International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 05 | May-2018 www.irjet.net p-ISSN: 2395-0072

Mechanical Farming Machine

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Abstract - *This paper centers around the automation of agriculture techniques. Today, India ranks second in agriculture output worldwide. India exports an average of $25 billion worth of agricultural products every year, making it the seventh largest agricultural exporter worldwide and the sixth largest net exporter. But it is not an easy task to continuously feed a 1.2 billion population. Lots of problems and hindrance comes on the way like under developed infrastructure, conventional agricultural technologies, farmer suicides and usage of agricultural land for non-agricultural purpose. There is an urgent need to mechanize the agricultural operations so that the wastage of labor force and land is minimized. It results in huge wastage of human labor and in low yields per capital labor force. The concept of Mechanical farming Machine is the fusion of agricultural methods with modern technologies. The machine proposed can perform the three basic agricultural techniques weeding, seeding and watering simultaneously. This project encourages the farmers to adopt technically advanced agricultural equipment in order to carry out farm operations timely and precisely and to economize the agricultural production process*

Key Words: **Slider crank mechanism, Sprocket chain Mechanism, Roller Bearing, Hand Pump Mechanism, Flywheel, Agriculture, Seeding, Weeding, Watering, Lever Mechanism, Welding, Metal Cutting, Technology, Automation.**

1. INTRODUCTION

Agribusiness, the foundation of Indian economy, adds to the general financial development of the nation and decides the standard of life for over half of the India's populace. Agriculture contributes only about 14% to the overall GDP but its impact is felt in the manufacturing sector and the services sector as the rural population has become a significant consumer of goods and services. The agriculture sector faces lots of problem like Irrigation problem, Sustainability problem, fragmented land holding, old technologies and negligence of Natural resources. Modern farms and agricultural operations work far differently than those a few decades ago, primarily because of advancements in technology, including sensors, devices, machines, and information technology. Today's agriculture automation routinely uses sophisticated technologies such as robots, temperature and moisture sensors, aerial images, and GPS technology. These advanced devices and precision agriculture and robotic systems allow businesses to be more profitable, efficient, safer, and more environmentally friendly. The object of the project is the automation of three essential agricultural techniques Weeding, Seeding and Watering into a single machine. Its benefits includes:

- Combined multiple operations can be done in a single usage.
- Reduce operation time, labour cost, wastage and animal dependency.
- Cost effective which support economically weaker farmers who cannot afford expensive equipment, costly animals and work force.

2. LITERATURE REVIEW

According to Martin Abell, one of the researchers at Hands Free Hectare (HFH): We have possessed the capacity to demonstrate people in general that horticulture mechanization is something that isn't too a long ways ahead later on, and it could be going on now. It has likewise enabled us to raise the impression of horticulture to the general population, so they consider it to be a ground breaking industry and something that may draw in new individuals to the business.[15]

According to Jonathan Gill, A Mechatronics researcher at Hands Free Hectare (HFH): It takes new minds entering the business to grow new agriculture advancements. We trust this task motivates individuals and demonstrate to them the scope of intriguing and creative occupations that are accessible now in agribusiness.[15]

3. METHODOLOGY

The Mechanical farming machine is able to perform multiple operations at a single time. The plough operation and seed sowing operation can be done when it moves in one direction while water spraying is done when moves in other direction. For digging the field, first rotate the lever in clockwise direction so that the blades of weeder touch the ground surface. When the machine moves in forward direction, the driver shaft rotates the driven shaft on which sprocket is attached. The chain sprocket mechanism rotates the seeder cylinder in clockwise direction and the seeds get out from the holes at equal interval. Simultaneously, the blades dig the soil. After completing the sowing operation, we have to irrigate the soil for proper growth. Water spray operation activates, when the machine moves in backward direction. During this movement the driver shaft rotates

another driven shaft with the help of chain sprocket mechanism such that the first driven shaft becomes free due to opposite revolution of sprocket. The driven shaft rotates the crank attached, which activates the slider crank mechanism (Fourth inversion) and thus water gets pulled due to vacuum and sprayed by the sprayer with the help of Hand Pump.

Advantages of Mechanical farming Machine:

- Can be utilized on little real estate parcel.
- Coined activity should be possible at the same time.
- Lessen labour necessity.
- Less expensive value contrast with other substantial machines.
- Diminish costlier creature reliance.
- Diminish wastage of seed and product.
- Good for practical weaker rancher.
- Simple to work.
- Expanded profitability rate.
- Require less time for development.
- Relatively appropriate for each sort of harvests.

4. SPECIFICATION OF MACHINE

Frame of model	Length=1000mm Width= 500mm Height= 530mm Material: Iron Pipe
Sprocket Teeth	18
Shaft	Diameter= 10mm Material: Mild Steel
Roller bearing(center)	Part No.= 6000series Number of bearing= 7 Bore Diameter= 10mm Tolerance= -0.003mm Outer diameter= 26mm Tolerance= -0.004mm Width= 8mm Max. Fillet Radius= 0.012mm Static Load= 440lbs Dynamic Load= 790lbs
Roller bearing(drill)	Inner diameter= 12mm Outer diameter= 32mm Width= 10mm Weight= 0.034kg
Flywheel	Diameter= 180mm Weight= 0.65Kg
Operation Performed	Weeding, Sowing and Watering
Wheel (4No.)	Diameter= 400mm

5. FABRICATION

Modeling of Structure Frame
Process Used: Material Selection, Metal Cutting, Welding, Grinding etc.

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Assembly of chain and sprocket mechanism for transmission, Assembly of Seeder Mechanism, Assembly of Weeder using Lever Mechanism.

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Assembly of Hand Pump I.e slider crank mechanism with the flywheel, Final attachment of wheels, Hand Grill, and Painting.

6. ANALYSIS

Analysis of Hand Pump Mechanism

Flywheel diameter(d) =18cm= 0.18m

Mass of flywheel(m) = 1000 gm= 1kg

Moment of inertia(I) = $M * R^2 / 2$

$I = (1*0.09^2)/2 = 0.405$ kg-m^2

Speed of Flywheel (N)=100 RPM

Angular Velocity(Ш) = $(2\pi N)/60 = 2*3.14*100/60=$ **10.472 m/s**

Energy stored(E) = $(I* Ш^2)/2 = (0.405*10.472*10.472)/2=$ **22.2067J**

7. PICTURES

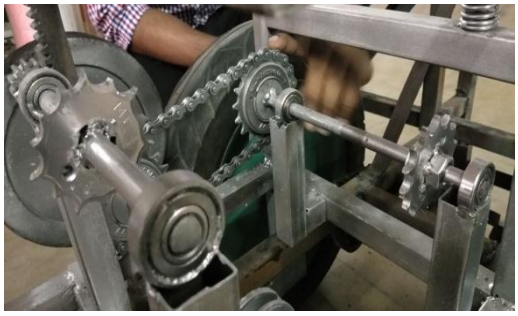

Fig. 1 Sprocket Chain Mechanism

Fig. 2 Slider Crank Mechanism

Fig.3 Weeder and Seeder Mechanism

Fig.4 Structural Frame

Fig. 5 Mechanical Farming Machine

8. CONCLUSION

Notwithstanding the huge scale motorization of agribusiness in a few sections of the nation, a large portion of the rural activities in bigger parts are carried on by human hand utilizing straightforward and regular instruments and executes like wooden furrow, sickle, and so on. Practically zero utilization of machines is made in furrow, sowing, flooding, diminishing and pruning, weeding, reaping sifting and transporting the yields. This is extraordinarily the case with little and minimal agriculturists. It brings about gigantic wastage of human work and in low yields per capital work compel. On the off chance that we combine the farming procedure with the cutting edge innovation, different issue can be explained effortlessly along these lines lessening the cost, time, and workforce. The venture depends on similar grounds. We join the 3 basic horticultural system seed sowing, weeding and water showering which are honed independently into a solitary machine utilizing mechanical component.

- Sowing Technique (dispersing seed over the land) is done using round and hollow shape material.
- Weeding (expulsion of undesirable plants from region of ground) activity is done using furrow edges.
- Water splashing operation is done based on one slider wrench system i.e. Hand draw appended with a sprayer through a pipeline.

A basic structure is developed to complete this task. It's not just enables agriculturists in lessening time and man to constrain yet in addition helps in decreasing the cost, creature reliance and wastage. With help of this venture even a little land outside the home can be effortlessly changed over into a developing area. Albeit greater machines are accessible in introduce showcase yet can be utilized for huge homestead terrains and in this way costly. This advancement essentially bolster the development of financially frail agriculturists who can't bear the cost of costlier creature, work compel and costly machine.

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