinese. The stages of the design process were carried out through two stages consisting of the data collection stage and the packaging creation stage. The data collection stage was carried out in order to obtain primary data through surveys, observations, and interviews as a source of creative ideas as outlined in the design concept which would be applied at the design stage. Secondary data were obtained through a literature review in the form of references to similar works as references for packaging so as to produce packagings that have novelty compared to previously existing works.

The creation stage was carried out to realize the design concept into packaging design products made of bamboo to package Balinese souvenirs. The creation of works was carried out through several stages including; 1. *Brainstorming* to collect various creative ideas that are in mind to produce alternatives for developing more creative and new packaging designs. 2. *Mind mapping* is the stage of organizing creative ideas that have been collected through visual graphics to create design concepts. 3. The design concept as the basis for the creation of packaging designs was carried out by collecting visual references as a reference in the creation process. 4. The design sketch stage and the digitization of the motif were used as a reference to be developed using the woven bamboo technique. 5. The stage of creating the packaging using environmentally friendly materials such as bamboo from the type of *tali* bamboo obtained from Kayubihi Bangli village and *buluh* bamboo from Tigawasa Singaraja village by adopting the woven bamboo technique. The tools used were a saw to cut bamboo into various sizes, a scraper to clean the bamboo bark, an ax to split the bamboo, and large and small knives for slicing bamboo. The dye used was made from natural ingredients and a brush to apply natural color paint to the bamboo surface.

RESULT AND DISCUSSION

The woven bamboo packaging design is designed to

present bamboo *besek* packaging with a display that represents Balinese cultural identity. This packaging can later be used to package Balinese souvenirs for tourists as eco-design products to help reduce waste, especially plastic, which is widely used by the IKM sector to package food products. Eco-design is referred to in the creation of bamboo packaging as an approach that aims to unite environmental aspects and product design as a solution to reduce waste (Luu et al., 2022). Packaging should not only focus on an attractive design appearance but also the ability to solve problems that occur environmentally (Wiyancoko et al., 2018). Therefore, adopting the concept of eco-design in creation is an effort to be responsible for the environment by contributing to preventing waste as a result of the use of single-use packaging (Sumrin et al., 2021). Eco-designed packaging can reduce landfill waste because the designed packaging can be reused. It is also safe to be used for food packaging because the raw materials used are environmentally friendly and will not contaminate the packaged product (Zeng et al., 2021). The packaging created in this study will stand out with the local Balinese cultural identity in the form of decorative motifs with the inspiration of the *gringsing* weaving motif as a visual element of packaging.

The Stage of Creating Woven Motifs

The creation of bamboo packaging as Balinese souvenir packaging begins with the design of the motif as an aesthetic element of the packaging. Based on the results of brainstorming and mind mapping The source of the idea for creating the motif is *gringsing* weaving, a work of art and culture typical of the Tenganan village community, Pegringsingan, Karangasem. *Gringsing* as the inspiration for the woven bamboo motif was chosen because the *geringsing* woven fabric has a meaning as a repellent. This is confirmed by the meaning of the word *gering* in Balinese which means plague or disease while *sing* means not or refuse. *Gringsing* is believed to be able to resist disease (Lodra, 2015). Based on this, the *gringsing* motif is used as a bamboo packaging motif used to package food, with the hope that the food packaged using bamboo packaging can be well protected from disease as suggested from the philosophical meaning contained in the *gringsing* motif. Packaging with the inspiration of the *gringsing* weaving motif is presented as a cultural identity of a region in order to be able to form a positive image and become a tourist attraction in the arts and culture field. This motif can later function as a differentiator and add to the diversity of Balinese cultural products (Sari & Sarjani, 2018).

The *gringsing* motif as a source of inspiration was distilled into a woven bamboo packaging motif using digital techniques through a vector-based computer application program. The stages of making woven motifs were preceded by selecting several *gringsing* woven fabric motifs that have the potential to be developed into woven motifs for example *cemplong*. For the people of Tenganan Pegringsingan village, the *cemplong* motif, as shown in Figure 1, is used as a means of praying and traditional rituals (Sukmadewi, 2021). *Cemplong* according to the tradition of the Tenganan Pegringsingan village community, better known as *cemplong memedi*, consists of two words *cemplong* characterizing large, or small motifs (*nyemplong-nyemplong*) and *memedi* meaning an evil spirit that can disturb the harmony of the village community. *Cemplong* motif for the people of Tenganan Pegringsingan village is used in the "*muhu-muhu*" tradition or the *memedi-median* procession which aims to expel evil spirits from the village (Sukmadewi, 2021).



Figure 1. *Gringsing* woven fabric with *cemplong* motif.
(Source: Desi's Document, 2022.)

Cemplong woven fabric motif was then processed digitally using a vector-based computer program. The *cemplong* motif was re-designed by adopting the woven bamboo technique carried out by the *keben* (fabric) craftsmen in the Keben craft centers of Bangli, and Singaraja districts, namely the weaving technique with an inclined position. So that in the making process for the *gringsing* woven fabric, the motif is vertical if it is converted into a woven bamboo shape, thus the shape cannot be realized vertically like the original, but in a horizontal position as shown in figure 2. This is because the weaving stages carried out by the *keben* craftsmen used inclined weaving techniques so that it can only realize motifs whose woven direction is horizontal (Sari et al., 2022).



Figure 2. The *gringsing* (*Cemplong*) weaving motif is shown in the left image. The right image is a *cemplong* motif that has been digitally processed using a vector-based application program by adopting a woven bamboo technique. (Source: Desi's Document, 2022)

Cemplong motif design that has been developed through digital techniques was then applied with a woven bamboo technique so that it can be realized. At this stage, collaboration with *keben* craftsmen was carried out to transfer digital images into woven forms as a reference in making woven motifs. The stages of media transfer from digital to weaving techniques by the craftsmen were carried out by making small *kebans* filled with samples of new motifs as a reference before being applied to bamboo packaging of various sizes. This *keban* will be used as a reference in weaving so that it can be imitated by other craftsmen, as shown in Figure 3. The process of making new motifs is difficult and not all craftsmen can make new motifs because it requires skill and intelligence to make it happen.



Figure 3. The *gringsing cemplong* motif that has been digitally processed is shown in the left image and then applied with the bamboo woven technique shown in the right image. (Source: Desi's Document, 2022)

Coloring Stage of Bamboo Materials with Natural Colors

In order to realize environmentally friendly and sustainable bamboo packaging as well as the eco-design concept, the packaging materials used all use natural materials and do not use chemicals at all. The natural materials in question consist of bamboo as the main material and dyes sourced from nature. The bamboo material used as a packaging material is selected from the type of string bamboo/*tiing tali* in Balinese (*Gigantochloa apus*) or *buluh* bamboo. For the Balinese people, string bamboo is widely used for household crafts, crafts, building construction, and as a means of ceremonies (Arinasa, 2013). String bamboo was chosen because the material is durable and flexible so it is easy to weave to produce

various motifs. Before being processed into packaging, bamboo is first processed through several stages as follows: 1). The cutting stage is done by cutting a piece of bamboo into several sizes to be formed into bamboo packaging using a saw. 2). The drying stage aims to clean the rough surface of the bamboo epidermis to make it smoother and easier to apply color using a scraper. 3). The bamboo coloring stage uses natural color paint using natural materials through a series of processes. The green color used as the bamboo dye is produced by mixing mango leaves and *strobilanthes* (indigo) leaves by boiling them for approximately two hours to produce a green pigment. The green pigment is then left to stand a day before being processed into paint by adding an adhesive made from tapioca flour as shown in Figure 4.



Figure 4. The process of making green pigment with natural ingredients of mango leaves and *strobilanthes* (indigo) leaves. (Source: Desi's Document, 2022)

After the dye is ready, the next step is to color the bamboo with natural color paints. The coloring process was carried out by applying natural color paint to the previously scraped bamboo surface. The application of paint using a brush and stacking was done several times to get the desired color. The use of natural colors in the painting process cannot be done once but must be repeated several times because natural color paints are softer than chemical paints. At the stage of painting bamboo with natural colors, there were several things that needed to be considered, namely dividing the bamboo into two parts. The colored part will be used to form the motif while the uncolored part serves as the base color. The division of this bamboo also has a calculation.

The colored part of the motif (foreground) is made with a longer size than the base (background), this stage is shown in Figure 5.



Figure 5. Stages of the painting process with natural colors. (Source: Desi's Document, 2022)

The Creation Stage of the Bamboo Packaging

The bamboo packaging design was inspired by the Balinese *beseke* and *keben* packaging used as a container for traditional ceremonies. The technique used is the weaving technique through several stages as follows: 1). The stage of preparing the woven material from bamboo that has been coated with natural color paint consists of *nyibakin* which means splitting the bamboo with an ax into small parts according to the size of the packaging made. After *nyibakin*, the next step is *nyebit* which aims to separate the skin and the contents of the bamboo so that it is easy to weave. The last step is *ngangsud* by using a knife to clean the bamboo so that it is thinner, smoother so that it is easy to weave into various motifs, as shown in Figure 6. 2). The stage of making woven (*nyampelin*) begins with making the basic part (*bakalan*) which functions to form a motif according to a digitally designed design. *Bakalan* as the beginning of bamboo packaging can be classified into two, according to the form of packaging made. The square-shaped *bakalan* is intended for square-shaped packaging while the rectangular-shaped *bakalan* is intended for rectangular-shaped packaging as shown in Figure 7. The base part of the woven *bakalan* is then continued to the *mucuin* (corner) stage. Weaving every corner of the *bakalan* to form a woven *cemplong* motif according to the desired size of the bamboo packaging as shown in Figure 7. The development of the visual elements of the packaging design motif can be sourced from art and cultural artifacts that are icons of the identity of a region (Mulyanto, 2018). Sustainable eco-design products are currently a trend in the public and have been developed in various fashion products (Nurcahyanti & Septiana, 2018). This design offers novelty by creating bamboo packaging as a form of eco-design development in the field of packaging design and

product design.



Figure 6. Stages of the painting process with natural colors. (Source: Desi's Document, 2022)



Figure 7. The weaving stage of the *bakalan* (bottom part) is square (top left), rectangular *bakalan* (top right), and the *mucuin* for the *cemplong* motif (bottom left), and the finished packaging design (bottom right). (Source: Des's Document, 2022)

CONCLUSION

The design of packaging made of bamboo as Balinese souvenir packaging is realized through several stages while maintaining a sustainable and environmentally friendly design. The sustainable packaging design referred to here is to design packaging made of bamboo so that it can continue to be used after its main function has been performed, in this case, the packaging can be reused for different functions so that it can continue to be used as another useful packaging and can reduce waste while functioning as an art craft icon from Bali. The form of packaging that was designed was inspired by the *keben* for the Balinese people and functioned as a container during ceremonial activities. *Kebe*n as packaging is designed with a new motif that has never existed before, the application of natural color

paint as a color was chosen with the aim of not contaminating the packaged food. Through the creation of bamboo packaging, it is hoped that bright ideas will be born in different fields by carrying out the concept of eco-sustainable design.

The creation of bamboo packaging designs by carrying out the eco-sustainable design concept offers a new trend in the creation of packaging designs made from bamboo. Bamboo packaging was designed as a pioneer to be developed by *keben* craftsmen in Bali by starting to switch to using natural materials as a form of responsibility to the environment.

ACKNOWLEDGMENTS

Appreciation is due to LP2MPP ISI Denpasar for funding this creation through the 2022 Art Research and Creation (P2S) scheme. The funding of this study came from the DIPA of the Indonesian Institute of the Arts Denpasar in 2022 in accordance with the Letter of Assignment for the Implementation of P2S ISI Denpasar Number: 1922/IT5.4/PPK /IV/2022, April 5, 2022. Appreciation is also to Pagimotley, the *keben* craftsmen in Tigawasa village, Buleleng, and Kayubihi Bangli village, for their cooperation in making this packaging design possible.

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List of Resource Persons/Informants

I Made AndikaPutra (36 years old), Owner of Pagimotley Natural Dye, interviewed on 30 April 2022, at Pagimotley Jl. Airsanih Tejakula-Sembiran, Buleleng Regency.

I Putu Eka Darma (36 years old), Craftsman of Tigawasa Singaraja village, interviewed on 14 May 2022, in Dauh Pura Hamlet, Tigawasa Village, Banjar District, Buleleng Regency