

## Conference Paper

# An Effort of Furniture Design Development through the Utilization of Rice Straw Gogo Red Rice Slegreng Variety

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## Abstract

Rice is a staple food source and therefore widely planted by farmers. Straw is a residual waste of rice harvests which has not been utilized optimally. This residual waste can be used in semi-finished products and finished products, especially crafts and furniture for the export market. This study considers the use of waste straw for the needs of the handicraft industry and mining. The second objective is furniture and craft design innovation using a straw. Experiments were carried out by twisting straw so that it becomes a certain diameter and length. The upland variety of *slegereng* red rice straw was the research object owing to its greater length and higher strength than other types. Data was derived from literature and informants, and evaluated using interactive analysis models, including data reduction, data display and data verification. The study demonstrates that waste straw can be used in furniture and craft product design innovations. The application is on chairs, tables, stools, tissue boxes, table lamps, frames and so on.

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## 1. Introduction

Rice is a staple food for the people of Indonesia, rice as a producer of rice, therefore rice is the most widely planted by farmers in Indonesia. Ploughing, planting, caring, harvesting and so on are activities carried out by farmers as a cycle of working on rice fields. Harvesters are efforts to pluck the crops by cutting rice stalks and knocking them down to get grain. Rice stalks that have been knocked off the grains of rice are called straw. Rice stalks or straw for some farming communities in Indonesia are still categorized as harvesting residual waste.

In Indonesia, the straw produced by farmers is very large, reaching 64-96 million tons/year, with the calculation that on average each 1 kg of rice produces about 1 - 1.5 kg of straw (Situmeang 2010). Indonesia even ranks third as the third-largest country

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in the world producing rice by 64 million metric tons/year (Purwandaru 2013). 62% of the straw is burned, 38% is used as animal feed or for industrial purposes (Situmeang 2010).

Straw as a residual waste of rice harvest is abundant and has not been used optimally. Efforts to use a straw are therefore important so that the value of benefits, added value and economic value increases. Efforts to use a straw for various purposes include fertilizer, animal feed and handicraft industries. Handicraft industries made from straw include paper, mats, paintings, sandals, bracelets, necklaces, puppets, chicken or bird's nests, egg packing, furniture and so on.

Efforts to utilize straw waste, referring to the lignin content of straw stalks to allow the utilization of straw fibre for various creative products. Natural fibre materials that are quite popular for the benefit of the handicraft and furniture industries include pineapple fibre, hemp fibre, water hyacinth, and *mendong*. In some types of material, of course, the nature, character, colour and strength of each is different. The nature and characteristics of natural fibres for handicraft and furniture products, their use and placement naturally vary. Therefore this research is how to use straw fibre as a material for the needs of the craft and furniture industry.

## 2. Method

The research material is a stem on the leftover harvesting called straw. Utilization of long-sized straw so that it is more focused on the remaining straw harvested by manually cutting. The research object sampling is purposive. Research conducted in the Surakarta and surrounding areas as for the type of rice selected is the type of rice that is widely planted by local farmers. As for the species that are widely planted in the Soloraya region and surrounding areas that meet the criteria to be twisted. The selection criteria for the straw to be twisted as material for handicraft products and furniture are rice with large diameter, height, and resilience. The straw is cleaned by the leaves so that what remains is leafless rice stems. The rice stalks are then twisted into elongated threads. Torsion of straw that has become an elongated yarn or rice mine is twisted into several different diameters. The result of twisting yarn or straw mines as a basis in the design development of handicraft products and furniture. Product design by enhancing the nature and character of the material (Karana et al. 2015).

### 3. Results and Discussion

Throughout human civilization, rice is the main crop as a producer of staple food in various countries, including in Indonesia. Rice-based on classification is included in *kingdom: Plantae, subkingdom: viridiplantae, infra kingdom: streptophyte, super division: embryophytes, division: Tracheophyta; subdivisions: Spermatophyta, class: Magnoliopsida, superorder: Liliaceae, order: Poales, family: Poaceae, genus: Oryza L., species: Oryza sativa L.* Vegetative parts of rice plants are roots, stems and leaves, while the generative part is in the form of rice grains (SO and Ismunaji, tt). Rice has 25 species of *Oryza*, and what is known is *Oryza sativa*, with two main species, *japonica* (fur rice) and *Indica* (cere rice). *Japonica* rice is widely planted in subtropical regions, while *Indica* is widely planted in Indonesia (Purwono and H. Purnamawati 2009).

Straw is a round-shaped rice stalk with a diameter of about 0.5 cm, on the inside of the hollow and broad and hard textured. The distance of straw space at the bottom is shorter and harder, and the longer and softer at the top. The leaves grow on the stem segments and cover the rice stems. Straw is thus the whole stem from after the root to before the rice grains. The average annual planting period for rice ranges from 80-120 days so that in a year harvesting of rice can be done two and three times for irrigated rice fields. The volume of straw in Indonesia as a result of rice harvest is, therefore, abundant reaching 64-96 million tons/year.

Rice straw is biomass that is chemically a lignocellulosic compound with the components of cellulose (35-50%), hemicellulose (20-35%) and lignin (10-25%) and other substances making up rice straw (Saha (2004). Lignin is the organic substance which has many polymers with its main molecular composition is phenyl propane (Simanjuntak, 2007) Lignin content in straw so that it can be processed and utilized for various fibre-based human needs., and Yvonne 2016), straw as particleboard (Gultom, Dirhamsyah, and Setyawati 2013), straw as an acoustic panel (Mediastika 2008).

Utilization of straw as a handicraft product in the form of straw stems and pieces with the technique of pressing/pressing (Purwandaru 2013); straw stems directly as handicraft products (Rubiyar 2006) products produced in the form of flowers, wall hangings, pencil cases, frames, and so on. Lignin content is not too high so that the utilization is also in products for human use with the tensile strength of adjusted raw materials.

Research and development in agriculture to bring up various rice varieties. The location of the research conducted in Solo and its surroundings as for the rice varieties that are widely planted include rice paddy which includes IR 64, *membramo*, *ciherang*, *inpari*; upland rice including *bagendit*, *mayang* and *slegreng*. Based on the plant height of the

six varieties of rice above *membramo* is the highest which is between 126-140 cm (Suprihatno et al. 2009).

*Slegreng* is, therefore, the right rice variety in the effort to utilize fibre-based straw for the Solo and surrounding areas, this *slegreng* is rice varieties where the stems are quite resilient. *Slegreng* is a variety of upland rice, red rice scaffold. Slippery rice is widely planted in Solo and its surroundings because the area tends to be dry or tidal. *Slegreng* red rice has advantages; (a) The results are quite high 3-4 tons/ha; (b) The color of red rice on the skin contains  $\beta$ -carotene 488, 65 micro g / 100 g, can function to maintain heart health and prevent aging; (c) the sale value of rice is high, 30% more expensive than ordinary rice; (d) rice that is tolerant of water stress; (e) high protein content which is around 7.3%, iron 4.2%, and vitamin B1 0.34% (Haryanti, Kusumaningrum, and Budiharjo 2013).

Straw as raw material for handicraft products with stranded techniques, what is needed is straw that is still in a long-sized state. Therefore, the straw used is straw leftover harvesting manually. Rice harvesting generally consists of traditional, manual-*masinal*, and *masinal* methods. The traditional way where cutting and threshing is done manually. *Masinal* manual where the cutting is done manually, threshing is done *masinal*. The next way where cutting and threshing is done by machine.

How to harvest will greatly affect the character of the straw produced specifically in the size, shape of the straw. Rice harvesters that are done manually are generally still in a state of hay. Therefore, rice straw harvested manually is straw that will be used as material for handicraft products and furniture with stranded techniques.

Gyre; spinning is spinning or spinning two or three pieces of thread, rope, and so on with fingers, palms, and so on <https://kbbi.web.id/pilin>. Pilin technique is quite prominent in the textile industry, pilin technique, however it is also applied to the natural fibre spinning industry such as hemp, pineapple fibre, banana stem fibre, *mendong*, even the term is also developed by producing pottery. Rice stalks or straw as a mine with twisted techniques some things that need adjustment are as follows:

1. Hard and brittle segments of rice, so it needs to be broken down with a hammer to make it softer.
2. The length of rice stalks is quite short, which is around 50-70 cm so that it is necessary to make frequent connections.
3. The thickness and diameter of the straw are not the same between the tip and the base so that skidding skills are important so that the spinning thickness is stable.

The nature of straw is relatively brittle in wet or dry conditions so that weaving is best done when the straw is in a half-dry condition. Dry straw so it needs to be soaked or moistened to be more resilient. Utilization of straw on the stem so that it needs to clean the parts that are not needed, especially on the leaves. Cleaning needs to be done because of the nature of the hard and brittle straw leaves. Cleaning is done by a comb to make it easier to remove straw leaves.



**Figure 1:** (a) straw before cleaning; (b) straw after cleaning or combing the leaves.

The segments of straw that have been broken down are then stranded so that they can be stranded. Basically, *pemilitan* can be done manually or massively, however, in this study *pemilitan* is done manually. To produce strands of long-term mine, therefore at the time of the connection a connection is made to produce a long mine. Efforts to produce mines for various handicraft and furniture products, therefore the spinning is made into several mines with different diameters. The diameter of the mine is made with 4 mm, 6 mm, 8 mm, 10 mm and 12 mm.

Utilization of straw into straw mines is the processing of raw products into semi-finished products. Increasing added value is how waste becomes a finished product of use-value and high economic value products to empower the farming community through design (Tung 2012); (Thomas 2006).

*Mendong* mining, water hyacinth, and banana stems that can be used as raw materials for handicraft products and furniture, the straw mine should also be used as raw materials for handicraft products and furniture. Utilization as materials for handicraft and furniture products, both decorative and functional. Utilization is functional, among others, as a woven chair seat, backrest, furniture frame cover, tabletop, wicker panel furniture products, frame frames, lampshades and others. Utilization is decorative as a patch and decoration on a variety of handicraft and furniture products weaving or pasting. Utilization and placement of straw mines, of course, must be considered the



**Figure 2:** Large and small-sized straw twisting mines.

maximum tensile strength of the straw mines. Utilization of the straw mines with weaving techniques, the mines will be interrelated and tied together so that strength is created as a functional component. The next consideration is on the shape, colour, and surface smoothness of the straw mines. Some of the designs by utilizing fresh waste into a mine and a design of handicraft products and furniture are as follows.

**Figure 3:** Design of handicraft products and furniture using a straw.

Handicraft products and furniture made from a straw as a creative industry for the global market are interesting things because natural products are the advantages of Indonesian products in the global market (Hidayat 2011). Utilization of the straw mines through woven furniture products, a very influential step on the aesthetic value of the product is the weaving pattern. The weaving pattern of products made from *mendong*, water hyacinth, and rattan can be applied to straw mining materials. The innovation

of handicraft and furniture products by utilizing straw into a mine can, therefore, be maximized through the application of woven motifs.

## 4. Conclusion

Straw can be processed into mines as a material for handicraft products and furniture. The persistence of straw pull is relatively low, therefore the use of the straw mines as material for handicraft and furniture products is, of course, taking into account its placement. Utilization of straw as a handicraft product and furniture needs to be combined with other materials so that it is technically accountable and aesthetically acceptable to the market. The firmness of the straw is quite low needs further research to produce a stronger mine so that the opportunity for utilization is also high as an effort to increase the added value of straw as a residual waste of rice harvesting.

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