DESIGN AND FABRICATION OF MULTI UTILITY AGRICULTURAL VEHICLE

Submitted in partial fulfillment of the requirements
Of the degree of

BACHELOR OF TECHNOLOGY
IN
MECHANICAL ENGINEERING

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CERTIFICATE

This is to certify that the Research work titled **DESIGN AND FABRICATION OF MULTI UTILITY AGRICULTURAL VEHICLE** that is being submitted by **Akash Gaur, Akhilesh Kumar Ranjan, Rahul Yadav and Vikas Kumar Pandey**is in partial fulfillment of the requirements for the award of **Bachelor of Technology**, is a record of bonafide work done under my guidance. The contents of this research work, in full or in parts, have neither been taken from any other source nor have been submitted to any other Institute or University for award of any degree or diploma.

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ABSTRACT

Agriculture is one of the most significant variables for our Indian economy. We as a whole know the greater part of the Indian ranchers are little scope ranchers; they can't bear the cost of overwhelming rural hardware. We have planned and created this vehicle by utilizing strong works. An examination has been completed to create and manufacture parts utilized in the multi-utility rural vehicle for performing major Agricultural tasks like gatherer, seed planting, Ploughing and an arrangement for stubble consuming. It will diminish the cost of showering, pesticides sprinkling and collect cutting the field and will help with growing the creation pace of the farmer. The model doesn't use any kind of fuel. This structure will bolster the farmers.

India is set to be a farming based nation. Roughly 75% of population of India is subject to cultivating legitimately or in a roundabout way. Our ranchers are utilizing similar strategies and hardware for a very long time. For instance, Ploughing, seed planting, water system, leveling and so on. The primary target of our task is to plan and improvement a self-loader multi utility farming vehicle which can furrow, seed sow, flood and level simultaneously in a solitary hardware. Our fundamental point is to diminish the labor and decrease the time required for cultivating.

TABLE OF CONTENT

		Page
Certificate		**II**
Approval sheet		**III**
Student declaration		**IV**
Acknowledgement		**V**
Abstract		**VI**
Table of content		**VII**
List of figures		**X**
Chapter 1	**Introduction**	
1.1	**Project Background**	**1**
1.2	**Research Purpose**	**2**
1.3	**Objective of Study**	**2**
1.4	**Quality of Project**	**3**
1.4.1	Proposed Tool & Their Relevance	3
(A)	Excavator	5
(B)	Vacuum Cleaner	5
Chapter 2	**Proposed Methodology**	
2.1	**Frame Design**	**6**
2.2	**Ploughing Tool**	**6**
2.2.1	Concept of Tool	6
2.2.2	Design of Proposed Tool	6
2.3	**Seed Sowing Machine**	**7**
2.3.1	Major Component inThe Proposed Sowing Machine	8
(A)	Hopper	8
(B)	Sliding Plate	8

(C) Harvester 8

2.3.2 Scotch Yoke Mechanism 9

2.4 Assembled View of Vehicle 9

2.5 Working 10

2.5.1 Ploughing 10

2.5.2 Seed Sowing 10

2.5.3 Irrigation 10

2.5.4 Levelling 11

2.6 Design Analysis 11

2.6.1 Calculation for Plough 11

2.6.2 Calculation for Cutter **11**

2.6.3 Tool Life Calculation 12

2.7 Feature 13

2.8 Advantage 13

Chapter 3 Literature Review

3.1 Reviews 14

Chapter 4 Problem Description

4.1 Result and Discussion 15

4.2 Conclusion 16

4.3 Future Scope 16

REFERENCES 16

List of figures

Figure	Tittle	page number
Figure 1.1	Dc Motor	3
Figure 1.2	Pump	4
Figure 1.3	Battery	4
Figure 1.4	Wheel	4
Figure 1.5	Excavator	5
Figure 2.1	Chassis of Vehicle	6
Figure 2.2	Ploughing Tool	7
Figure 2.3	Plougher	7
Figure 2.4	Harvester	8
Figure 2.5	Scotch and Yoke Mechanism	9
Figure 2.6	Right View of Vehicle	10
Figure 2.7	Top View of Vehicle	10

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1

INTRODUCTION

1.1 PROJECT BACKGROUND

Agriculture has been the muse of the Indian financial system and will stay so for preety a while. India positions second worldwide in ranch yield. The exceptional vehicles assume a significant job in different fields, for example, modern, clinical, military applications and so forth., A bit of the significant issues in the Indian agrarian are rising of data costs, availability of talented works, nonappearance of water resources and yield checking. To overcome these issues, the robotization progressions were used in cultivating. The robotization in the Agribusiness could help farmers with decreasing their undertakings. The vehicles are being made for the methods for Furrowing, seed planting, leveling, water showering. These limits have not yet performed using a single vehicle in this the robot. We are implanting plougher, collector, leveler, seed sower and an arrangement for stubble consuming in one vehicle which can perform effectively and can give a high creation rate. These capacities can be incorporated into a solitary vehicle and afterward performed.

Farming being one of the noteworthy occupation in India, it is major to discover and realize new idea in this field, anyway package of work has been done around there. It is seen that , these considerations are not been around there. It is seen that; these thoughts are not been executed appropriately in real agrarian field. Multipurpose Agriculture equipment is basic and huge apparatus related with Agriculture for generally outrageous yielding. Customary technique for planting and building up the sugarcane is a persistent strategy and consequently hence there is a deficiency of works, this result in delayed Agriculture to crush these difficulties, multipurpose Agriculture equipment is organized. Cultivating accept a basic activity in the Indian economy. More than 70 % of the rural family units depend after cultivating. Horticulture is a huge region of Indian economy as it contributes about 8.4% to the total national output and offers work to over 60% of the of the populace. The vehicles are being delivered for the systems for Plowing, seed planting, leveling, water sprinkling. These limits have not yet performed using a single vehicle. In this the robots are made to accumulate in a beneficial manner also, besides it is depended upon to play out the exercises self-governing. The proposed idea executes the vehicle

to play out the limits, for instance, Plowing, seed planting, mud leveling, water showering. These limits can be composed into a lone vehicle and a while later performed.

1.2RESEARCH PURPOSE

The essential point of this venture is to build up a multipurpose machine, which is utilized for burrowing the dirt, seed planting, and leveler to close the mud and water sprayer to splash water with least changes in adornments with least expense. This entire arrangement of the robot works with the battery and the sun based force.

1. The base edge is made for the robot with 4 wheels associated and driven the back wheel is dc engine.
2. One finish of the casing, cultivator is fitted which is additionally determined by dc engine and configuration is made to burrow the dirt.
3. On the end leveler is fitted to close the seeds to the dirt, and water siphon sprayer to splash the water
4. Sun-powered board is put on the robot and is associated with the battery
5. Thus the max efficiency is utilized from the sun by the solar panel and to the battery
6. The whole robot requires the 12v battery to operate the system.

1.3 OBJECTIVE

The target of this paper is to introduce the status of the present patterns and usage of Agricultural what's more, self-ruling frameworks and layout the potential for future applications. Various utilizations of independent vehicles in farming have been analyzed and contrasted and traditional frame works and are proved as efficient and effective.

1. To decline human effort in the agrarian field with the usage of little robot.
2. To play out every one of the 4 errands at single time henceforth forward forms creation and extras time
3. To completion enormous proportion of work in less time
4. The use of sun based can be used for Battery charging

5. As the Robot works in the field, the beams of the sun can be utilized for sunlight based force age

6. To increment the effectiveness, the sun based force is utilized and the Force yield can be.

1.4 QUALITY OF PROJECT

A multi utility agriculture vehicle which Can be used for many agriculture purpose. In agriculture field work farmer do first Work ploughing to loosen the soil, seed Sowing, irrigation and levelling. These four Operation is done in different time which Take more time and required more human Efforts. in our project ploughing, seed Sowing, irrigation and levelling is done at the Same time. For different operations required Different mechanism but in our project These four mechanism is assembled. The Main advantages of this project is to reduce The time, human efforts and cost.

1.4.1PROPOSED TOOLS AND THEIR RELEVANCE

1. Plough
2. Hopper
3. Leveler
4. Storage Tank
5. Dc Motor
6. Pump
7. Battery
8. Wheel

1. **Plough: -** It is used for loosening or turning the soil in preparation for seed sowing.

2. **Hopper**: - It is used for seed sowing.

3. **Leveler: -** It is used for make surface plain for uniform distribution of irrigation water.
4. **Storage tank: -** It is used for storage of irrigation water.

5. **Dc Motor: -** Use four dc motor with high torque 100rpm for the wheels. Use one dc motor 30rpm for the 360-degree Circular movement of excavator arm.

Fig 1.1

6. **Pump: -**We are using one 12v dc pump. It is used for Supplying the water from storage tank.

Fig 1.2

7. **Battery(12V,7AH): -**A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.

Fig 1.3

8. **Wheel**

R1, R1W and R2 Tyres are known as agricultural tyre and provide The best traction and friction for farm field conditions.

Fig 1.4

1.4.1

a. Excavator

Excavator are heavy construction equipment consisting of a bucket on a rotating platform. All movement and functions of a hydraulic excavator are accomplished through the use of hydraulic fluid, with hydraulic cylinders and hydraulic motors. Excavator bucket is made up of steel or iron. The type of material chosen based on loading

Application of Excavator

Digging

Loading

Unloading

Fig 1.5

1.4.1

b. VACUUM CLEANER

Vacuum cleaners pull air in and The air sucks up dirt and dust. The low pressure air caused by The air going into the vacuum Cleaner draws up small objects Which then get trapped in bags or filters. Vacuum cleaners use low air pressure to help us pick up small particles of dirt and dust

Application of Vacuum cleaner

Cleaning of the floor or surface

Collecting the weed and grass or dirt

2

PROPOSED METHODOLOGY

2.1 Frame Design

Casing Design the assurance of surface for the vehicle is that the first and most basic factor for vehicle style. there's a kind of materials that might be utilized in the car body and body. the preeminent essential models that a texture should meet are light-weight, monetary viability, wellbeing, recyclability, and life cycle thought. The material for the body and undercarriage of the vehicle is steel. The most factors for picking material particularly for the body is a wide determination of qualities like warm, concoction and mechanical obstruction that region unit ease for creating and strength. The arranging is framed that is proper for supporting all the activities. This structure is appropriate to play out all tasks.

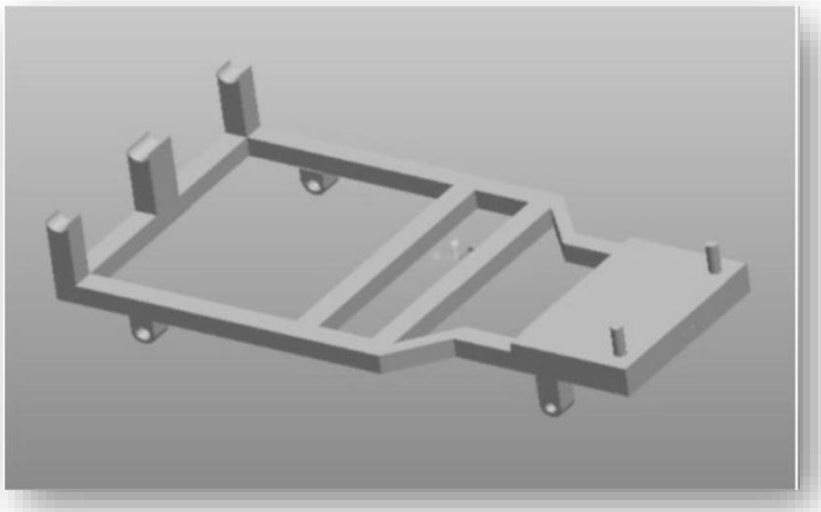

Fig 2.1

2.2 Ploughing Tool

2.2.1 Concept of The Tool: The Ploughing tool is suggested inside the way that it wouldn't break by unexpected experience of rocks and roots present inside the earth. The inadequacies inside the current tool changed furthermore, balanced. The organized new instrument is strong and reasonable and might be utilized in each kind of nation.

2.2.2 Design of proposed Tool: The lifetime of the tool is extended by substitution the sole the tip of the gadget. The sharpness of the mechanical assembly remains consistent for an amazingly longer proportion of your time. The power and moreover the ampleness of the tool is redesigned. Mechanical assemblies perfect weight is procured. The breakage of the device is diminished by abuse quick steel inside the tip. the surface used for the wrinkle mechanical assembly is Fast Steel.

Fig 2.2

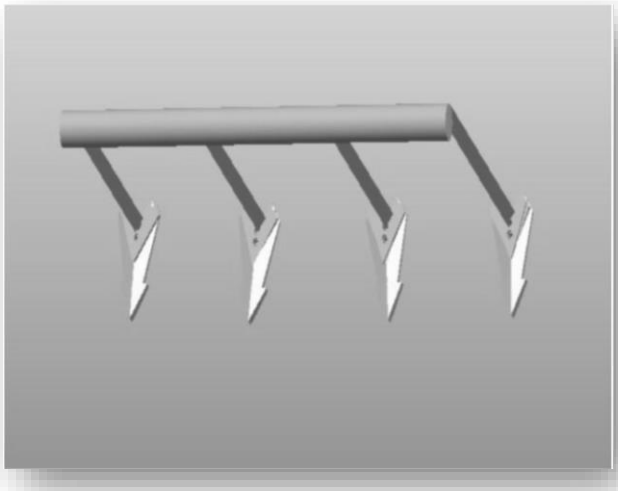

Fig 2.3

2.3 Seed Sowing Machine

The current seed planting machine is essentially excessively exorbitant. it's lavishly realistic in the Asian country. the cost of the machine goes to be diminished by presenting the regular seed stockpiling place inside the machine. An engine drive system is utilized

2.3.1 Major Components in the Proposed Sowing Machine*:*

The proposed sowing machine consist of the following components

2.3.1

a. Hopper

The anticipated planting machine conveys with it the resulting parts Container it's a game plan to store the seeds. The sort of the compartment is rectangular box thusly the wastage of the seed is avoided. it's produced using iron 20G sheet it diminishes the heaviness of the compartment.

b. Sliding Plate The base of the container comprises of a sliding plate with gaps dividing in equivalent separation. The sliding plate responds forward and backward over the base of the container. It is comprised of gentle steel plate

b. Sliding Plate

The base of the hopper consists of a sliding plate with holes spacing in equal distance. The sliding plate reciprocates to and fro above the base of the hopper. It is made up of mild steel plate.

c. Harvester

The collector configuration is predicated on the appearance of the brush shaper. The shaper is extra solid and more grounded. The denser vegetation is frequently cleared with it basically. The shaper edge is manufactured, one is a static edge and another is portable.

The harvester is given below and it consist of the following parts.

1. Scotch
2. Yoke

3. Frame plate
4. Blade

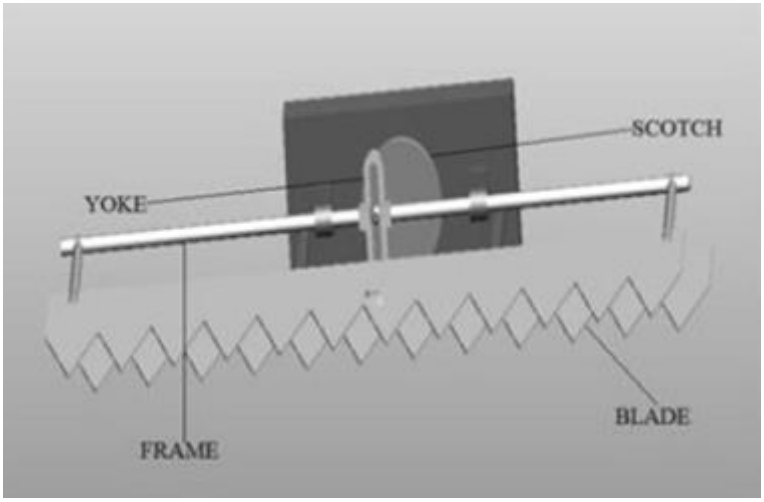

Fig 2.4

2.3.2 Scotch Yoke Mechanism:

The Scotch weight part is a reacting development framework, changing over the straight development of a slider into rotational development, or the reverse way around. The chamber or other reacting part is clearly coupled to a sliding weight with an opening that draws in a pin on the turning part. In numerous inside ignition motors, straight movement is changed over into rotational movement by methods for a crankshaft, a cylinder and a pole that associates them. The Scotch burden is viewed as an increasingly effective method for creating the rotational development as it contributes more vitality at the high reason for its transformation than a chamber and it has less parts.

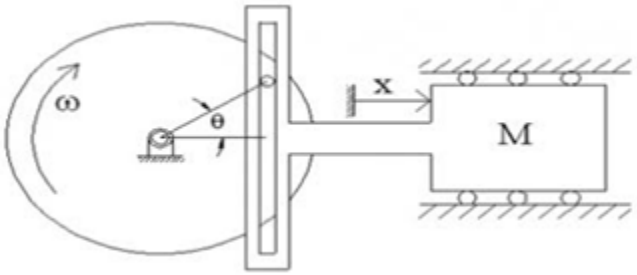

Fig 2.5

The responding movement as talked about being developed part above. The power is given to the Dc motor, shaft and wrench joined to the post start turning. As the wrench turns the pin slides inside the weight and moreover pushes the weight ahead. Exactly when the wrench turns through clockwise way the weight will get a dislodging the forward way. The best dislodging will be identical to the length of the wrench. Exactly when the wrench completes the accompanying of insurgency the weight comes back to its basic position. For the

accompanying of turn, trouble moves the backward way. Exactly when the wrench completes a full rotate the weight moves back to the basic position. For an all-out turn of wrench, the weight goes through a length comparable to twofold the length of the wrench. The dislodging of the weight can be compelled by changing the length of the

2.4 Assembled View of Vehicle

The separately fabricated components are assembled in the vehicle frame. The harvester is attached to the front. The plough tool is attached with the clamp at the backside of the frame. The seed sowing machine is attached in respective place

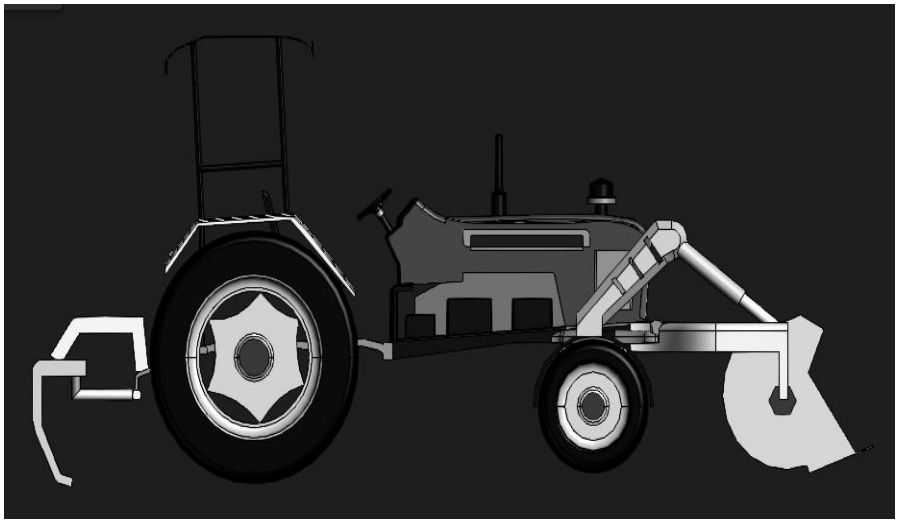

Fig 2.6

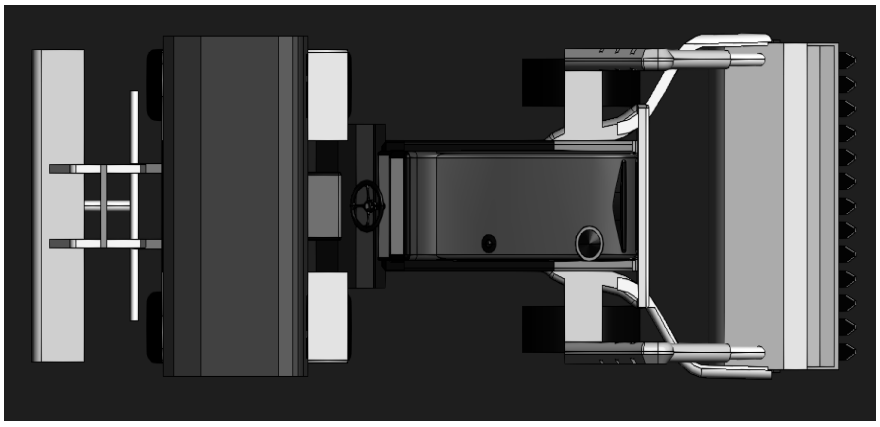

Fig 2.7

2.5 WORKING

2.5.1PLOUGHING

A Plow is a device or ranch actualize utilized for introductory development to release or turn the dirt in preparation for sowing seed or planting. In present day use, a furrowed field is ordinarily forgotten about to dry, and is then harrowed before planting

2.5.2 SEED SOWING

Seed sowing is defined as the process of placing the seed in soil to germinate and grow into plant. planting is the putting the plant propagules in soil for growing plants.

2.5.3 IRRIGATION

Water system is the utilization of controlled measures of water to plants at required interims. Water system assists with developing horticultural harvests, look after scenes, and revegetate upset soils in dry regions and during times of less than average rainfall.

2.5.4 LEVELLING

Land levelling is A measure used in surface irrigation. Preparing the irrigation plot in A way that no high or low spots disturb the uniform distribution of irrigation water on the field, and. Ensuring the optimal slope for water movement across A field when irrigated.

2.6 DESIGN ANALYSIS

2.6.1 Calculation for Plough

Depth of cut= 5 cm

Speed of the tool= 2.5 km/hr. = 41.66 m/hr.

No. of tool= 4

Feed rate= Rpm x N x CL

FR = 41.66 x4 x 0.05

Feed rate, FR= 8.332 m2/min

2.6.2Calculation for Cutter

$P = 2\pi NT/60$ watts

P = Power N = Speed of motor T = Torque

Then, P = V * I

V= Voltage I= Current

Power input to the motor,

Pin = I * V

Pin = 8*12

Pin = 96W (1)

Power output from motor to shaft,

Pout = T * ω (2)

Motor Efficiency,

From equation1 &2, E = Pout / Pin

0.36 = [T * (2π * N/60)] / 96

T * (2π * 65/60) = 34.56

T = 5.0773Nm

Here, the power, torque and speed generated on the motor shaft is transmitted wholly to the crank of the crank and slotted lever mechanism. The cutting velocity of the blade can be determined by the relation between lever speed and the stroke length of the blade.

Here, β = Cutting Angle α = Return Angle

In ACB2, Cos (α/2) = CB2/AC =0.0750.08807

α = 63.23

Also, β = 360 - α

β = 360 – 63.23

β = 296.77

Quick Return Ratio or Time ratio,

β/α = 296.77/63.23

β/α = 4.9635

Stroke length,

R1R2 = P1P2 = 2P1Q

Here, P1Q = AP1 * Sin (90 – α/2)

P1Q = 176.14 * Sin (90 –63.23/2)

P1Q = 150mm

Therefore, R1R2 = 2 * 150

R1R2 = 300mm 31

Now, Cutting speed of the blade, Vc = (s∗ Ns/1000) (1+1/QRR)

Where, S = Stroke Length Ns = Number of strokes per minute.

QRR = Quick Return Ratio

Vc = 0.300 ∗ 251000 (1+14.9635)

Vc = 0.0075 * 1.2015

Vc = 0.00901103 m/min

Vc = 1.5018 x 10-4 m/s

Vc = 1.5018 x 10-4 x 3600 x 103

Vc = 540.648 mm/hr

Now, Volume of grass cut per hour is given by,

Vg = Vcx Clearance Area

Vg = 540.648 x 3 x 800

Vg = 1297555.2 mm3/hr

2.6.3 Tool Life Calculation

From Taylor's tool life equation,

$vT^n = C$

Where, v= velocity, T= tool life

C,n= Taylor coefficient

For HSS, n=0.2

V= 41.6 m/min

41.6xT^n=100

T= 2.4x10^20cycles

For mild steel, T= 2.4x10^10 cycles

Calculation for seed sowing:

Speed of the motor= 30 rpm

Row spacing= 22 cm

Seed sowing time= 2 sec/per seed

No. of openings = 4

Seed dropping per minute = 30x4 = 120 seeds

If the speed of the wheel is 42 m/min, then for 42 meter 120 seed is dropped.

2.7 FEATURE

1. Multipurpose, can perform cultivations operations such as plough, seed sow, irrigation, leveling, weeding, digging etc.
2. Performing multiple tasks, in one get together of the hardware it performs furrow, seed sow, water system and levelling.
3. Robotized, the gear can be tractor controlled simply pulling of the hardware is sufficient and rest of the activities are robotized
4. The Successful actualize of logical cultivating with our hardware will prompt better return and better nature of yield
5. Relevant for all kind of seed to seed development
6. Successive separating of seeds will diminish the wastage of seeds and helps in the best use of the field and lessens the diminishing and filling exertion
7. Number of laborers required is decreased unnecessarily, which thus diminishes work charges.
8. Our hardware is totally adaptable for simple gathering and dismantling

2.8 ADVANTAGE

1. Includes logical framing methods. Grouping separating seed planting machine has a larger number of favorable circumstances than standard seed planting machine.

2. Involves exactness framing and simpleton sealing innovation. By utilizing this machine, a solitary seed can be set in the ideal separating, with the goal that the wastage of the seeds will be diminished. This will diminish the diminishing activity during the germination time.

3. Suitable for a wide range of seed to seed shaping.

4. Low cost, it's the most minimal evaluated multipurpose rural hardware at any point fabricated.

5. Performing various assignments, both planting and treating is done at the same time.

6. Starting endeavor is less and bolster free.

7. Diminishes works considering robotization

8. Decreases time usages

3

LITERATURE REVIEW

3.1 Reviews

a. D.A. Mada, Sunday Mahai, [2013] - In this examination paper creator has referenced significance of motorization in farming by giving models. The end from the paper was need of multifunctional single axel vehicle for pre and post collecting. We have accepted this as base for our exploration and further creation of our multifunctional agrarian vehicle.

b. Dhatchanamoorthy. et al., 2018-This is a vehicle which utilized for different reasons for rural field, for example, furrowing, seed planting, leveling activity, water splashing activity, pesticide showering activity, gatherer. This vehicle runs on petroleum as a fuel, motor sort is 4 stroke single chamber. It's a vehicle where operator(farmer) can without much of a stretch demonstration it and work it as a car. This is a car which is mounted with agrarian gear.

c. Shree Harsha B T et al., 2017-This undertaking is essentially little form of farming vehicle such tractor, collector and so forth. This is anything but difficult to run. This vehicle chips away at sunlight based force which accuses the battery of help of sun oriented photovoltaic cell present on sun powered board. This vehicle utilizes instruments, for example, engine, sun oriented board, batteries which are costly.

d. Md. Aqib Naque, Akhtar Ali Rizvi [2013] - This machine is created to decrease the time and exertion required for creation up to the incredible degree. Likewise, this machine producing cost is less when contrasted with other, by choosing above subject we are get, recognizable and know the subtleties of rural innovation, with the assistance of this machine we are attempting to decrease work cost, time of a white collar class and little segment ranchers.

e. Patil Nikhil V et al., 2018-This present vehicle's principle objective is penetrating, leveling, compost showering, seed planting and furrowing. This vehicle runs on a 100-cc motor. At the point when motor is turned over the bit drill device will be actuated to bore opening for seed planting after that administrator press switch for drop a seed from container then the burrowing and planting activity will be finished. Furrowing is done physically.

f. Thange R.B et al., 2016-In this hardware, motor is utilized which is associated with the front wheel by utilizing chain drive. Revolving movement of wheel is associated with sprayer siphon. In this way, at running position sprayer will consequently work. Presently for planting activity programmed seed feeder system start their capacity by pivot of wheel. As wheel, pivots seed feed system permits seed to descend in extent with speed of hardware. For slicing activity power is provided to shaper.

g.F.A. Adamu, B. G. Jahun and B. Babangida [2014]-In this paper creators draws our consideration towards the presentation factor of a force tiller. Among those interest for light weight power tiller was searched out most. Fuel effectiveness and field limit such parameters are additionally talked about. We take those focuses in thought while structuring a maintainable multifunctional farming vehicle.

h. Nitin Kumar Mishra et al.,2017-This machine included sunlight based board, battery and engine. This undertaking is a multipurpose agro hardware as it incorporates all the three gear together for example Seed feeder, pesticide sprayer and harvest shaper. A sun powered photovoltaic board is fixed that changes over sunlight based vitality into electric vitality, further this electric vitality is utilized to run engine which further runs the siphon which is utilized to splash pesticide.

4

PROBLEM DESCRIPTION

1. Lack of automation in cultivating
2. Required overabundance endeavors for various procedure.
3. Required more labor.
4. Required more expense.
5. Excess time utilization for performing singular procedure
6. In past ventures there is absence of intensity investment funds hardware's and there is no arrangement for halting stubble consuming.

4.1 RESULT AND DISCUSSION

The furrow instrument life is contrasted and the normally utilized material and the outcome acquired is the life of the device is progressively effective. The tasks like furrowing, seed planting and collecting is done in a similar vehicle, so the expense is decreased. The current seed planting machine is gauges more and complex working metering system. In any case, in this planting machine, the weight is diminished and the working strategy is basic by association a different engine

4.2 CONCLUSION

For all intents and purposes our multipurpose horticultural gear can be utilized for furrowing, seed planting, water system and leveling and furthermore utilized for weed evacuation purposes. All the parts are associated so that in each phase of farming the hardware can be adjusted or handily amassed with latches to required length and details of field activity. Our group has effectively consolidated numerous thoughts from different fields of mechanical designing and horticultural information to improve the yield and by lessening the work exertion and costs.

4.3 FUTURE SCOPE

By expanding the hardware quality and quality to its pinnacle, we can have multipurpose rural gear forever time utilization. By giving hydrodynamics, gear courses of action and some minor changes the hardware can likewise be made as tractor fueled hardware.

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