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Introducing an appropriate mechanical way for Coconut dehusking

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Abstract

Coconut (*Cocos nucifera* L.) is a perennial tree crop, which has a *percapita* consumption of 120 nuts/ year/ head in Sri Lanka. Nut is the most important economical part in a coconut palm. Fruit has to be de-husked before any production process and there is no any mechanical mean, available in Sri Lanka other than manual coconut de-husking with an iron spike. This has become a major problem in coconut industry, as it is laborious, dangerous and expensive. This study was aimed to introduce an efficient and affordable mechanical method for coconut de-husking. Main components of the de-husking machine are; set of blades and blade spreading system, operating lever system and adjustable fruit holder. The most salient feature of this machine is detaching the husk into four pieces while retaining the soft eye covering part. Machine weighs 65 kg and the total cost of production was LKR 13,200. The performance of the de-husking machine was evaluated separately using a single operator (T₁) and an operator with a helper (T₂) and compared it with most practicing manual de-husking method (de-husking with iron spike). According to the analyzed results by one way analysis of variance (ANOVA), there is a significant difference ($p < 0.05$) between T₂ and the manual method but no significant difference was observed between T₁ and the manual method. Actual capacities of T₁, T₂ and the manual method were 69, 135 and 78 nuts/ hr, respectively. Theoretical machine capacities of T₁, T₂ and manual method were 107, 164, 105 nuts/ hr, respectively. Efficiency of the machine with T₁, T₂ and the manual method were 64.5%, 82% and 74%, respectively. Therefore, the coconut de-husking machine could be effectively utilized using operator with a helper for a higher capacity and machine efficiency.

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Keywords: Coconut production; dehusking; machine capacity

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1. Introduction

Coconut (*Cocos nucifera* L.) is a versatile palm tree in which most of the parts can be used for different purposes. Coconut oil, copra, vinegar, jaggery, coconut oil cake, shell products and coir products are few of industries, which are based only on nut and inflorescence of the coconut tree¹. An individual coconut fruit is made up of an outer exocarp, a thick fibrous fruit coat known as husk, underneath is the hard protective endocarp or shell which protects the edible flesh. The size of nut varies from 147 to 196 mm in diameter and 245 to 294 mm long². The coconut fruit should be dehusked prior to any postharvest application on flesh. Prevailing de-husking techniques in Sri Lanka are risky and laborious. Semi and fully automated machines used in developed countries are not affordable for small and medium scale farmers in Sri Lanka. Although, lots of studies on coconut de-husking machines have been carried out, those are not popular among coconut producers due to their complexity in operation and low efficiency. This research was conducted to develop a manually operated coconut de-husking machine for medium scale farm holders which make their coconut de-husking operation efficient, safe and cheaper in order to increase profits in this particular aspect of the coconut industry in Sri Lanka.

2. Methodology

The study was conducted at the Faculty of Agriculture, Rajarata University of Sri Lanka. A preliminary experiment was carried out with hundred coconuts selected from a properly maintained coconut plantation in order to find out the average measurements such as height and width of the fruit, thickness of the husk at stalk end, height and width of the nut, for the determination of the dimensions of the machine components.

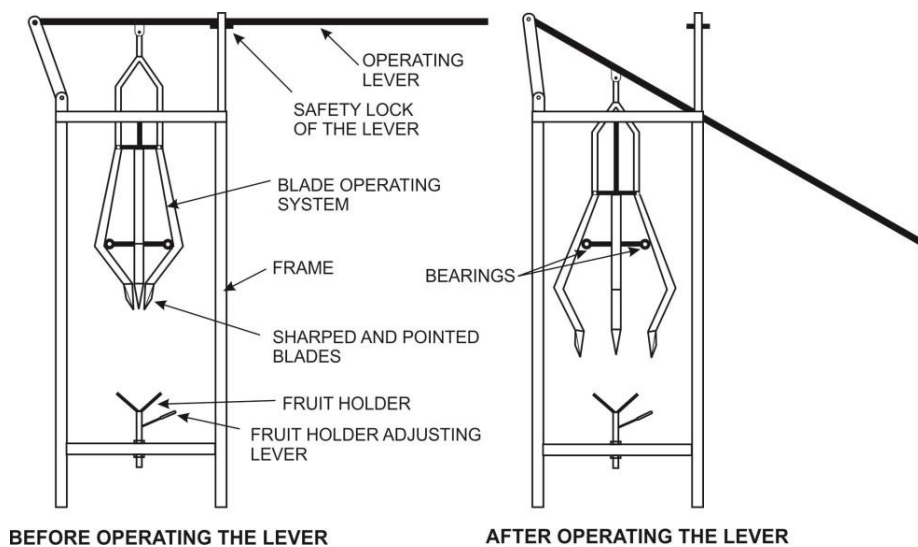


Fig. 1. Side views of the machine after and before operating the lever

Specially designed lever system which has two fulcrums was used to give a straight downward motion to the set of blades. Blades set consisted of four sharp, pointed blades, made of steel and connected to the system of bended blade hands. Shape of the blades was designed considering the fibre arrangement inside the coconut husk. The blade hands were designed to a special shape to operate the blades set in such a way to penetrate into the husk without damaging the nut and then spreading them to detach the husk while retaining the soft eye covering part.

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