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Optimization & Automation of Corn Deseeding Machine

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***Abstract** this study work seeks to develop a low cost design of a portable maize shelling machine for small scale farmers by reducing processing cost and thereby making readily available on the market for the ever growing number of maize farmers in INDIA. Since there are various techniques for threshing maize in India, the main problem with machines is that they are not affordable to many farmers in India because of its heavy cost i.e. (~Rs.25,000 /-). So these farmers resort hand operated tools which gives low output, more damages of kernel threshed from cob, which is monotonous work. So our goal is to provide framers with a good maize shelling machine which not only reduces their work load but also ensures them cost saving option with simple mechanical design.*

***Keywords1:- Maize,** Sheller Machine, Design, Efficiency, Cost, Pedal Power, Bicycle chain, Maize Deshler*

I. INTRODUCTION

In India, most of the farmers shell corn by mainly three methods namely shelling cob grain by hand or beating by stick method were carried for removing corn kernel from the cob; hand operated corn shelling machine and corn shelling machines powered by electricity. People use various methods for removal of corn shells and to de-seeding of the corns with minimum damage to the corns. Manual method involves shelling operation by hand itself while the automated involves use of machine equipment's for the same purpose.

Maize production is on the high increase as a result of new improved varieties, fertilizers and better modern practices primarily processing continues to be problem. Traditionally, after harvesting, threshing is accomplished by hand beating in a mortar with pestle or beating the cobs with stick in sags until the grain are separated from the cobs. There are problems associated with these methods. It limits the scale of production, time consuming, reduces reliability of the grain break the maize in to pieces sometimes Effects have been made in overcome the limitation observed in the traditional method of threshing.

II. CONCEPT

Introducing low cost automation was to overcome problems with the current manual traditional method. In mechanism there are a numbers of uncertain shelling machine such as hand operated corn. The concept of the work is,

1) Observe the manual methods to identify the important process variables.
2) Quantify the important method.
3) Develop a prototype automation system which could control over all of the process.
4) Investigate all areas of automated forming.
5) Produce a specification for a low cost automated system.

III. OBJECTIVE

- Reduce the 70% efforts of farmers by helping them to remove beans of maize.
- Provide an affordable Corn DE seeder machine which is under Rs.25, 000/- so that it would be utilized even in the rural areas.
- 0% electricity utilization during shelling operation.
- To improve the productivity by 60% of the threshing by this mechanism than by manual method.
- Reduce the grain damage percentage from 6% to 1% in hand operated mechanism to pedal operated mechanism respectively.

IV. SCOPE

Currently, in rural areas cutting or deseeding the corn by hand it required more time and labor which increases the labor cost. Currently, using a motorized machine will result in more cost of the machine and also the electricity consumption will be more. So we try to develop a machine which reduces the human effort and work without the consumption of the electricity.

V. PARAMETERS CONSIDERED

Twenty five cobs of maize were selected and divided into five groups of five cobs each were threshed by the machine. And also another twenty five cobs of maize were also selected and divided into five groups which were also threshed by hand.

5.1 Parameters Considered:

The following parameters were determined from the data collected:

I) Output (rate of threshing) = $\frac{\text{Mass of shelled grain (kg) x 3600kg/hr.}}{\text{Time taken in (sec)}}$

II) Threshing efficiency = $\frac{\text{Mass of threshed grain}}{\text{Mass of threshed grain +mass of uncherished grain +100 (\%)}}$.

III) Grain damage = $\frac{\text{Mass of damaged grain-100(\%)}}{\text{Mass of threshed grain}}$

5.1.1 For Pedal Operated Threshing Machine:

Output (Rate of shelling) = $\frac{\text{Mass of shelled grain (kg) X 3600kg/hr.}}{\text{Time taken in (sec)}}$

VI.RESEARCH METHODOLOGY

Pedal Operated Corn Threshing			
Trials No.	Time (s)	Mass Of Threshed Grains (kg)	Output (kg/hr.)
I.	20	0.25	44.85
II.	18	0.25	50
III.	21	0.25	43.05
IV.	17	0.25	52.95
V.	16	0.25	60

Hand Operated Corn Threshing			
Trials No.	Time (s)	Mass of Threshed Grains (kg)	Output (kg/hr.)
I.	65	0.25	13.85
II.	60	0.25	15.4
III.	61	0.25	14.81
IV.	58	0.25	15.512
V.	57	0.25	15.89
Mean			15Kg/hr

Table 1: - Output obtained with Pedal Operated Corn Threshing & Hand Operated Corn Threshing.

The thresher threshed three times as a fast as hand threshing. This translates in to about 68% savings in time. The output shown in above table indicated that there is decrease in hand threshing which increases in pedal operated threshing. This is an advantage over the hand threshing in terms of the output of pedal operated machine. A mean threshing efficiency obtained as 95.08%

5.1 COST BENEFITS TO FARMERS

Sr. No.	Parameters	Cost/day (Rs.)
1.	Production	13,392/-
2.	Electricity	530/-
3.	Labor	400/-
4.	Grain Damage	575/-
	Total Cost	**14,897/-**

Table 2: - Cost benefits per day by Pedal Operated Machine

Rs. 14,897/- per day benefit for farmer by using Pedal Operated Corn Shelling Machine.

VI. Advantages & Disadvantages

6.1 Advantages

- ✓ Operation is relatively simple and safe.
- ✓ The equipment is suitable for rural farmers.
- ✓ The equipment runs with mechanical power, hence no electricity required.
- ✓ The chain drive has power transmission efficiency of 98% hence reduces human efforts.
- ✓ The equipment has higher rate of threshing and efficiency than handheld tools.
- ✓ The equipment is portable.
- ✓ No Skilled labor is required to operate this machine.

6.2 Disadvantages:-

- ✓ Introduction of pedal powered thresher will have conflict with cultural beliefs or practices in some cases. The preferences of the region must be taken into consideration.
- ✓ Physical dangers may involve in this type of threshers while miss feeding maize to the thresher. Operator should concentrate while feeding process.
- ✓ Speed breakage may cause due to the miss pedaling. Pedal should be operated in a uniform speed.

VII. Future Enhancement / Scope

- ✓ Two threshing units can be attached to the single pedal power source.
- ✓ The equipment can be made run by a battery by efficient power transmission system.
- ✓ The battery can be charged by Solar Energy.
- ✓ An electric generator or a dynamo can be connected to the rotating shaft to produce small amount of electric energy.
- ✓ Open Close Cap Sensors can be used to operate the canopy of the machine.
- ✓ Electric Motor can be used for increasing efficiency of the shelling.
- ✓ Different size of canopies can be used according to size of cobs

VIII. CONCLUSION

The pedal maize thresher was constructed to thresh maize. The machine is easy to construct and costs Rs. 13,000/- only. Result of performance test conducted showed that an average output of the pedal operated machine was 51 kg/hr., while the average output of the hand thresher is 15.00 kg/hr. This shows the machine output is significantly higher than the hand threshing output. The shelling efficiency is 95.08% and 0.01% grain damage.

VII. REFERENCENCES

[1] S.P. Singh , “Ergonomics in developing hand operated maize Dehusker-sheller for farm women”, The Ergonomics Society, 1973.

[2] Nguyem QuangLoc. "Study the broken maize grain on tangential thresher", Nong Lam University, 2002.

[3]Kareem Buliaminu, "Development of a Role in Orientation Machine for Maize Shelling", David publication, 1977.

[4]D.K. Lingaiah. , "Mshelling, Journal of AgriculturalEngineering (ISAE) 23 (1), 71e8achine design data handbook", Suma publishers, 1985.

[5]Ali, U.Singh, J.Soni, A.K.Maheshwari "Economics and Technical feasibility of maize dehusking, 1997.

[6]Abate Tsedeke, Bekele Shiferaw, Abebe Menkir, Dagne Wegary, and Yilma Kebede 'Factors That Transformed Maize Productivity in Ethiopia', avaliable at <https://doi.org/10.1007/s12571-015-0488-z> accessed June 20, 2008.

[7] Anonymous . , Consolidated final report 1975-1986 of Operational research project on post-harvest technology (Coimbatore center): 2009

[8] Begum and H. Shaik. 2014. 'Design, Development and Performance Evaluation of a Hand Operated Maize Sheller', 7: 2010.

[9] Chabra, S. D. and K. N. Singh, 1977 , Effect of cylinder speed and peg spacing of axial flow thresher on wheat threshing. J. Agril. Engg. 14:141-144, 2011.

[10] Chowdhury, M. H. and W. F. Buchele, 1978, the nature of corn kernels Damage inflected in the shelling crescent of grain Combines. Trans. of the ASAE, 21(4): 610-614, 2012.

[11] Kumar, A., D. Mohan, R. Patel and M. Varghese, 2002, Development of grain threshers based on ergonomic design Criteria. Applied Ergonomics, 33: 503-508, 2014.

[12] Ignatio Madanhire, Simon Chinguwa and Elton Ntini , Design and Simulation of Maize Sheller for Small Scale Farmers, 2016.

[12] Nwakaire, J.N., B.O. Ugwuishiwu, and C.J. Ohagwu, 2011,'Design, Construction and Performance Analysis of a Maize Thresher for Rural', 30.

[13] Sachin, C., 2016, Development and Performance Evaluation Of Modified Maize Dehusker Cum Sheller, Department Of Farm Machinery &Power Engineering Vaugh School Of Agriculture Engineering and Technology, India.

[14] Sachin P., 2008, Design, development and evaluation of a poweroperated maize sheller (Spiked Disk Type). Int. J. Agric. Sci., 4:215-219.

[15] Patil, S.B., A. D. Chendake, M. A. Patil, S. G. Pawar, R. V.Salunkhe and S. S. Burkul. 2014. "Development and performance evaluation of pedal operated maize sheller". Internatnal Journal of Advanced Research, 2(9):561-567.

[16]Sagar Shelare, A LITERATURE REVIEW ON DESIGN AND DEVLOPEMENT OF MAIZE THRESHER Article · (April 2015)

[17] Robert Eugene Fox, Development of a compression type corn threshing cylinder, 1969.

[18] Merga Workesa Dula Review on Development and Performance Evaluation of Maize Sheller, International Journal of Engineering Research & Technology (ISSN: 2278-0181 IJERTV8IS050329 Vol. 8 Issue 05, May-2019.

[19] Sharmistha Sahu, Geetanjali dhupai, Jogendra soren Design and Fabrication of a Hand Operated Small Scale Maize Sheller Article in International Journal of Current Microbiology and Applied Sciences · June 2020.

[20] Anirudha G. Darudkar, Dr. C. C. Handa Literature Review of Corn Sheller Machine ISSN (online): 2349-6010.

[22] Hamid Fadhil Al-Jalil, Design and performance of low damage corn shelling machines, 1978.

[23] Salih K. Alwan Al Sharifi1*, Mousa A. Aljibouri2 , Manhil Abass Taher2 Effect of threshing machines, rotational speed and grain moisture on corn shelling .Bulgarian Journal of Agricultural Science, 25 (No 2) 2019, 243–255.

[24] Khayer SM, Thaneswer Patel* and Dewangan KN, Ergonomic Design Improvement of Pedal Thresher: An Approach Combining Digital Human Modelling and Response Surface Analysis.