International Journal of Future Generation Communication and Networking
Vol. 13, No. 3, (2020), pp. 2513–2521

Design And Evaluation Of Cardamom Plucking Machine

V Thanigaivelan[1], J. Silkson John [2], M. Krishna [3], S. Ganesh [4], B Prabhakaran [5]
[1,2,3,4,5] *Assistant Professor, Department of Mechanical Engineering,*
SRM Institute of Science and Technology, Chennai
thanigailav@gmail.com[1*]

Abstract

Today, the cardamom harvest is physically carried out by tree-climbing workers.

Therefore, to avoid scaling and troubleshooting in this area, cardamom extraction equipment is required. Although India is an agricultural nation and the more of its citizens rely on agriculture for a living, some agricultural areas are short of labor. This labor problem is currently on the rise. Therefore, it is necessary to apply an innovative technique to solve the problem of labor shortage. For the design of the cardamom harvesting tool, it is significant to acknowledge the customer's necessity, mainly suggested by users, and market trends. Detailed ethnographic research has been conducted in the field of cardamom harvesting to understand the problems in the area. Bibliographic searches, GEMBA surveys and customer surveys, market surveys, etc. were carried out. The main objective of the study is to design and develop equipment for the extraction of cardamom to facilitate the collection of cardamom in the agricultural area. The quality analysis distribution (QFD) and the product design specifications were made from the information analysis result.

Keywords— *Big data; Data Analysis, Hadoop, Digital Marketing*

I. INTRODUCTION

Cardamom is the one of the earliest spices in the nature. Cardamom (Elettaria cardamom Matron) is the most perennial herbaceous rhizomatous monocotyledon, belonging to the Zingiberaceace family [1]. It is popularly known even as "the queen of spices" due to its very enjoyable aroma and flavor. Cardamom is often called the third mainly pricey spice in the world behind saffron and vanilla. Guatemala, with a production of 25,000 to 29,000 tons, is the best cardamom architect sought by India and Tanzania. The main cardamom shipping nations are Guatemala, India, also Indonesia, and the large-scale exhausting nations for cardamom are West Asia, Pakistan, European nations, the United States, and Japan.

Small cardamoms are enormous cardamom. In Indian culture successive cardamom generated in Southern side those are green in color (small in size), black cardamom(large in size) generated by traditional methods of bhatties in Sikkim [2,3]. The main growth areas are Idukki, Nelliampathy and Wayanad in Kerala that produce 70%, Uttar Kannada, Shimoga, Hassan, Chickmagalur and Kodagu in Karnataka that produce 20%; The northern and southern hills of Nilgiris, Madurai, Salem, Thirunelveli, Anamalai and parts of the Coimbatore districts in Tamil Nadu produce 10% [4]. Guatemala and India are the main producers of cardamom and represent 70% of world production and the plantation of cardamom [5] is shown in fig. 1.

ISSN: 2233-7857 IJFGCN

Fig. 1. Cardamom Plantation

Large cardamom remains cultivated in the rocky mountain chains distributed in Gangtok, Ravangla including therefore the Darjeeling region in Eastern part, Arunachal Pradesh, Nagaland and Uttarakhand cultivates culture economically [6]. Furthermore, some households in Manipur, Meghalaya and Assam are also trying to farm. On the world stage, Nepal and Bhutan are the 2 competing countries in India for a great cardamom assembly [7] and it is shown in fig.2.

Fig. 2. Pictorial view of Small cardamom

Several analysis foundations have selected several high-yielding elite clones with a yield potential of more than 250 kg / ha (upland) and superior capsule traits that work in the aspects of cardamom culture improvement [8]. They are used successfully for cultivation in plantation fields according to their agro climatic adaptability. There are triple agriculture different mixtures. The components of these triple mixtures are precise in the board.

Cardamom is marketed as a huge and classified product. [9] Cardamom is classified with sieves and different prices are obtained according to its size, color and freshness, with different prices [10,11]. Grade 7mm and above with elegant green color has a premium over other grades. Cardamom comes from the seeds of a plant like ginger. Small sticky black-brown seeds in three double rows with about six seeds in each row. The largest variety mentioned as black cardamom is brown, and therefore the smallest is green. Their dry surface is rough and ribbed; the huge blocks have deep wrinkles. The varieties of cardamom are identified as given in the table 1.

ISSN: 2233-7857 IJFGCN

Table 1. Different Dimensions of Cardamom

Type	Plant Stature	Panicle Type	Capsule Type	Adaptability	States recommended
l.Var.Malabar	Dwarf(2to3m)	Prostrate	Round/oblong	600-900m (lower elevation)	Karnataka and Parts of Tamilnadu and
2. Var. Mysore	Tall(3to 5m)	Erect	Bold elongated	900-1200m (higher elevation)	Kerala
3. Var. Vazhukka	Tall(3to 5m)	Semi Erect	Round oblong	900-1200m (higher elevation)	Kerala and suited for wide range of environmental conditions[27]

II. RELATED WORKS

A. A review of Value Chain Analysis in India by SFAC in 2012

The one who started bringing large areas under food crops later turned out to be the area under cultivation of cardamom. Early settlers were attracted to the possibility of turning wild cardamom into a commercial product [13].

B. Evaluation of solar dryer By M.Sevada and D.Jhajharia in 2012

To preserve cardamom for an extended time and enhance its aroma, contemporary cardamom shells (with 80-85% wetness) ought to be dried out once harvest to scale back the moisture content to lower than 10% and also the method hardening [14].

Antimicrobial activity of vital oil & diverse extracts of greater cardamom by S.Agnihotri and S.Wakode in 2010. It has been used interacting of sure diseases and conditions, similar to abdomen ulceration. Thus, the antimicrobial strategies of crude oil ether, methanol, plus liquid take out of leaves and roots, volatile oil, also cut off vaccines. Large cardamom curing through ICRI improved bhatti by T.Deka,, A.Biswas,B. Gopakumar, and S.Potty in 2003. The study also examines ICRI initiatives to transfer innovative techniques and practices developed by researchers to manufacturers. Therefore, he concluded his study, arguing that the overall development of sustainable development in the region should be integrated with pancreatic research.

C. Training of Horticultural Crops. By Horticulture Department, Sikkim in 2006

The importance of horticulture to improve land use, promote crop diversification, job creation and nutritional security of populations has multiplied and its realization by a representative sample of people [15].
A Journal of Humanities and Social Science Research in 2019. After the successful schedule survey and numerous field observations in detail, the researcher got to know various problems of cardamom cultivators in the study area from planting to Socio- economic problems and Technological problems.

A Report of Cardamom in: Spices and Condiments, by J.Pruthi in 1991. The different uses of spices in food and beverages as flavorings, in medicine and in perfumery and cosmetics are described. It also kept the latest PFA quality standards for spices, as well as lists of other national and international standards for spices, their products and their test methods [12].
Fumigation methods on large cardamom capsules by J.Naik,B. Ramesh and K.Gurudutt in 2005. Large cardamom is a crucial spice crop in Asian nation. Massive cardamom seeds have meditative properties resembling carminative, stomachic, internal organ stimulant [16]. In India, the gathering also process of enormous cardamom capsules is historically doled away despite several advanced treatment ways. What is more, the shortage of an honest promoting channel conjointly prevented producers from getting a much better worth for his or her merchandise. This journal reviews post-

ISSN: 2233-7857 IJFGCN

harvest process ways (hardening, cup piece, loading, and storehouse), standard problems, and their impact on worth chain and business models. It conjointly centers on promoting features and suggests come up for upcoming analysis and growth that might create the culture a lot of widespread and property [17].

A report of drying large cardamom and Biomass Bioenergy by [18]. India is central manufacturer of cardamom within the globe by 54% share in globe manufacture chased by Nepal (33%) and Bhutan (13%). For extensive period storehouse of cardamom also so as expose its smell, the recent cardamom tablets (by 80–85% wetness) has got to be dried out instantly once harvest to decline its wetness to lower to 10% direct a natural action (drying) procedure. Still a ancient plus ineffectual (working effectiveness stage of regarding 5–15 percentage) and flaming methodology (utilizing ancient bhatti) is employed for dehydrating of cardamom leading to vast (predicted 20,000 MT/yr) wastage of wood and below standard product [19]. This report offers a short account of attempts created to get necessary drying frameworks of cardamom beneath completely diverse functioning conditions.

III. PROPOSED SYSTEM

A. Problem Definition

The main objective of the study is to design and analysis equipment for the extraction of cardamom to facilitate the collection of cardamom in the agricultural area as shown in fig. 3.

B. Steps involved in Methodology:

1) Selection and literature study

We carried out relevant study in internet scholar pages and text books on cardamom harvesting. We also analyzed the existing methods of cardamom harvesting used by farmers.

2) Problem definition and cost analysis

We defined our project objective and estimated the project cost. The aim of our project is to make easy harvesting process of cardamom and reduce labor cost.

3) Material selection

We are using stainless steel and structural steel to fabricate the device.

4) Design

We made a 3-dimensional solid model for the setup using CREO designing software.

5) Analysis

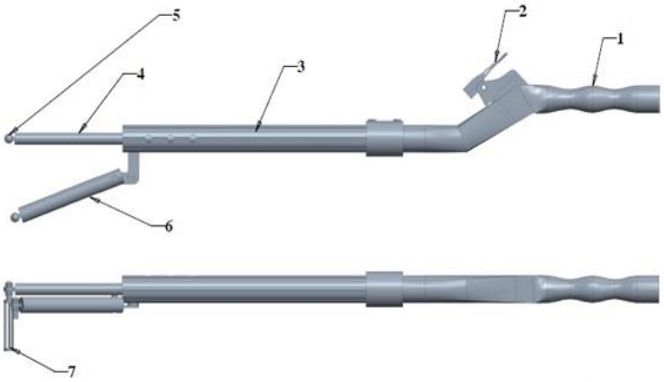
We performed Analysis of designed device in ANSYS analysis software.

Fig. 3 design tools

ISSN: 2233-7857 IJFGCN

Since the main concern is the efficiency and accuracy to minimize the wastage of the crop or product being cultivated. For plotting of Cardamom plucking instrument, it is essential to acknowledge the customer's requirement, major proposal from the users and the swing in the market. A completed ethnography analysis has been finished in the cardamom collecting ground for considering the trouble facing the area. Many type of parts used in the design of the cardamom plucking machine. They are shown in fig. 4.

DESIGN ANALYSIS



S.NO	Parts Name	NO of Parts
1	Handle Gripper	1
2	Brake Lever	1
3	Hollow Pipe	1
4	motor pipe	1
5	Spindle Motor	2
6	Adjustable Lever With Motor	1
7	Blades	2
8	Cable Wire	1

Fig. 4 Overview of arrangements of design parts

C. System Architecture

In this portion we discuss the key point and portions of the design which is included with the modeling of the whole system used for the proposed working as given in fig. 5.

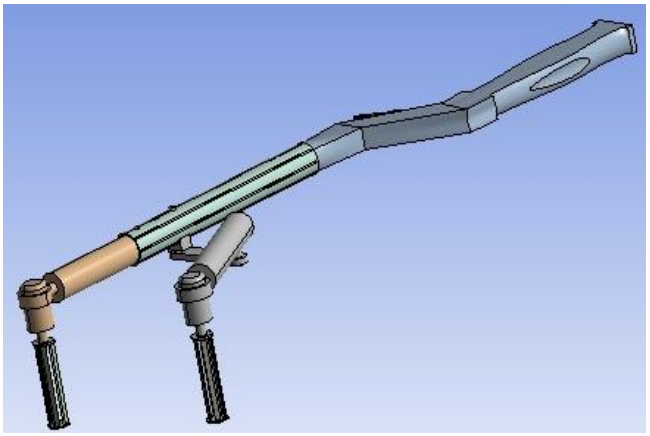


Fig. 5 Photographic view of design tool

ISSN: 2233-7857 IJFGCN

D. Dimension of Each Component

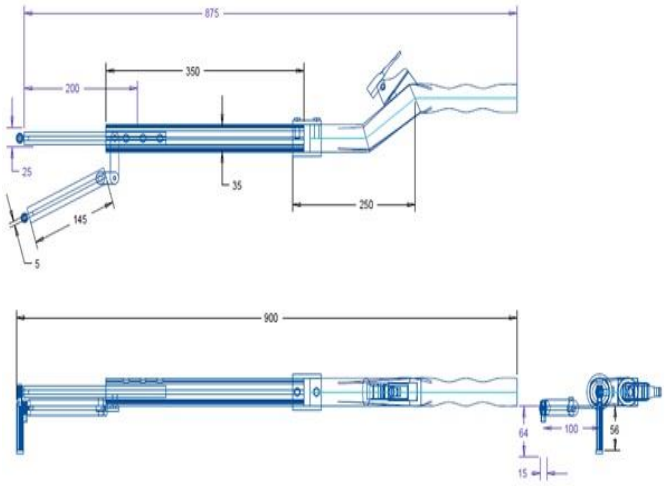


Fig. 6 Dimensional view of components

The dimensional view of components is shown in fig. 6. HAND GRIPPER: Hand grip is made of rubber material for a firm grip to the hand to hold and its length is 130 mm.

BRAKE LEVER

HOLLOW PIPE: Hollow pipe is used length of 350mm and diameter of 1 inch.

MOTOR PIPE: Motor pipe length of 200mm is used.

SPINDLE MOTOR: Spindle motor for rotation of the spindle for cutting tools. The mesh view and total deformation of the components are given in fig. 7 and fig. 8 respectively.

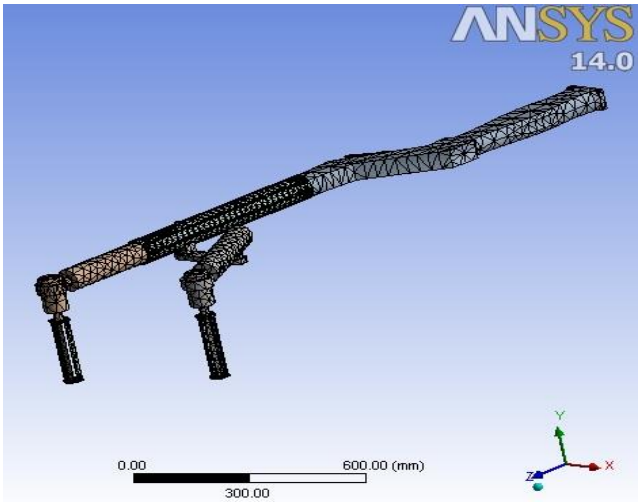


Fig. 7 Mesh view of components

ISSN: 2233-7857 IJFGCN

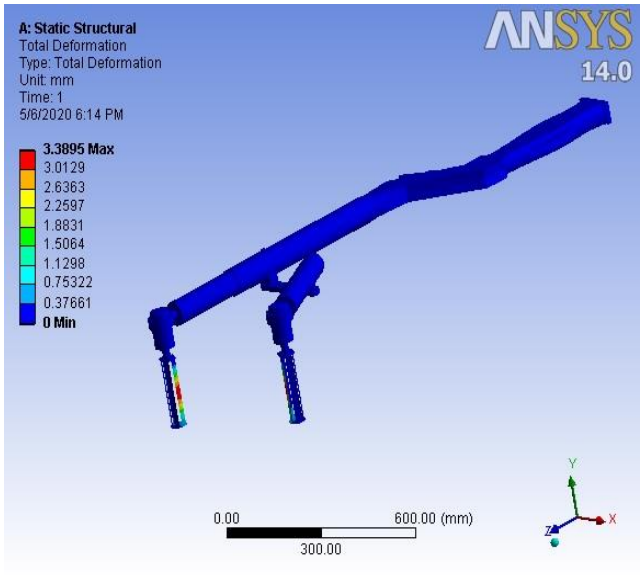


Fig. 8 Total deformation view of components

ADJUSTABLE LEVER WITH MOTOR: An adjustable lever motor of length 145mm for the cutting process and efficient cutting of the product.

BLADES: Blades of 5mm diameter for cutting the product are used.

CABLE WIRES: Cable wires for the usage of the brake lever of the machine. The equivalent elastic strain and equivalent stress value are shown in fig. 9 and fig. 10 respectively.

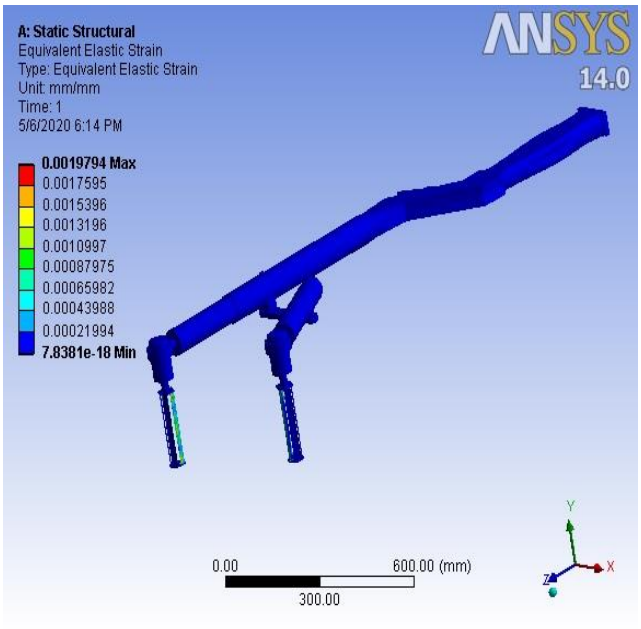


Fig. 9 Equivalent elastic strain of components

ISSN: 2233-7857 IJFGCN

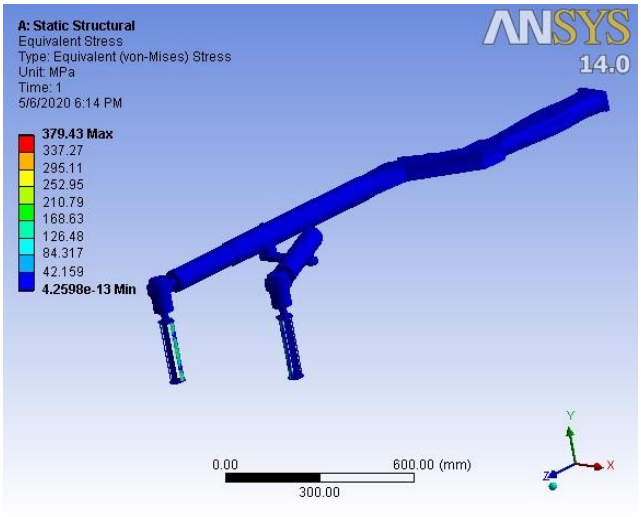


Fig. 10 Equivalent stress of components

IV. CONCLUSION

Global production of massive cardamom, low-volume, high-quality crops, has declined not long ago because of a variety of elements, including pests also diseases. Applying correct post-harvest tillage techniques can help you restore land by reducing post-harvest damage plus increasing value. Developed Bhatti works better then regular Bhatti, yet these machines are not well welcomed by farmers. Farmers require an affordable care system that produces fine standard capsules. Some other labor-exhaustive post-harvest actions, such as capsule extraction, cleaning, packaging, and sorting, have not attracted the attention of analyzers. Mechanical method that decrease heavy human labor and construct post-harvest operation more capable, reduce losses also enlarge the rate of capsules manufactured. In addition to operation, other ways of adding value to today's crops are also needed, alike the making of volatile oil as well oleoresin. The number of cardamom sold decreased in 2013-2014 compared to 2013-2014. However, the export rate was higher in 2013-2014, which shows that increasing the rate also requires harvesting. Therefore, further manufacturing of crop will upgrade the living of many people in the mountains of the sub-Himalaya province. However, the main cardamom producers encounter problems in post-harvest operations. The best additional services offered by NGOs and other public authorities will increase farmers' political knowledge and help them to be implemented properly. Companies like the Northeast local farming promoting Corporation can also aid planters by connecting them with merchants. Finally, an appropriate price for an excellent standard product can help form a large cardamom crop as a beautiful and profitable livelihood.

References

1. SFAC [Small Farmers' Agribusiness Consortium]. 2012. Value Chain Analysis of Selected Crops in North Eastern States. New Delhi, India: SFAC. Accessed on 8 August 2013.
2. Seveda, M. S. and Jhajharia, D. 2012. Design and performance evaluation of solar dryer for drying of large cardamom (Amomumsubulatum). J. Renewable Sustainable Energy, 4: 063-129.
3. Agnihotri, S. and Wakode, S. 2010. Antimicrobial activity of essential oil and various extracts of fruits of greater cardamom. Indian J. Pharm. Sci., 72(5):657-59.
4. International Journal of Humanities and Social Science Research ISSN: 2455-2070; Impact Factor: RJIF 5.22 Received: 12-11-2018; Accepted: 15-12-2018, Volume 5; Issue 1; January 2019;
5. The study on Analysis of Cinnamon, Pepper and Cardamom Value Chains in SriLanka was given by team led by JanakaWijayasiri, Manoj Thibbotuwawa and Dilani Hirimuthugodage,

ISSN: 2233-7857 IJFGCN

Institute of Policy Studies of Sri Lanka with the National Planning Department and Japan International Cooperation Agency (JICA).
6. Buckingham sebstian, synthesis report on cardamom cultivation, fauna and flora international community-based conservation in the hoang lien mountains, Darwin initiative of the UK Government in Vietnam,2004.
7. Sharma R, Sharma E &Purohit A.N, Cardamom, mandarin and nitrogen-fixing trees in agro forestry systems in India's Himalayan region, II Soil nutrient dynamics, Agro forestry Systems and Performance of an age series of Alnus-cardamom plantations in the Sikkim Himalaya: Productivity, Energetics and Efficiencies(2002).
8. Sulochanamma, G., Ramalakshmi, K., Kumar, T. M. M., Indiramma, A. R., Ramesh, B. S., Sampathu, S. R. and Naik, J. P. 2008. Storage characteristics of large cardamom (AmomumsubulatumRoxb.) and seeds in different packages. J. Food Sci. Tech., 45 (2) 183-86.
9. Stoep, G. A. V. 2010. Enhancing Competitiveness of Nepal's Large Cardamom Value Chain. Kathmandu, Nepal: SNV Netherlands Development Organization.
10. Srinivasa, H. S. 2006. Large Cardamom Cultivation in India. Report of the Spices Board, Regional Office. Gangtok, India.
11. Seveda, M. S. and Jhajharia, D. 2012. Design and performance evaluation of solar dryer for drying of large cardamom (Amomumsubulatum). J. Renewable Sustainable Energy, 4: 063-129.
12. Thanigaivelan, V. and Loganathan, M. 2019. Investigational Analysis of Performance Characteristics and Emission of Cashew Nut Shell Biodiesel on Di Diesel Engine. International Journal of Advanced Research in Engineering and Technology, 10: 1.
13. Rout, P. K., Sahoo, D., Jena, K.S. and Rao, Y. R. 2003. Analysis of the oil of large cardamom (AmomumsubulatumRoxb.) growing in Sikkim. J. Essential Oil Res., 15(4) : 265-66.
14. Naik, J. P., Ramesh, B. S. and Gurudutt, K. N. 2005. Fumigation studies on cured large cardamom (AmomumsubulatumRoxb.) capsules. J. Food Sci. Tech., 42(6) : 531-33.
15. Mande, S., Kumar, A. and Kishore, V. V. N. 1999. A study of large cardamom curing chambers in Sikkim. Biomass Bioenergy,16.463-73.
16. BIS. 2009. Indian Standard- Spices and CondimentsLarge Cardamom- Capsules and SeedsSpecification. Bureau of Indian Standards, New Delhi, pp. 1-2.
17. Loganathan, M. Madhavan, V., Arun Balasubramanian. K., Thanigaivelani, V., Vikneswaran, M. and Anbarasu, A. 2020. Investigation on the effect of diethyl ether with hydrogen-enriched cashew nut shell (CNS) biodiesel in direct injection (DI) diesel engine. Fuel, 277:118165.
18. Bhattarai, N. K., Deka, T. N., Chhetri, P., Harsha, K. N. and Gupta, U. 2013. Livelihood improvement through sustainable large cardamom cultivation in North Sikkim. Int.J. Sci. Res. Pub., 3(5):1- 4.
19. Thanigaivelan, V. and Loganathan, M., Saravanan, C.G. 2017. Pursuance Assessment and Discharge Characteristics Studies of Compression Ignition Diesel Engine by using Cashew Nut Shell Oil as Bio-Diesel Blends. International Journal of Applied Engineering Research., 12(13):4009- 4014.

ISSN: 2233-7857 IJFGCN