

Effect Of Developing A Copra Skimming Machine On Rural Economics

¹Giridhar S Kulkarni , ²Harshith K B, ³Darshan S, ⁴Bhyresh N S

¹²³⁴Dept. Mechanical Engineering, Channabasaveshwara Institute of Technology, Gubbi, Tumkur, India.

¹gsk@cittumkur.org, ²harshith235@gmail.com, ³darshan.s144@gmail.com, ⁴bhyreshns04@gmail.com

Abstract—Copra is widely grown in south India and it is a very important source of income for the farmers who grow the coconut. The copra is the inner most part of the coconut. It is covered by a hard shell and tough fibers. The conventional shape (circularity) of the copra is very difficult to maintain due to many factors like skill of the labor, sharpness of the tool, material of the tool and etc. Because of non circularity obtained in cutting the copra, the farmers, traders and merchants lose their profit from copra business.

The copra is extracted from the coconut shell from so many methods like de-husking and removed from shell by applying force from rod or stone along with knife. This makes the copra to lose its circular shape. The defected copra's have less value in a market, so they are sold for lesser price which is huge loss for farmers. The cost of the copra is dependent on its appearance, oil content, dryness etc. Among all these factors, shape is very important factor which can be controlled by man. The regular shape of the copra is very difficult to achieve by human effort because of variation in skill of the person, sharpness of tool, force applied by human and etc.

The involvement of human beings can reduce the production rate. This can be overcome by the application of automation or mechanical machine arrangement to get regular cutting shapes. According to survey, it is observed that so many people in and around Tumakuru are dependent on copra and there is no such machines are available in market for the efficient skimming and cleaning process.

The main objective of this machine is to skim out the damaged part by minimal reduction of mass and to maintain copra hygiene. The same purpose is being carried out by human labor but it involves huge loss of copra in skimming of damaged part and is also unhygienic as it contains dust particles. There is even fine chances of getting hurt as a person working can come directly in contact of the knife/blade. This paper also aims to design the cutter in such a way that the skimmed out copra is ready for oil extraction. After the extraction of oil from the sliced copra, the left out part that will be used for cattle feed and for sweets.

This motivates to develop the product/machine which helps the farmers, merchants and traders to get more profit margins and the customer will get the good and hygienic copra for consuming.

I. INTRODUCTION

Half of the world's population lives in the rural areas of the developing countries. Majority of them are generally involved in the field of agriculture and related activities. Copra (Dry Coconut) is one of the most important sources of income for farmers, merchants and traders in South India. This copra is the inner most part of coconut; it is protected by hard shell and tough fibers. So de-shelling is a very difficult task, time consuming and maintaining a shape after the de-shelling, and the cost involved. The cost of the de-shelled copra is fixed/ quoted based on the shape of appearance in the international market. Due to the many of the factors present conventional method it is very difficult to maintain the good appearing shape (Circularity). So, most of the farmers, merchants and

traders are losing their profit from the main crop and the source of income.

The copra is obtained from the coconut shell in the following tough process like De-husking, Copra removed from shell by applying a force from rod/ stone, which includes heavy pressures results in damage of copra. The damaged copra is sold for lesser price. i.e. the cost of the copra is fixed based on the appearance on shape, quantity of oil content, dryness and etc. among all these shape is very important parameter which can be controlled by human and other parameters are controlled by nature. The regular shape of the copra is very difficult to achieve by human effort because of variation in skill of the person, Sharpness of the tool, force applied by the human and etc.

As the human beings are involved in the process the rate of production may reduce. This can be overcome by the application of automation or mechanical machine arrangement to get regular cutting shapes. According to the survey it is observed that in and around Tumakuru district there is mass production of copra and many of the farmers family are dependent on it and no such machines are available in the market for the efficient skimming and cleaning process of copra.

The main objective of this machine is to skim out the damaged part causing less loss of good copra and to use the remaining part for commercial purposes maintaining safety of the worker and also hygiene of copra. The same process is being carried out by human labor but it involves huge loss of copra in skimming of the damaged part and is also unhygienic as it contains dust particles. There are even chances of labor get hurt/ injured as he may come direct contact with knife/blade. This paper also aims to design the cutter in a way that the skimmed out copra is ready for oil extraction.

After the extraction of the oil from the sliced copra, the left out part that will be used for cattle feed and for sweets. This motivates to develop the product/ machine which help the farmers, merchants and traders to get the more profit margins and the consumer will get the good and hygienic copra for consuming.

II. SCOPE AND MOTIVATION FOR THE WORK

We were motivated to do this paper/ project because the problem seen in traditional method of skimming of copra which is time consuming and involves risk. So the project deals on development, design and Fabrication of Copra skimming machine with providing copra cleaning unit. This machine has a reasonable design, excellent manufacturing, and ease of operational method with low energy requirement. It is a low cost machine used for efficient skimming of unwanted part of copra with reduced labor input and to reduce less wastage of good copra. The Copra skimming machine and cleaning unit are operated by same electrical motor. Spur gear arrangement is used to transmit power from motor to blades and cleaning unit. Cleaning unit cleans the inside copra efficiently to maintain the copra hygiene.

The feature of this is Copra skimming machine are small in size, light in weight, high efficiency, easy for operation and maintenance. It is widely used in places where coconut plantation and processing is in high capacity. Users can use it at yard or move it in fields if it is needed. It will be a great help to the farmers.

Skimming of the unwanted copra, which is been damaged while transportation and processing is the most important technique for improving the quality of primary grade copra as this will boost the appearance and thus fetching good rate while auctioning. It involves skimming of the damaged part and then cleaning inside part of it, so as to remove the dirt present in inner walls of the copra.

A good copra skimming machine should skim off the copra by slicing into thin slices with little loss of good copra. The long hours associated to skim the copra with human efforts is eliminated and the risk involving in it is also eliminated.

III. LITERATURE SURVEY

Copra skimming is nothing but removing the damaged part of the dry coconut by slicing it layer by layer as shown in Fig. 1. As of now this process is being carried by the workers where in, a worker holds the copra in such a way that the damaged part of the copra is one hand the good in the other like a person holding a ball, then he thrusts the copra against the blade in such a manner that the blade passes the middle of his both the hands. The skimmed copra obtained by conventional method is shown Fig2.

In operation, when this action takes place the copra any how gets sliced but the part of good copra also gets sliced. There is a fair amount of chances to get hurt by slicing of the skin. Fig.3 shows the process involved from coconut harvesting to copra storage.



Fig. 1: Conventional skimming of copra.



Fig. 2: Damaged copra from conventional method

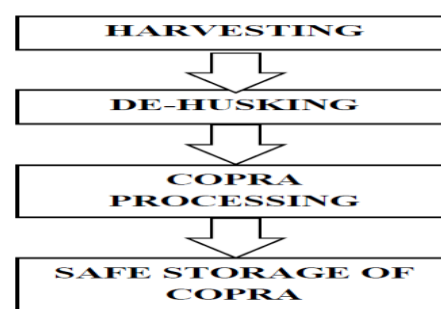


Fig.3: Post Harvest Treatment for Storage

The copra skimming machine is designed by the influence of the food processor invented by Pierre Verdon. Fig 4 shows the food processor. In food processor a blade is fastened on to a vertically rotating shaft. This blade and shaft arrangement is housed inside a jar, and then this jar is closed using a removable lid which contains guide ways guiding the vegetable/fruits directly onto the blade. The cutting of fruits/vegetable is achieved when the vegetable/fruits are pushed against the rotating blade. The thickness of the cut piece of the vegetable/fruit can be adjusted. The rotating action of the food processor is driven by an electric motor. This entire food processor is compact in structure and suitable for light work load. This

similar operation has been acquired and enhanced for large scale operation by altering the design and specification.



Fig. 4: Food Processor.

IV. DESIGN METHODOLOGY

A. Analysis of the rural farmer for copra skimming machine needs:

Copra/Dry coconut is sold for market whose price depends on the shape, size and quality. Copra is basically spherical in shape; it is very difficult to obtain the copra from the hard shell. Once the harvesting of the copra is completed it is transported to different places to the merchants. While transporting due to different pressure applications it gets damaged. Some of the copra's are damaged at a certain part or just a small region of it; this damaged copra is sold for the oil extraction purpose which is of low price value. Thereby the farmer experiences losses due to such kind. The damaged part can be removed manually but it involves much labor, time and also accounts greater chance of accidents. Therefore the copra skimming machine is designed in such a way that the skimming of the damaged part of the copra can be done by minimum amount of labor, very less time and also it is safer when observed relatively to the traditional method of skimming of the copra.

B. Design considerations

There are many different facts that shall be considered in the design process are shown in Fig. 5., and they are as below,

- The copra skimming machine should fulfill the basic need of cutting and cleaning the copra.
- It should be economical and the running cost should be at its minimum level.
- The device should be portable and robust such that it can be moved to the field easily.
- The design should be optimized to reduce the fatigue of farmers. Even it should be appropriate for women and children.
- The attachment should employ low-cost materials and manufacturing methods, standard spare parts like gears, bearings, blades, coupling, motor, should be used for easy and local availability.
- The weight of the system should be minimal to reduce the human effort in transportation/ moving from one place to another.

- The system may employ other attachments to integrate the post harvesting and related activities.
- The fabrication of system should be suitable for local capabilities i.e. use of simple tools in machine shop such as hack saw, files, medium duty welder, drill press, lathe and milling machine.

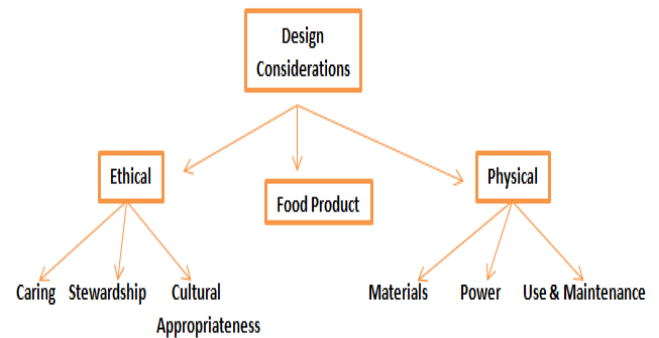


Fig. 5: Taxonomy of the Design Considerations

C. Ethical Consideration

Design norms are helpful guidelines that assist in design selection. For this project, cultural appropriateness, caring, and stewardship are chosen as the most important design norms.

• Caring

Food is a necessity of life, yet there are many places around the world that have lack in this resource. Designing a machine that improves the quality of copra grades at a low cost demonstrates caring for the company. As a method of caring for the men and women operating the machine, safety will be taken into consideration when choosing a final design

• Stewardship

Stewardship is another applicable design norm. This project will provide an excellent opportunity to use a few resources available to produce a vital product for the company.

D. Physical Consideration

An additional set of design considerations are the materials to be used, the power sources, ease of use, and reparability.

• Materials to be used

Among the physical considerations for the design is choosing the materials from which the machine will be constructed. The most important material consideration is the availability of the materials in villages. The machine will be designed so that most of the parts can be manufactured from local workshop, thus using materials that are cheap & readily available is an important consideration. The durability of the machine is another important physical design consideration. The operating environment like, the sorting and packing sections in the factory have the potential to be harsh, with the extreme weather conditions. These conditions necessitate choosing materials that are corrosion resistant. Additionally, the machine will be used for many years by many different operators, so the materials of machine must withstand prolonged heavy use. The weight of the final product is

another design consideration directly influenced by the chosen materials.

• Ease of use

Ease of use is another essential physical consideration. The machine will be designed so as to be used easily by various types of operators that include men and women.

• Reparability

The design will enable an easy for the repair and maintenance of the machine. This issue is closely linked with the cultural appropriateness consideration addressed in the ethical section and design for interchangeability.

E. DESIGN SPECIFICATIONS

The design of this winnowing machine is based on consideration of design specifications whose choice is based a number of factors, that include the availability of fabricating materials, fabricating facility, cost of such materials/ facility, desired size and shape of the machine as per ergonomics, machinability factors which includes, installation, simplification, and durability as well as the prolonged life of machine. Finally developed copra skimming machine along with cleaning unit is shown in Figure 6.



Fig.6: Developed Copra skimming

Following are the design specifications obtained/ followed;

- Overall dimension 720mm*700mm*1000mm.
- Shafts of length 660mm and diameter 26mm.
- Bearings of inside diameter 25mm and outside diameter 50mm.
- Electric motor of capacity 1Hp and 0.55KW with 700rpm.
- Sheet metal of thickness 2.5mm.
- L-Angle of thickness 5mm.
- V-Belt of 900mm, width 13mm, thickness 8mm & $\alpha=20^\circ$
- Inner diameter of the pulley is 75mm.

Figure.7 shows the skimmed copra from the developed machine which costs more than the conventional skimmed copra

ESTIMATION AND COSTING

A bill of materials or product structure (sometimes bill of material, BOM or associated list) is a list of the raw

materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product. A BOM may be used for communication between manufacturing partners, or confined to a single manufacturing plant. A bill of materials is often tied to a production order whose issuance may generate reservations for components in the bill of materials that are in stock and requisitions for components that are not in stock. The expenditure involved in developing the model is shown Table1.

Table 1: Estimation and costing

SL. NO	PERTICULARS	SPECIFICATIONS	QUANTITY	PRICE IN RUPEES
1	Electric Motor	0.75Hp, 750rpm	1	4000
2	Gear	100 teeth, 100 dia	1	1350
3	Gear	200 teeth, 200 dia	1	1500
4	Pulley	75mm inside dia	2	300
5	Bearing	25mm inside dia	7	700
6	Coupling	25mm inside dia	1	500
7	Sheet metal	2.5mm thickness	25Kg	1500
8	L-Angles	5mm thickness	60Kg	2400
9	Fibre Sheet	3mm thickness	284*600mm	500
10	Lock	Hinge type	3	100
11	Labor	-	-	2500
12	Miscellaneous	Nuts, Bolts etc.	-	1500
13	Paint	Black, Green	3	500
	TOTAL			17,350



Fig. 5.: Copra skimmed using machine



Fig. 7: Skimmed Copra obtained from the developed machine

V. CONCLUSION

- To get a clear circularity of copra(as shown in fig7, it requires minimum 60 seconds by human effort, but by copra skimming machine, it could be done in 20 seconds. Thus we could save more time and money.
- One person/ labor work simultaneously on skimming and cleaning of copra so that, time and human effort shall be minimized and there by profit range can be improved.
- Human power is minimized and hygienic copra could be optioned.
- Copra slices obtained shall be used for food processing/ preparing sweets, coconut oil and etc.

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