Journal of Plantation Crops 9 (2) : 95–99 December, 1981

DEVELOPMENT OF MANUALLY OPERATED COCONUT DEHUSKER*

BANGALI BABOO**
Central Plantation Crops Research Institute
Kasaragod 670 124, Kerala, India.

ABSTRACT

An improved model of a coconut dehusker first developed in U. K. in 1960's and subsequently modified by the research workers in India during 1970's has been described. This simple device can dehusk coconut of any shape and size. The observed breakage of nuts is about 1 per cent. Two unskilled workers can dehusk about 1600 nuts in eight hours.

INTRODUCTION

Coconut is grown in about 1.1 million hectares in India producing about 6,000 million nuts annually. Approximately 55% of the total production of nuts is utilized for edible purposes in the household sector in India (Thampan, 1976).

The nut is more or less ovoid in shape and varies considerably in size depending upon the variety. Three common shapes and a cross section of nut are shown in Fig. 1. The husk (exocarp) consists of about 35 per cent of the total weight of whole nut (Nathanael, 1965). The nuts used for

FIG. 1. THREE TYPICAL SHAPES OF COCONUT AND A CROSS SECTION

* *Contribution No. 206 of CPCRI, Kasaragod.*

** *Present address: Indian Institute of Sugarcane Research, Dilkusha 226 002, Uttar Pradesh, India.*

culinary purpose are dehusked in the house as and when required. However, for the preparation of copra, the dehusking of nuts is done on large scale.

In all the coconut producing countries of the world, the husk is removed by hand (Grimwood, 1975) by impaling the coconut on a sharp iron or wooden spike fixed in ground. The work is however not only hard, but calls for considerable skill. The out-turn per worker with this tool varies from 1,500 to 3,000 nuts per day of eight hours depending on extent of skill, type/size of nuts and moisture content in the husk (Aten, Mani and Cooke (1958).

Several research workers (Titmus and Hickish, 1929; Celaya, 1930; Waters, 1949; Beeken, 1954; and Singh, 1981) and M/s E. W. Downs and Son Ltd., England (Nathanael, 1965) have attempted to develop a simple and efficient coconut dehusker. The recent work by Singh (1981) was similar to that of M/s E. W. Downs and Son Ltd. in 1960's. The little change in the design was that upper blades were spring loaded and bottom ones shall also move on pressing down the upper ones. The test results of this dehusker, however, showed that it was not possible to dehusk nuts of all shapes and sizes. In addition, there was breakage of nuts to extent of five per cent.

In general, it can be stated that mechanical dehusking has never been found altogether satisfactory. Apart from difficulties associated with the size and shape of coconuts, it would appear that the machines that were or are in use, do not offer sufficient reduction in labour and skill to supersede the manual method.

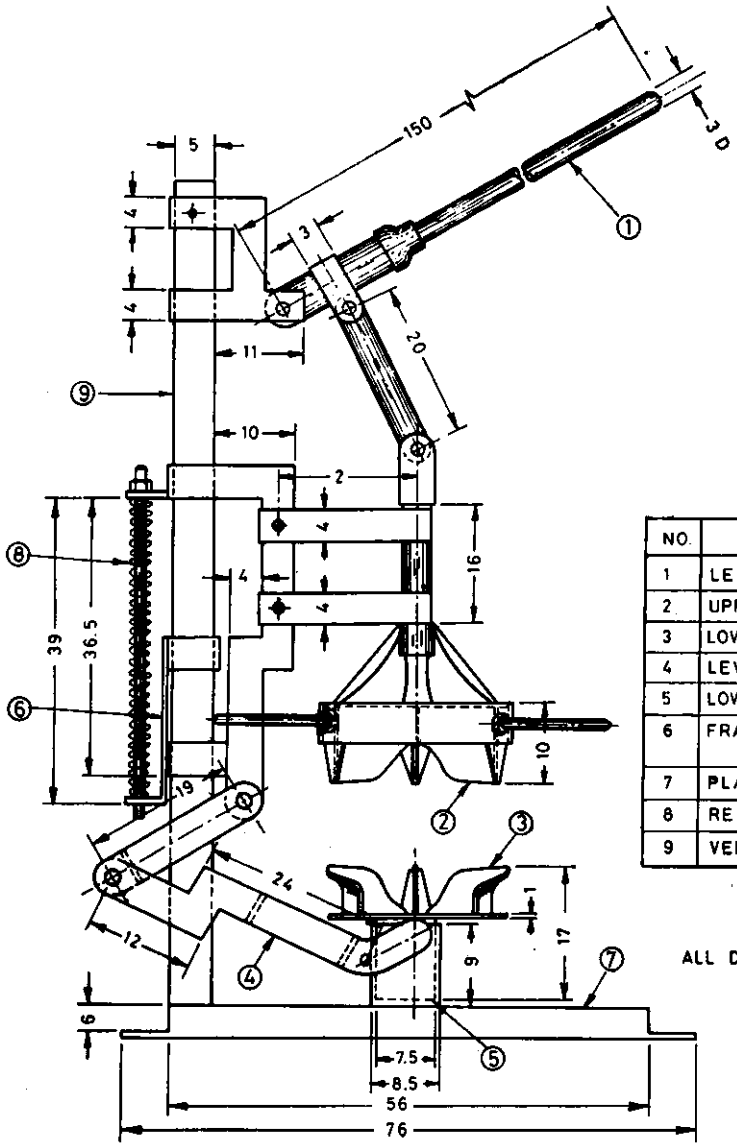
RESULTS

The upper blades which were spring loaded have completely been removed along with the mounting frame and rod. Now three blades which are simple and fixed are mounted on a round flat ring. These upper blades join each other at the centre. This arrangement provides flexibility in operation to dehusk nuts of any shape or size. Two rods are fixed on the upper blades mounting ring to facilitate its twisting by hand/leg after the blades pierce into the husk. The lower blades are made little longer and spaced closer. These blades are fixed on two different sized platforms to accommodate small and big sized nuts. The blades do not require resharpening, and replacement is expected in 2 - 3 years depending upon use. In place of telescopic lever, a simple lever is fixed as the effort required to pierce the blades into the husk is less (Fig. 2). The estimated cost of dehusker works out to be Rs. 800/-.

Operation

The operation of dehusker involves following motions (actions), 1) taking a nut from the nearby heap, 2) keeping the nut vertically facing its stalk end downward, in between the lower blades, 3) pressing down the lever in order to pierce the upper blades into husk, 4) twisting by hands/legs the lever fixed to upper blade mounting ring, first clockwise and then anticlockwise,

FIG. 2. MANUALLY OPERATED COCONUT DEHUSKER



NO.	DESCRIPTION
1	LEVER
2	UPPER BLADES
3	LOWER BLADES
4	LEVER MECHANISM
5	LOWER BLADES BASE
6	FRAME TO HOLD UPPER BLADES AND RETURN SPRING
7	PLATFORM
8	RETURN SPRING
9	VERTICAL SHAFT

SCALE 1:5
ALL DIMENSIONS ARE IN CM

5) taking out the loosened husked nut from the dehusker, and 6) peeling of the loosened husk and removal of the remaining husk, if any.

These six motions can be carried out by one, two or three workers. Single worker has to carry all motions in the sequence mentioned above. In case of operation by two workers, motions 1, 2 and 3 are carried out by one operator and motions 4, 5 and 6 by the other. When three workers are employed, motions 1, 2 and 4 are carried

Table I. *Observations on test trials of the dehusker for eight hours daily operation*

No. of workers	Out-turn per day (No.)	Average out-turn (No.)	Average out-turn per worker (No.)	Breakage of nuts (No.)	Average breakage (No.)	Average breakage (%)
1	460	500	500	6	5	1.00
1	540			4		
2	1560	1600	800	10	16	1.00
2	1640			22		
3	3100	3000	1000	25	26	0.87
3	2900			27		

by one, motion 3 by second and motions 5 and 6 by the third worker. In some cases the shell remains attached to one of the three lobes of husk which may be cleared by using either one of the lower blades of the dehusker or spike fixed in ground nearby.

DISCUSSION

The data on dehusking trials with one, two and three unskilled workers are presented in Table I. As seen from the Table, an unskilled worker can dehusk only about 500 nuts in a day (8 hours). If two or three workers are employed on the same dehusker, the turn-out is about 1,600 and 3,000 nuts, respectively. It is obvious that the operation becomes more efficient when two or three workers are employed. This may be on account of the fact that when more than one worker at a time do the operation, the time lost in movement from one motion to another is reduced considerably.

The out-turn of this improved dehusker is less as compared to the traditional method. This fact remains true with almost all the manually operated mechanical devices developed so far. The fact was analysed for motion studies. It is seen that a manually operated mechanical device involves atleast five motions to be carried out by the same source of power *i. e.*, human labour. In case of traditional method, where the tool is fixed, motions required for dehusking operations are only three (*viz.*, taking a nut from nearby heap, dehusking the nut by striking three times against the spike, and peeling off the loosened husk), however the job is more tiresome. Less time is lost in movements among the motions. It appears that unless the mechanical device is operated by some source of power other than the worker himself, it is not possible to compete with the out-turn achieved by single skilled worker with traditional method. Breakage of few nuts while dehusking on a large scale with any mechanical device appears to be inevitable.

ACKNOWLEDGEMENTS

Author expresses his deep sense of gratitude to Dr. N. M. Nayar, Director, CPCRI and Mr. E. V. Nelliat, Head, Division of Agronomy, CPCRI for encouragement and help in carrying out the work. Thanks are due to

Mr. M. V. Krishnan, Welder cum fitter for fabricating this functional prototype. Help of Dr. O. P. Joshi, Dr. P. K. Das and Mr. H. Hameed Khan in preparation of the manuscript is duely acknowledged.

REFERENCES

ATEN, A., MANI, M. and COOKE, F. C. 1958. Copra Processing in Rural Industries – A Monograph. F. A. O. Agricultural Development Paper No. 63, Rome.

BEEKEN, A. H. 1954. Device for husking coconuts. U. S. Patent 2, 666, 465 (19th January, 1954).

CELAYA, G. 1930. Machine for husking coconuts. U. S. Patent 1, 781, 215 (11th November, 1930).

GRIMWOOD, B. E. 1975. Coconut Palm Products: Their processing in Developing Countries. F. A. O. Agricultural Development Paper No. 99, Rome.

NATHANAEL, W. R. 1965. Coconut husks as industrial raw material. *Coconut Bull.* 19 (5) : 111–136.

SINGH, J. 1981. Coconut husking machine. *Invention Intelligence.* 16 (2) : 80–81.

THAMPAN, P. K. 1976. *The coconut Profile of India.* Directorate of Coconut Development, Government of India, Cochin–11.

TITMUS, R. W. and HICKISH, R. S. 1929. Coconut husking machine. U. S. Patent 1,724,739 (13th August, 1929).

WATERS, C. P. 1949. Coconut husk removing tool. U. S. Patent 2,472,354 (7th June, 1949).