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Literature Review - On Manually Operated Machineries for Current Development of Advanced Technologies

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Abstract - *This review paper deals through the review of diverse literature. The paper emphases on study of manually operated machines by different authors for the current development of the world using different designing and fabrication processes. Currently, extremely settled and very innovative machinery are available in the world. This is due to the presence of manually operated machine. For the growing countries like Africa, the condition of the manually operated small-scale equipment is playing a vital role in the national economy especially in the agricultural sectors. Although this sector is playing significant role but it is still at low level and many factors contributed for discouraging it. This paper review some of the investigation of manually operated small-scale machine for the development of advanced machineries for the current development of the world. And it compares the advancement of it. The reviews are from agricultural to highly powered machines. The review concluded that, distinctive production results in significant changes in the developed of the world which on the application of the manually operated machine*.

***Key Words*: Machinery, Manual Operated Machine, Small-Scale, Power Operated**

1. INTRODUCTION

The creation of a new class of mechanical systems needs a logical stage in the field of the improvement of the means for the mechanization of production [1]. Machineries can be driven by animals or people, by natural forces such as wind and water, thermal, or electrical power. It exactly includes, a system of mechanisms that shape the input to achieve a specific application of output forces and movement. As we know, manually operated machineries are a device that are operated by hand by turning knobs, pressing buttons, squeezing triggers, etc. hand curt, conventional machineries, low scale farming machines, an automobile driven by a human operating the pedals, steering wheel and sometimes even shifting gears and other labor-intensive machine are example of manually operated machine. Manually operated machines called labor-intensive machineries.

Those equipment are operated with the help of human being. This merely means that, in order to control these machines there is a need for a human hand. Mechanized farming is the process of using farming machinery to significantly increase farm worker efficiency. Modernization work contains the use of an intermediate device between the power source and the work. This intermediate device typically converts motion, such as rotary to linear, or delivers some sort of mechanical advantage, such as speed rise or reduction or leverage or may be others. So, modernizing mechanized farming or mechanization take in use of tractors, trucks, combine harvesters, airplanes (crop dusters), helicopters, and other vehicles. From the countries of the world, almost 65% of it lives under developing countries and they require continuous improvement in agriculture, manufacturing and transportation sectors.

In accomplishing the development on these sectors, the role of manually operated machine in all sectors plays a vital role. The developments of the infrastructure in turn highly depend on the availability of various types of vehicles (cars, pickups, trucks etc) construction machineries and agricultural equipment's. Advanced or Non-conventional machineries, on the other hand are machineries that function automatically with the help of computers and no need for human intervention or operator. Advanced machineries and engineering in the use of advanced technology is, to advance products or processes, with related technology being described as advanced, innovative, radical manufacturing industries increasingly integrate new innovative technologies in both products and processes. In general, the improvement of the manually operated equipment's and machinery can play a great roll for all sectors of the peoples and it encourage the development of the world. And the amount of technology embracing and the ability to use that technology to remain viable and add value to define the advanced manufacturing sector. So, this review can show the importance and development of manually operated mechanical machines for the current development of advanced technology. And it summaries the work of others engineers for the clarity of manually operated machinery.

Data extraction: Significant data was extracted and examined qualitatively by means of literature review. In the process, alike ideas/criteria were shared and some were improved in order to increase the level of clarity of the review.

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2. LITERATURE REVIEW

Traditional manufacturing is well-defined as the action of converting raw materials into ended goods by using labor-intensive or mechanized transformational techniques. The purpose of such doings is to enhance value to attain targeted objectives, which do not preclude society's overall interests. In different studies, the distinction between traditional sectors of manufacturing and others is the basis for a definition of advanced manufacturing, with the characteristics of the two contrary in terms of volume and scale economies, labor and skill content, and the depth and diversity of the network surrounding the industry. The following literatures handle so many important issues on the development of the advanced machines through conventional machine.

Prof. P.B.Chavan, Prof. D .K. Patil and Prof. D.S. Dhondge developed to help small-scale farmers to meet an increased demand for local grains, by designing a reaper machine to harvest grains more efficiently. Their study was about design and development of manually operated reaper. The exploration work focused on ease of harvesting operation to the small land holders for harvesting varieties of crop in less time and at low cost by considering different factors as power requirement, cost of equipment, ease of operation, field condition, time of operation with varies with climatic conditions. Also the work was operating, adjusting and maintaining principle are made simple for effective handling by unskilled operators. After all, the following conclusion were addressed. It work continuously and gives more efficiency than the machine existed before. It is high man power saving equipment, the cost of harvesting with this manual operated reaper is highly decrease with traditional method and due to the variation of the cost, it is so affordable to small farmers. The efficiency is increases from 59% to 66% due to its modifications [2].

A.S. Adekunle, I.O Ohijeagbon, H. D. Olusegun studied about motorized operated melon shelling in order to meet the domestic, commercial and industrial requirement of melon for food processing. Shelling in most part of the world, usually done manually by hand and it is not safe. But this machine is highly time consuming and strenuous. It is made up of three sections namely the hopper, the shelling chamber consists of the shelling disc, shaft, and the gear system. The materials used in the construction of this machine were easily available, cost effective and possess the required properties were based on strength, suitability and local availability and it is from locally sourced materials and it can be used in both urban and rural areas even where there is no power supply. The efficiency of the machine is around 68%. From the study, the following conclusion were addressed. Materials and methods they used for the fabrication of the shelling is involved utilizing scientific principles to design components and systems that performed reliably and satisfactorily. It is very applicable for local production, operation, repair and maintenance. Also a melon shelling plant based on this technology could provide employment and at the same time it makes available quality melon seeds at low cost for domestic use and for melon oil processing industry[3].

Kyada, A. R, and Patel, D. B. Seed planting is possible for different size of seed at variable depth and space between two seed. It increased seed planting, seed/fertilizer placement accuracies and it was made of durable and cheap material affordable for the small scale harvester farmers. The operating, adjusting and maintaining principles were made simple for effective handling by unskilled farmers. Sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climate conditions to achieve optimum yields. This manual seed planter machine has considerable potential to greatly increase productivity. The task for the study was to promote this technology and have available to farmers at an affordable price. The manual Seed Planter machine can be readily made from local components in workshops. By using of this machine, achievement of flexibility of distance and depth variation for different seed plantation is possible. A manually operated template row planter was designed and developed to advance planting efficiency and reduce drudgery involved in manual planting method[4].

M. Ranjit Kumar and N. Kapilan studies about floor cleaning machine from the help of available sources. In this project, an effort has been made to develop a manually operated floor cleaning machine so that it can be an alternative for conventional floor cleaning machines. It was developed for roads, railways and so on. This was to achieve simultaneous dry and wet cleaning in a single run, to make the machine cost effective and lastly to reduce the maintenance cost of the manually operated floor cleaning machine as far as possible. The conventionally used materials were considered for the components of floor cleaning machine. From the finite element analysis, we observe that the stress level in the manually operated floor cleaning machine is within the safe limit. It is an alternative for an automated floor cleaning machines during power crisis. Body is pedal operated to achieve dry and wet cleaning simultaneously. The study was about Design and Analysis of Manually Operated Floor Cleaning Machine [5].

*Mahapatra and P. S. Chattopadhyay investigated on design and development of vegetable transplanter. The investigation was on d*esign, development and evaluation of a Power Tiller Operated Vegetable transplanter." It is the improvement of the power tiller operated vegetable transplanter from laboratory and field investigation. The effective field capacity of the machine was found for transplanting cabbage, chilli, tomato, knolkhol and brinjal respectively. And again, the yields of crops in different methods were found at par with each other with seedlings of size more than 150 mm. The transplanting quality parameters and the yield of the crops under study when transplanted by machine were at par with manual transplanting with considerable saving in cost of transplanting. Also, he conclude that, the developed machine performed satisfactorily on transplanting the seedlings of cabbage, chilli, tomato, knolkhol and brinjal in the prepared field and was found economical over manual transplanting. Lastly it brings bright future for the development of advanced agricultural machineries in the world as well as tropical nation[6].

Kumar, K.R. Jolvis Pou, Sanat Das and Mrinmoy Biswas studied about manual operated rocker sprayer. The study was modification and testing of manually operated rocker sprayer. Over a period of time, it was replaced with an electric motor and the speed of the motor was regulated by a voltage regulator. For determining the power requirement, the speed of the manually operated sprayer was regulated by subjects' analysis and was found to work with an average speed of 74 rpm of the piston movement. From the components of the machine, hand lever of the existing sprayer was replaced with an electric motor and Speed of the motor was regulated by a voltage regulator. The piston displacement and the velocity decreases with an increase in the length of the connecting rod and vice versa. The speed of manually operated sprayer was estimated by the subjects' survey and was found to work with an average speed of 74 rpm of the piston movement. It was found that piston displacement and the linear velocity increases with a decrease in the length of the connecting rod and vice versa. In all the cases, piston linear velocity was found to be higher at two crank angles[7].

Panashe Mombeyarara, Tauyanashe Chikuku, and Tawanda Mushiri studed about paper recycling machine by the name of design of a manually operated paper recycling machine. It is from integration of acquired knowledge on the recycling technology, existing manually operated and available paper recycling machines to form a cheap but efficient paper recycling machine and it explores the design of a cheap and efficient manually operated paper recycling machine. Estimated efficiency was equal to 90% but using the 90% for design, the design power input is 450 watts and since an average person can produce 100 Watts constantly therefore 5 people are necessary to drive the machine. The conclusion was, able to meet the necessary requirements and specifications. It does not require any specialized training hence an average person can operate it. Due to the small power, speed and load requirements of the machine, it is not expected to fail in its stipulated life time although special attention and maintenance will be required for the bearings and compression rollers which are the mostly likely components to fail during operation. The landfill and pollution problems in primary consumers of waste such as higher institution and schools considerably reduced by use of the machine and also the users will be benefit by meeting the demands of the paper market, allow the generation of income from waste and help to curb unemployment [8].

Junaid Baig, Anasuya Barik, Prathamesh Baikerikar, Anoop Ghuge developed pedal powered clothes washing machine. It has low cost, easily and readily available components in in every environment. It made by simple design, use of inexpensive parts, very low repairing and maintenance cost, affordable member of the society and highly protect the environment. The machine generates power through human pedaling and with the drive mechanism, converts the pedaling motion into required rotary motion of the washing drum. It was directly addressed the problems faced in washing clothes, and thus have developed a new design for easy effort in washing, rinsing and drying clothes in rural area. In the rural areas where electric supply is unobtainable and expensive, powered washing machines becomes almost unfeasible. It provide a product with an alternative way to wash clothes when there is no electricity. Not only cheap but has low maintenance cost. So the product which is a pedal driven machine, it satisfies the need of rural people by giving them an alternative way of washing clothes which is quick, cost effective and eco-friendly. The very effectuality of the machine has zero operating cost, cost-effective, and it can be used with minimal effort[9].

A.K. Goel D. Behera B.K.Behera and S.K.Mohanty S.K.Nanda investigated manual operated weeder. The investigation was on the development and ergonomic evaluation of manually operated weeder for dry land crops. The finding was from five numbers of weeding elements were made up of 10 mm mild steel rod and 3 mm mild steel plate. The performance of the developed weeder along with other available weeders in the state for dry land crops was studied. The ground wheel, steel rod, rod spokes, Slots, L-shaped support, types are the components of it. From his study, the following conclusions were drawn. The weeding index and performance index of all the weeders were found to be maximum at 11.63% and minimum at 8.04% moisture content. Hence, a soil moisture of 11.63% was considered to be most suitable for weeding in groundnut crop in sandy loam soil, developed weeder has higher weeding index, lowest plant damage, lower energy consumption rate and higher performance index at various soil moisture content proved its superiority over other treatments, The cost of operation of developed weeder was found to be 10.5% per hectare in conventional method of weeding by using trench hoe[10].

V. F. OGUNTUYI et.al studies about orange juice extraction machine. The study was about evaluation of development and performance of a manually operated orange juice extracting machine. This paper was developed on the basis of mechanical and physical properties of the sweet orange fruit production, fruit density, size peeled whole fruit mass ratio, epicarp/mesocarp thickness, crushing strength, stiffness modulus, modulus of resilience, yield point, toughness modulus maximum breaking force and minimum deformation at failure were considering design properties of the machine. Maximum extraction efficiency was 90% for fruits cut into small pieces. Electrically powered ones are costly high and cannot be used in places where there is no electricity. Therefore, there is need to develop an orange juice extractor which could be easily available and manually operated for further application. A portable and manually operated orange juice extractor was designed and constructed[11].

Sukhbir Singh, D. C. Sahoo, and J. K. Bisht. Was developed on manual operated multi-crop mechanical machine for hilly region. The sample was a nylon made cell type seed metering mechanism with 4 types of cells of different sizes on a roller, and also has a fluted roller for fertilizer metering. Shovel type and Inverted T-type furrow openers can be used as the basic. The cost of operation was observed 42% less in multi-crop planter with 21%-33% increase in yield as compared to traditional broadcasting method.

The study was titled by development and performance evaluation of manual/bullock operated multi-crop planter for hilly region. it contained of a main frame, ground wheels, seed and fertilizer hoppers, seed and fertilizer metering system, furrow opener, power transmission system and hitch. Operated manually with two or three persons or with a pair of bullock, must be light in weight so that it can be transported easily from one walkway to another by a single person, the machine should be inexpensive i.e. within the purchasing capacity of small and marginal farmers,

It should be able to sow the major crop of hills viz. wheat, maize, soybean, millet, pea, lentil, paddy etc. were some design considerations for the machine in the development of it. And should be able to work under ploughed and unplugged conditions, meter the seed and fertilizer with required seed rate and It should be easy in operation and maintenance and again, It should be easily fabricated by local manufacturers [12].

3. DISCUSSION

Currently, developed countries uses advanced mechanical machineries for homes, production of agricultural goods, scientifical and technological developments. Similarly, developing and under developing countries also use manually operated equipment for development of their life. As we seen before, advanced machines are those machines that operate automatically with the help of computers i.e. without human involvement or operator. The rate of technology implementation and the ability to use these technologies to remain competitive and add value to define the advanced manufacturing sector. So, from the above literature, all study deals about manually operated machine for the development of the world. And the studies are about for the design, modify and evaluate the performances of manually operated machines. From the design, some of them is for specific functions and others are for multi-functions. And all the studies play a major roll for the current development of the global technology. As we said before, advanced machines usually controlled by an automatic robot or computers. Comparatively they are very expensive and it needs high cost for fabrication. Due to the direct contact between the tool and the working material, manually operated machineries are less in price and it made from simple laboratories and workshop. When we come to costs, non-conventional tools are more expensive compared to conventional ones. Non-conventional tools require skilled operators who are experts in machining because it has a complicated set up while conventional tools are easier to set-up and operate without the assistance of professionals and easy to find spare parts for conventional machines but harder for non-conventional ones. Therefore, conventional machineries are helpful for current development of the society and still plays major roll for 85 - 90% of world population. In general, non-conventional equipment's are uses tools that are less noisy thus preventing noise pollution. In conventional machining processes, there is a risk of tool wearing since physical contact is required to perform the tasks. Non-conventional process promoted longer tool life because no direct contact is made between the tool and the materials. Tools used in non-conventional processes are more accurate and with higher precision compared to conventional tools that create conventional parts. Also conventional machine needs more care to prevent mechanical hazards to that of non-conventional machine.

4. CONCLUSIONS

Manually operated device is very crucial for our country like Ethiopia and other under developing countries. Even though is not currently produced in industries as well as in a small enterprise industry. As clearly the different design and evaluation in this review is produced in local industries with the locally available and cheap materials. The design can be carried out with affordable capacity in most of the countries. Also a better quality product may be produced through a developed time. That will save a huge amount of foreign currency which was paid to import this huge machinery and also able to provide the low farmers to use the machine in affordable cost. The best thing is, highly help and enhance the life of our farmers. The survival of human beings without farming is unimaginable. And farming with help of

technology has brings a profit for them and survive of farmer's life.

REFERENCES

[1] V. Arakelian, "Hand-Operated Balanced Manipulators (HOBM)," vol. 14315, pp. 347–348.

[2] P. P. B. Chavan, P. D. K. Patil, and P. D. S. Dhondge, "Design and Development of manually Operated Reaper," vol. 12, no. 3, pp. 15–22, 2015.

[3] A. S. Adekunle, I. O. Ohijeagbon, and H. D. Olusegun, "J estr," vol. 2, pp. 12–17, 2009.

[4] "DESIGN AND DEVELOPMENT OF MANUALLY OPERATED SEED PLANTER MACHINE," no. Aimtdr, pp. 1–7, 2014.

[5] M. R. Kumar, "Design and Analysis of Manually Operated Floor Cleaning Machine," vol. 4, no. 4, pp. 828–831, 2015.

[6] M. Mahapatra and P. S. Chattopadhyay, "Design , Development and Evaluation of a Power Tiller Operated Vegetable Transplanter," vol. 5, no. 9, pp. 92–112, 2018.

[7] S. Deb, S. Kumar, K. R. J. Pou, S. Das, and M. Biswas, "Modification and Testing of Manually Operated Rocker Sprayer," no. June, 2017.

[8] T. Mushiri, P. Mombeyarara, and T. Chikuku, "Design of a manually operated paper recycling machine .," no. January, 2018.

[9] J. Baig, "Pedal Powered Clothes Washer," vol. 4, no. 4, pp. 1127–1130, 2015.

[10] A. K. Goel and D. Behera, "Development and Ergonomic Evaluation of Manually Operated Weeder for Dry Land Crops," vol. X, pp. 20–30, 2008.

[11] O. Orange and J. Extracting, "Evaluation of Development and Performance of a Manually Operated Orange Juice Extracting Machine," no. 1970, pp. 257–264.

[12] S. Singh, D. C. Sahoo, and J. K. Bisht, "Development and performance evaluation of manual / bullock operated multicrop planter for hilly region," vol. 19, no. 1, pp. 81–86, 2017.

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