

Design and Fabrication of Multipurpose Farming Machine

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Abstract- Agriculture being one of the major occupation in India, Agriculture plays a vital role in the Indian economy. Indian agriculture has registered impressive growth over last few decades. It is very essential to discover and implement new idea in this field, though lot of work has been done in this area. It is unfortunate that, these ideas are not being implemented properly in actual field. This is due to high cost and is complicated for rural people. Multipurpose agriculture or farming machine is basic and major machine involved in agriculture for maximum yielding. The Conventional method of ploughing and seed sowing is a laborious process and hence for that reason there is a scarcity of labours and Basically, many farmers in India also use bullocks, horses and he-buffalo for farming operation. This will not satisfy need of energy requirement of the farming as compared to other countries in the world. This result in delayed agriculture crop production practices to overcome these difficulties, I am thinking that human and animal efforts can be replaced by some advance mechanization which will be suitable for small scale farmer from economical and effort point of view. So, I developing this machine which will satisfy all this need and to solve labour problem. A multipurpose farming machine is designed.

The multipurpose farming machine is doing four operations i.e. ploughing, seed sowing, irrigation and transportation purpose. The multipurpose farming machine is driven by 100cc engine. The machine is divided into two parts assembly. Part-1 assembly is the main machine. The part-1 assembly is doing three operations i.e. Ploughing (also called as loosening of soil), seed sowing and irrigation. And the part-1 assembly operator walks behind the machine during the working period of machine. For the loosening of soil, the iron plough tool is assembled to tool holder of machine and the gripper wheel is also attach to the tyre. The gripper is providing a proper grip into soil and will stop the tyre for skidding action into soil. At a time only one row is plough. In seed sowing operation the seed sowing machine is assembled to machine and the furrows will be place back of plough tool. The seed is store in hopper of seed sowing machine after storing seed into hopper the seed is come into rotor box. The rotor box contain rotor (different rotors for different crops)

and this rotor wheel is throwing seed into the furrows. The plough tool is hoe or plough the soil after ploughing into the soil the seed will be fall into soil and the T-Shape leveler is cover soil. In the seed sowing operation there are two row is sow at a time. The machine is seed sow constantly at the uniform depth and constant plant to plant distance. There are less wastage of seed and less time required for sowing seed. The pump is also assembling into machine for irrigation purpose and pump will take a power from engine with the help of V-Belt drive. Pump is pumping water from canal or river or lake or pond to the farming place. The part-1 assembly is only working on farming field i.e. off road. The part-2 assembly is trolley which is joining to the part-1 assembly with the help of knuckle joint. The part-2 assembly working on road.

The main aim of joining part-2 assembly to the machine is transportation goods, seed, fertilizers etc. from farmer home to farming place or farming place to farmer home. Both the part assembly will be joint and separate by one person easily. not required more number of labour to operate this machine only one person is operating this machine easily. The multipurpose farming machine will be available for small and medium farmer at affordable price. For using this machine productivity of the crops will be increase.

Keywords- Multipurpose, ploughing, seed sowing, Trolley, etc.

I. INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. Agricultural sector is changing the socio-economic environment of the population due to liberalization and globalization. About 75% people are living in the rural area and are still dependent on agriculture. About 43% of geographical area is used for agricultural activity. Agriculture has been the backbone of the Indian economy. As Indian population is growing continuously, the demand for producing crop per hector is also increasing, this requires efficient and high-capacity machines. So mechanization in agricultural industry plays an important role in Indian economy. The basic

function of multipurpose farming machine is to sow the seed, wastage of seed and loosening of soil in rows at required depth and to maintain the distance between the seeds and provide proper compaction over the seed. A multipurpose farming machine is a device that plants or sows the crops, it digs a furrow places the seed or seeds into the furrow and covers it. multipurpose farming machine ensures uniformity in seed broadcasting and saves time and money.

II. LITERATURE REVIEW

- **Amol B. Rohokale, Pavan D. Shewale, Sumit B. Pokharkar, Keshav K. Sanap**

A REVIEW ON MULTI-SEED SOWING MACHINE [1]

The main purpose of this paper is to compare between conventional sowing method and new proposed machine which can perform number of simultaneous operation. The required row to row spacing, seed rate, seed to seed spacing and fertilizers placement varies from crop to crop can be achieved by the proposed machine. This machine reduces the sowing time, human efforts and labour cost.

- **Aditya Kawadaskar, Dr. S. S. CHAUDHARI**

REVIEW OF METHODS OF SEED SOWING AND CONCEPT OF MULTI-PURPOSE SEED SOWING MACHINE [2]

Redesigned and tested the seed sowing machine using CAD package like PROE. This Paper deals with the various sowing methods used in India for seed sowing and fertilizer placement. The comparison between the traditional sowing method and the new proposed machine which can perform a number of simultaneous operations and has number of advantages. As day by day the labour availability becomes the great concern for the farmers and labour cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement.

- **Wankhede, A. P. Rathod, A. V. Gorde, R. K. Gondane**

DESIGN MODIFICATION OF ADVANCE SEED SOWING CUM FERTILIZER MACHINE [3]

The purpose of developing this paper is to develop multipurpose machine to reduce cost and time required for seed sowing and fertilizer placement. By using advance seed sowing machine and advance techniques we can increase the production of crops in minimum cost and time.

- **Mr. Muhammed Kashif R, Mr. Sharanabasappa Bolashetty, Mr. Mohammed Yaseen A H, Ms. Bhargavi**

A DESIGN AND DEVELOPMENT OF SEMI AUTOMATED MULTIPURPOSE AGRICULTURE WHEEL HOE [4]

The main objective of this project is to design and development of semi-automated multipurpose agricultural wheel hoe to use of weeding, ploughing and cultivating in single equipment. Their aim is to reduce the man power required for the operation of the wheel hoe. The only way is to automate it but we cannot fully automate it due to few constraints such as it will require electricity which will not be mostly available in villages, they will be requiring Microprocessor and sensors which will again increase the cost and might require skill to use it. They thought of solution being that instead of automating it fully they planned to semi automate it using engine, motors and power transmission equipment's. This might help us reaching their goal by reducing the man power as well as cost. In this design, fabricate and testing of semi-automated multipurpose agricultural wheel hoe to use of various agricultural operations.

They designed and fabricate Wheel hoe and made semi-automated operative with the use of 2 stroke petrol engines to assist human to perform various agricultural operations like cultivating, ploughing, weeding and also other operations by attaching and detaching different tools for different agricultural operations. They are using Four pneumatic wheels used to support the set-up and tools were found best suited to grip over ground. We noticed that Engine power and efficiency were almost Up to the desired level of performance. They were tested the model for cultivating operation and noticed that the semi-automated wheel hoe gives the better performance compare to manual and power tiller.

- **Humbade A.B., Kalingwar C.M., Kadam. N.S., Davargave M.M., Prof. Lande.S.B**

MULTIPURPOSE AGRICULTURE VEHICLE [5]

This Project presents work on design of a new agricultural multipurpose vehicle to be used for various applications. As global competition is pressing farmers on many fronts, mechanized agriculture has become one of the important modern agricultural methods. In India 60% population involved in agricultural work, Conventional mechanized systems may increase productivity but are less

adaptive and flexible. As a consequence, there have been initiatives in developing advanced mechanized systems. We are evolving a multipurpose vehicle for farm, which can easily use for digging, seeding, spreading fertilizer.

- **Dr. C.N. Sakhale, Prof. S.N. Waghmare, Rashmi S.Chimote**

A REVIEW PAPER ON MULTIPURPOSE FARM MACHINE [6]

In this research paper author developing equipment which will satisfy all this need and to solve labour problem. In this equipment they used 24cc engine for digging operation. And for spraying used motor with 12V battery. Next two operations are manual base which is cultivation and sowing. This machine performs four farming operation (digging, sowing, cultivation, spraying) which is used small scale farming. By using above attachments one may perform various farming operations in less time and economically.

- **V.M. Martin Vimal1, A. Madesh, S.Karthick, A.Kannan**

DESIGN AND FABRICATION OF MULTIPURPOSE SOWING MACHINE [7]

In this project a multipurpose sowing machine is designed for small farmers to improve their productivity. In this machine a common seed storage place is introduced to reduce the cost of the machine. The existing sowing machine had the individual storage place and separate seed metering mechanism which leads to more cost. The drawbacks in the existing sowing machine are rectified successfully in this machine. It will be more useful for small farmers and the agricultural society. The cost of the machine comes around Rs 6000/- INR.

- **U.S. Kankal, D.S. Karale, V.P. Khambalkar and S.H.Thakare**

PERFORMANCE EVALUATION OF SINGLE ROW MANUAL COTTON PLANTER [8]

The manually operated seed planter was tested at Deptt. of Farm Power and Machinery, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. A single row cotton planter was evaluated for performance by conducting laboratory and field tests. In laboratory test calibration of planter for seed rate, uniformity of seed planting and percentage of seed damage was determined at three cell plate, two gear ratio and level of seed in hopper. Based on the

laboratory test cell plate, gear ratio and level of seed in hopper were selected for field test. The three trials of planter were taken for planting Bt-cotton crop. The field tests comprised of determination of effective field capacity, average depth of placement of seeds in the furrows and mean spacing of seeds within each row. The rate of work was observed to be in the range of 0.18 to 0.21 ha/h at forward speed of 2.24 to 2.5 km/h in well prepared seed bed along with the opened furrows. The average depth of planting was observed in the range of 4.5 cm to 5cm. The field efficiency of the planter was observed in the range of 88.88 to 91.1 per cent.

- **Kyada, A. R, Patel, D. B.**

DESIGN AND DEVELOPMENT OF MANUALLY OPERATED SEED PLANTER MACHINE [9]

A manually operated template row planter was designed and developed to improve planting efficiency and reduce drudgery involved in manual planting method. Seed planting is also possible for different size of seed at variable depth and space between two seed. Also it increased seed planting, seed/fertilizer placement accuracies and it was made of durable and cheap material affordable for the small scale peasant farmers. The operating, adjusting and maintaining principles were made simple for effective handling by unskilled operators (farmers).

- **Kalay Khan, Dr. S. C. Moses, Ashok Kumar**

THE DESIGN AND FABRICATION OF A MANUALLY OPERATED SINGLE ROW MULTI - CROPS PLANTER [10]

This project work focused on the design and fabrication of a manually operated planter sowing for different crop seed that is cheap, easily affordable by the rural farmers, easy to maintain and less laborious to use. The multi-crop planter has the capability of delivering the seeds precisely with uniform depth in the furrow, and also with uniform spacing between the seeds. The seed planter consists of the main frame, adjustable handle, seed hopper, seed metering device, adjustable furrow opener, adjustable furrow closer, drive wheels, seed tube and ball bearings. Most of these were fabricated from mild steel material, except for the metering mechanism which was made from good quality nylon and the seed funnel tube, was made from rubber material. Seed metering device was designed to be interchangeable to allow for the different varieties and types of seeds. The single-row manually operated multi-crop planter is very simple to use, the various adjustments are made with ease, and it is maintenance free, except for the bearings which needs to be lubricated from

time to time to allow the planter's ground wheel to move freely.

- **Mursec a, P. Vindis, M. Janzekovic, F.Cus , M. Brus**

TESTING OF QUALITY OF SOWING BY PNEUMATIC SOWING MACHINES [11]

The purpose of the paper is to presents two sowing machines for interval sowing, differing in the mode of operation. We were interested in adequacy of sowing at different working speeds of the pneumatic vacuum sowing machine OLT and the pneumatic pressure sowing machine Aeromat - Becker for sowing sugar beet. The goal of the paper is to find out the optimum working speed for the individual sowing machine.

- **Subrata Kr Mandal, Dr. Atanu Maity, Ashok Prasad, Palash Kr Maji, Sankar Karmakar**

DESIGN & DEVELOPMENT OF A SUITABLE IMPLEMENT MATCHING WITH LOW HP TRACTOR [12]

Proper matching of implements with tractor and the performance evaluation of the combination is very much important to minimize the expenditure in farming operations. To obtain a suitable implement according to tractor horsepower, implement size plays an important role. An improper matching of tractor-implement combination results in under loading of engine and hence poor efficiency and higher operating costs. Implements that are too large for the horsepower available will cause overload, excessive tire slippage, increase in fuel consumption and unsatisfactory performance in general. Implements that are too small will result in inefficient operations, low production and increased cost. The objective should be to match as effectively as possible the tractor with the implement as some of the small size implements will not utilize all of the tractor horsepower available. With small size tractor, it is necessary to select an implement size that is convenient to use or adequate for the job to be done. This paper aims to describe the design process and development of a suitable size implements to be matched with a low hp Tractor for optimum field performance at minimum operating cost.

III. SCOPE OF THE PROBLEM or OVERVIEW

In spite of the large scale mechanisation of agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and conventional tools and implements like

wooden plough, sickle, etc. Little or no use of machines is made in ploughing, sowing, irrigating, thinning and pruning, weeding, harvesting threshing and transporting the crops. This is specially the case with small and marginal farmers. It results in huge wastage of human labour and in low yields per capita labour force. There is urgent need to mechanise the agricultural operations so that wastage of labour force is avoided and farming is made convenient and efficient. Agricultural implements and machinery are a crucial input for efficient and timely agricultural operations, facilitating multiple cropping and thereby increasing production.

Strategies and programmes have been directed towards replacement of traditional and inefficient implements by improved ones, enabling the farmer to own multipurpose farming machine for ploughing, seed sowing, irrigation and transporting the crops. I am design and fabricating the multipurpose farming machine. First, design a machine using pro-e software and then fabricate the machine.

IV. CONSTRUCTION

i. Frame and Engine Foundation:

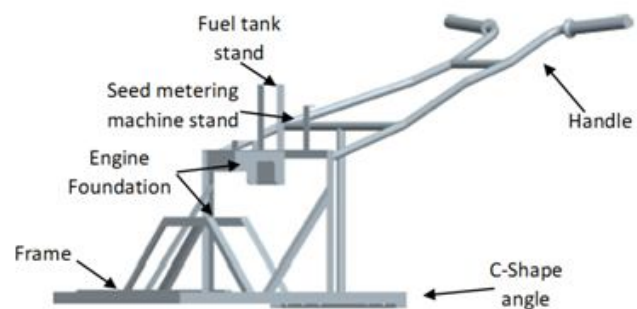


Figure-Frame and engine foundation

The frame of machine is made up of mild steel angle. All the assembly of machine is assembling into frame and angles are welded to made a frame. After making frame the engine foundation is also welded to the frame of machine. engine is bolted to the engine foundation. The fuel tank stand is also welded to machine. The fuel tank is bolted to this stand and tank is assembled above the engine. Fuel tank supply petrol to engine. Seed metering machine stand is also welded to the machine frame and this metering machine is bolted into this stand. A handle is also welded to the frame which is handle or control the machine. The handle of machine is made up of mild steel round pipe. In the machine frame hole is drill into C-Shape angle and with the help of this hole the plough tool is assemble to the machine frame.

ii. Seed Metering Machine:

Seed is store or place into hopper of seed metering machine. After placing seed into machine the seed is come into rotor bow. The seed flow is adjusted from hopper to rotor box by seed flow adjuster. In rotor box the rotor is mount on rotor shaft and sprocket gear 4 is also mount on the rotor shaft. The rotor is carrying seed from rotor box and throw into the furrows. The rotor is rotate according to the machine speed at some gear ratio. The different-different rotors are used. The selection of rotor is based on seed to seed distance between crops. For the use of seed metering machine uniform seed to seed distance made. This is most important machine for seed metering.

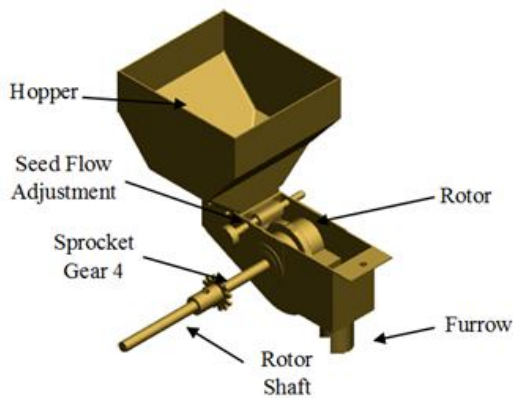


Figure- Seed Metering Machine

iii. Plough Tool and T-Shape Leveler:

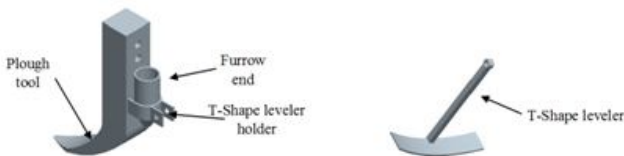


Figure-Plough Tool and T-Shape Leveler

The plough tool is assembling to main frame of machine. At the back of the plough tool furrows end and T-Shape leveler is welded. The T-Shape leveler is fixed into the holder. The plough tool is used for ploughing or hoeing soil and seed sowing purpose. For the seed sowing operation, a plough is hoe into the soil after hoeing the seed is coming from furrows end. The seed is fall into the soil after falling into soil the T-Shape leveler is cover seed by soil. There are two rows are sow or plough at one time.

iv. Depth Adjuster Wheel:



Figure-Depth Adjuster Wheel

The depth adjuster wheel is maintaining the uniform depth in case of ploughing and seed sowing. This adjuster wheel is assembled in between two plough tool. The wheel is adjustable up and down as per the requirement.

v. Gripper Wheel:

The gripper wheel is assembled into Part-1 assembly i.e. main machine. Gripper wheel is fitted to the tyre for preventing or providing grip into soil during ploughing and seed sowing. The gripper wheel is also made up of mild steel.



Figure-Gripper Wheel

vi. Differential:



Figure-Differential

The differential is a device that splits the engine torque two ways, allowing each output to spin at a different speed. In our machine differential is assemble between two wheel of machine i.e. part-1 assembly at Axle-A. The differential allows the outer drive wheel to rotate faster than the inner drive wheel during a turn.

vii. Silencer:



Figure- Silencer

Silencer or muffler is a device for reducing the amount of noise emitted by the exhaust of an internal combustion engine. In our machine silencer is fitted to the engine in vertical direction.

viii. U-Clamp and Bearing:

The clamp made up of U-Shape therefore it is called U-Clamp. Above the U shape of clamp ball bearing is place. The Axle-A and Axle-B is pass into this bearing and both assembly is bolted to the frame.

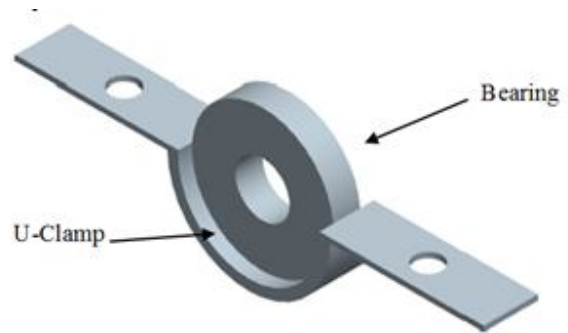


Figure-U-Clamp and Bearing

ix. Trolley Frame:

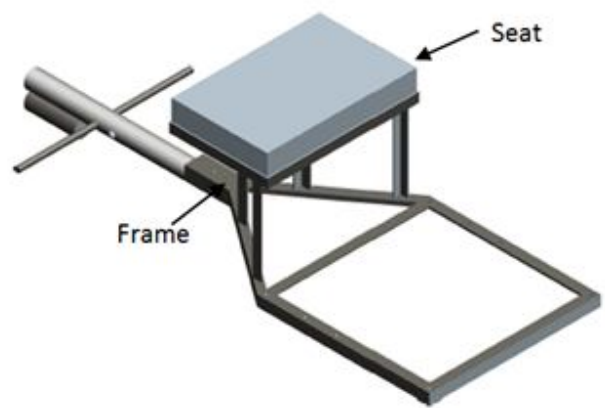


Figure-Trolley frame

The trolley frame is also made up of mild steel angle and in front of frame mild steel round pipe is welded. The seat is also welded to frame. For the joining of machine to trolley frame the farmer will drive easily.

x. Trolley Bucket:

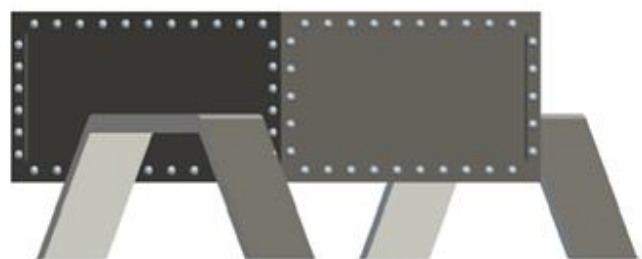


Figure- Trolley Bucket

In the trolley frame the wood block base is made. The trolley bucket and woodblock is bolted together into trolley frame. Trolley bucket is used for placing goods, crops, etc. from farmer home to farming place and vice versa. The bucket is also made up of mild steel angle and sheet metal.

xi. Water pump:

The water pump is assembling in left corner of machine. the pump is taking power from engine with the help V-belt drive. The pump is useful for pumping water from canal, river, well, etc. to the farming place. And the machine is stand only one place during working.



Figure-water pump

4. Fuel Tank(Petrol)
5. Machine Handle
6. Axle-A
7. Sprocket Gear 1
8. Sprocket Gear 2(Differential)
9. Sprocket Gear 3
10. Sprocket Gear 4
11. Engine Pulley
12. Water Pump Pulley
13. Water Pump
14. Tyre
15. Gripper Wheel
16. Seed Metering Machine
17. Plough Tool
18. U-Clamp and Bearing
19. Trolley Frame
20. Spring
21. Seat
22. Wood Block
23. Nut and Bolt
24. Trolley
25. Axle-B
26. Knuckle Joint
27. T-Shape leveler
28. Depth adjuster wheel

V. ASSEMBLY OF MACHINE

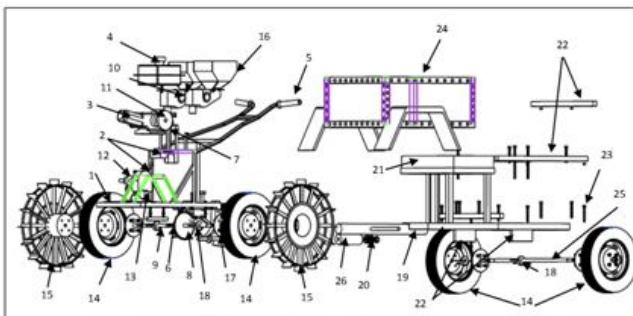


Figure- Exploded View of Multipurpose Farming Machine

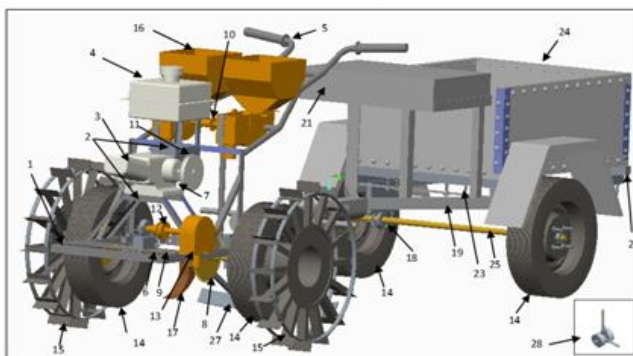


Figure-Assembled View of Multipurpose Farming Machine

1. Machine Frame
2. Engine Foundation
3. Engine

Assembling Procedure of Machine

First, the machine frame is made of a material M.S. angle. Then after making frame engine foundation is welded to the frame and foundation for engine is made. After making engine foundation the engine is assembled to frame of machine. For the output of engine, the sprocket gear 1 is assembled to gearbox output of engine. Fuel tank stand is also welded to frame and fuel tank is place or assemble above the engine.

1. To handle or for controlling of machine the handle is also welded to frame. Gear liver and accelerator is assembled into handle.
2. Axle-A is assembling below the frame with the help of U-clamp and bearing. The wood block is maintaining the distance between frame and Axle-A. the sprocket gear 2 and sprocket gear 3 is mount on Axle-A. A sprocket gear 2 is welded to differential at the place of crown wheel. At both the end of the Axle-A the tyre and gripper wheel will assemble.
3. Water pump is assembling into the left corner of a machine. Pump pulley is mount on the pump propeller shaft and engine pulley is mount on crankshaft of engine.
4. For the seed sowing operation seed metering machine is also assemble to the machine. The seed sowing machine

having rotor shaft and at this rotor shaft a sprocket gear 4 is mounted. The chain is attach in between sprocket gear 1 to sprocket gear 2 and sprocket gear 3 to sprocket gear 4.

5. The frame of machine having hole for assembling the plough tool. The furrows and T-shape leveler is assembled to the plough tool. There are two plough tool assembly attach to the machine frame. The furrows (like hose pipe) is attach in between seed metering machine to the furrows opening in plough tool.
6. The depth adjuster wheel is joint in frame of machine between two plough tool.
7. After assembly of machine the trolley is also assemble. For trolley assembly the trolley frame is made. The trolley frame is also made up of mild steel angle. In the trolley assembly there are two tyre are assemble.
8. At Axle-B Both the tyre is assembled and the wood block is also provided in between axle and frame. For the use of long wood block base is made. After the assembly of long wood block the trolley is rest on wood block. Both the assembly of trolley and long wood block is fix with the help of nut and bolt.
9. U- clamp with bearing is also assemble into the Axle-B and both are rest on the wood block, as shown in above figure.
10. Both assembly (i.e. machine and trolley) is assemble with knuckle joint. And for avoiding jerk in between the machine and trolley running on road the spring is provided in knuckle join rod.

VI. 2D VIEW OF CAD MODEL WITH DIMENSION

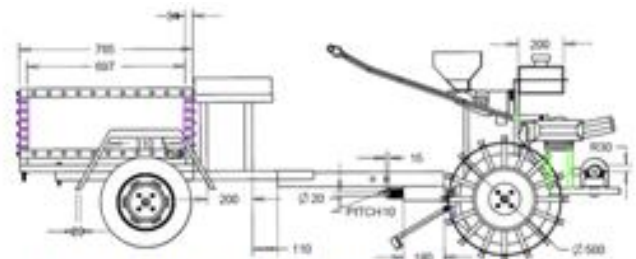


Figure-Side View of Multipurpose Farming Machine

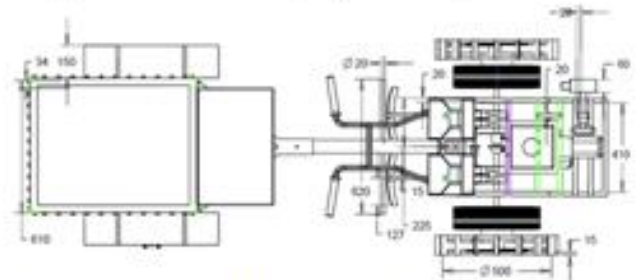


Figure-Top View of Multipurpose Farming Machine

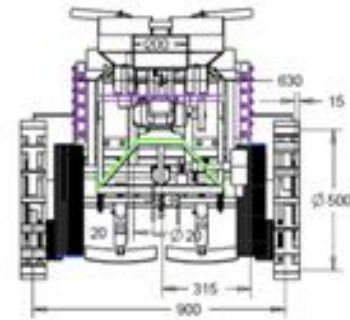


Figure-Front View of Multipurpose Farming Machine

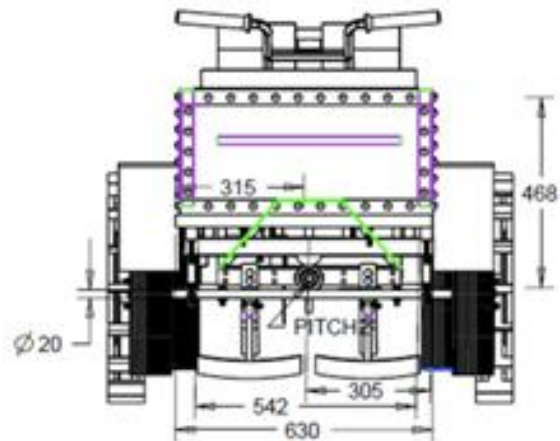
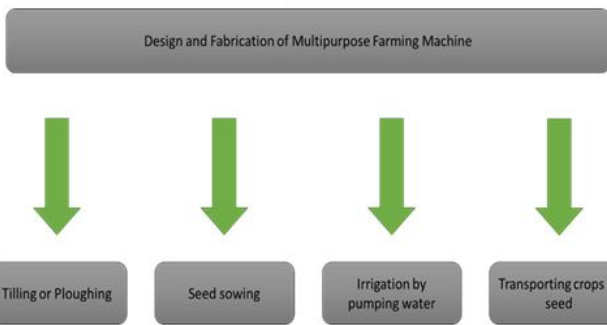


Figure-Back View of Multipurpose Farming Machine

VII. WORKING OF MULTIPURPOSE FARMING MACHINE



1. This farming machine is done more than one operation one by one therefore it is called as multipurpose farming machine. The machine done four types of operation by small changes or assembling and disassembling of some part. Machine are divided into two-parts assembly i.e. part-1 assembly and part-2 assembly. As shown in below fig.

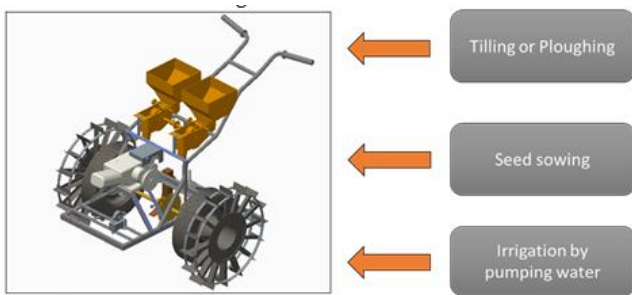


Figure Part-1 Assembly of Multipurpose Farming Machine

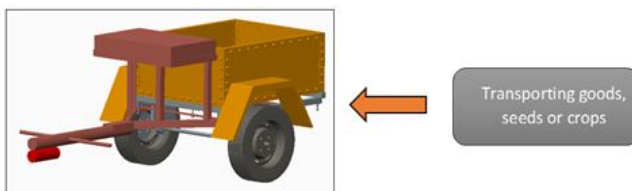


Figure Part-2 Assembly of Multipurpose Farming Machine

2. The part-1 assembly is working in farming field and this assembly is doing three operation or three crops practices i.e. ploughing also called as loosening of soil, seed sowing and irrigation purpose. All operation is done one by one. The gripper wheel is provided for making proper grip into the soil and prevent from skidding tyre.
3. The machine is taking a power to 100cc or 1 HP petrol engine. The sprocket gear 1 is assemble to engine output. And this sprocket gear is transmitted power or motion to the sprocket gear 2 which is welded to the differential. The differential differentiates the power to both wheel of machine equally and the machine will be run smoothly.
4. For tilling or ploughing also called as loosening of soil operation is done by assembling the plough tool to the machine. The running of machine plough tool is loosening the soil or hoeing into soil. The adjuster wheel

is providing uniform depth of ploughing or hoeing. The soil is level by T-Shape leveler. This is first crop practices.

5. After the ploughing and leveling of the soil the seed sowing operation is done. For the seed sowing operation seed metering machine is assemble to the machine. The seed metering machine is delivered seed at different interval. Because for delivering the seed at different interval seed to seed distance is maintaining. A rotor is help to deliver seed at different interval. For different-different crops there are different types of rotor is use. The selection of rotor is based on crops or seed to seed distance. The rotor table is shown below for different-different crops,

Table- For Different-Different Crops

Sr. no.	Crops Seed	Plant To Plant Distance(cm)	Row To Row Distance(cm)	Depth Of Seed Into Soil(cm)	Rotor Number
1	WHEAT SEED	4 to 5 cm	22.5 to 30 cm	5 to 6 cm	A
2	SOYABEAN SEED	4 to 5 cm	45 to 60 cm	3 to 4 cm	5
3	CORN SEED	21 cm	45 to 50cm	5 to 7.5 cm	B,C
4	GARLIC SEED	15 cm	20 to 25 cm	2 to 3 cm	1,1/8
5	GROUND NUT SEED	10 cm	30 cm	4 cm	2
6	GRAM (TOOR DAL) SEED	15 to 20 cm	30 to 35 cm	7-10 cm	A
7	CASTOR SEED	40 to 60 cm	90 to 120 cm	0.635 cm	6
8	SESAME SEED	10 to 20 cm	25 to 35 cm	3cm	4,D
9	PEARL MILLET SEED	5 to 7.5 cm	12 to 15 cm	1.25 to 2.5 cm	4A
10	KIDNEY BEANS SEED	7.6 to 10 cm	30 cm	2.5 to 3.8 cm	E

6. The rotor is rotate into seed metering machine. The speed of machine is 1.5 times of machine speed. sprocket gear 3 is mount on the axle-A and sprocket gear 4 is on rotor shaft of seed metering machine. the motion is transmitted with the help of chain drive from sprocket gear 3 to sprocket gear 4 with gear ratio of 1.5.
7. In seed sowing operation the seed is storing into seed metering machine hopper. After storing seed into hopper the flow of seed from hopper to rotor box is adjusted. The seed some into rotor box the rotor is throwing seed into the furrows. The plough tool is plough or hoe into the soil. After ploughing the seed is fall into soil from furrows. After falling seed into furrows the T-Shape leveler cover a seed with the help of soil. There are two row is sowing at a one time.

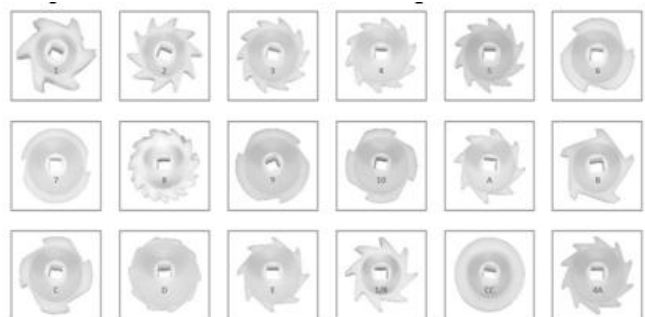


Figure-Seed Metering Machine Rotor

8. For placing seeds, the proper depth is required and for placing seed at uniform depth the depth adjuster wheel is joint in between both the plough tool. Different crops required different depth as per requirement the depth adjuster wheel is adjusted. For the uniform depth of seed production of crops is increase because in traditional way some seed sow more inside the soil and for the growing of seed oxygen is required. Sowing seed more inside the soil seed will be damage and the production of crops is decreases.
9. The multipurpose farming machine is also useful for irrigation purpose. The machine will be stand at one place. And the pump inlet is deep into river, well, canal, etc. and the outlet of pump is place at farming place. The pump is pumping water from canal, river, well, etc. to farming place. The power is transmitted from engine to pump with the help of pulley and V-Belt drive.
10. This machine is also used for transporting purpose. Remove the plough tool, gripper wheel, adjuster wheel and seed metering machine to part-1 assembly and joint part-2 assembly i.e. trolley with the help of knuckle joint. The trolley is useful for goods, seeds, crops and fertilizer from farmer home to farming place or farming place to farmer home. The trolley is pulled by a machine engine.

VIII. CALCULATION AND SPECIFICATION

a) Engine

Displacement of Engine	97.20cc
Maximum Power	7.5 BHP @ 8000rpm
Maximum Torque	7.3 Nm @ 5000rpm
Number of Cylinder	1
Cooling of Engine	Air cooled
Number of Speed Gears	4
Top Speed	60. Mph

- b) The engine having four speed gear and we observed that by shifting the gear rpm or speed of the machine will also be increases. We get minimum and maximum rpm of output shaft as shown in below table by changing the gear of engine gearbox.

Gear management of engine	Speed on output shaft of gear box in rpm	
	Minimum	Maximum
1 st	0	1308.58
2 nd	1308.58	1972.75
3 rd	1972.75	2954.14
4 th	2954.14	7881.14

c) Gear in gearbox

Gearboxes are used to increase torque while reducing the speed of a prime mover output shaft (e.g. an engine crankshaft). This means that the output shaft of a gearbox

rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque. There are 8 gear available in gearbox at different outer diameter and number of teeth as shown in below table.

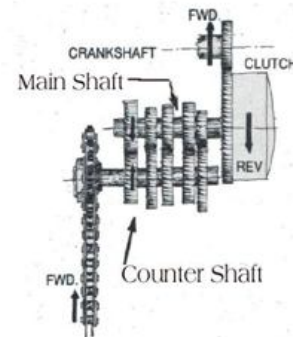


Figure-Gearbox

Number of gear	Outer diameter of gear (in mm)	Number of teeth (T)
1	23.30	11
2	33.40	17
3	43.10	22
4	43.60	22
5	47.10	24
6	47.60	26
7	56.40	29
8	66.40	34

Table Gear ratio

d) Gear ratio machine

The engine is transmitting power to the main axle of the machine with the help of roller chain drive and the machine will be run. The gear ratio is calculated below,

Gear ratio = driven teeth / driver teeth

Where, diameter of driven =180mm and teeth of driven sprocket gear =43 teeth

diameter of driver =65mm and teeth of driver sprocket gear =14 teeth

Gear ratio = driven teeth / driver teeth
= 43/14

Gear ratio = 3.072

Therefore, the gear ratio from engine to machine is 3.072.

Gear ratio of seed sowing machine

In seed sowing operation the seed sowing machine is taking motion to machine. There are two speed will be made to machine by interchanging the gear. As shown below,

Gear Ratio= Driven Gear Teeth /Drive Gear Teeth

Where,

case 1: - Driven Gear Teeth =18 Teeth and Diameter of Driven =75 mm

Drive Gear Teeth =12 Teeth And Diameter of Drive =50 mm

Gear ratio = $18/12 = 3/2 = 1.5$

case 2: - Driven Gear Teeth =12 Teeth and Diameter of Driven =50 mm

Drive Gear Teeth =18 Teeth and Diameter of Drive =75 mm

Gear ratio = $12/18 = 2/3 = 0.67$

In our machine, we using case 1 i.e. gear ratio =1.5

e) Velocity of machine

- a. During seed sowing and ploughing of soil = 2.5 to 5 km/hr.
- b. By assembling trolley to machine and using for transporting purpose = 40 to 50 km/hr.

f) Design of knuckle joint

d = diameter of rod = 20 mm (from design data book)

$d_1 = d = 20\text{mm}$

$d_2 = 2d = 2 \times 20 = 40\text{mm}$

$d_3 = 1.5d = 1.5 \times 20 = 30\text{mm}$

$t = 1.25d = 1.25 \times 20 = 15\text{mm}$

$t_1 = 0.75d = 0.75 \times 20 = 15\text{mm}$

$t_2 = 0.5d = 0.5 \times 20 = 10\text{mm}$

Mean diameter of split pin = $0.25d$
 $= 0.25 \times 20$
 $= 5\text{mm}$

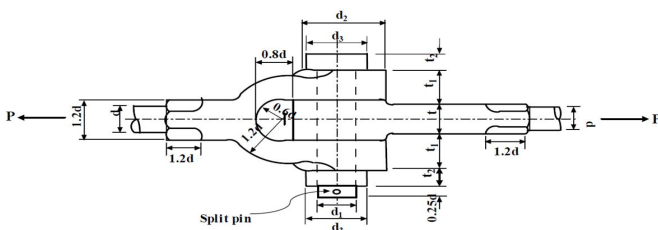


Figure-Knuckle joint

g) Seed sowing metering calculation

- i. Circumference of wheel = $\pi D = \pi * 500 = 1570.79$ mm
 - Since gear 2 is mounted on the same axle of wheel therefore for one rotation of wheel the gear 2 also rotate at same rpm.
 - For one rotation of gear 2, gear 3 will be rotate by 1.5 times rotation of gear 2. Because, the gear ratio of gear 2 and gear 3 is 1.5.

- Gear 3 will rotate 1.5 time, since gear 3 and seed sowing machine rotor 4 are mounted on same shaft, therefore rotor 4 will rotate 1.5 times.

Where, Rotor 4 is throwing seed into the furrows and which is fitted into seed sowing machine.

For one rotation of rotor, it will throw 4 seeds
 Therefore, For 1.5-time rotation = $4 * 1.5 = 6$ seeds

- Which means 6 seeds for one rotation of wheel. i.e. 6 seeds will be place at 1570.79 mm into soil.
- Therefore, distance between each seed (x)

$x = \frac{1570.79}{6} = 261.67$ mm approximately 262 mm

- ii. There are two cases to test the machine at two different speed.

Case-1: -

Speed of machine = 0.695 m/sec

$V = 0.695$ m/sec

$V = \frac{\pi * D * N_1}{60}$ where, D =diameter of wheel = 500 mm = 0.5 m and N_1 - rpm of wheel

$0.695 = \frac{\pi * 0.5 * N_1}{60}$

$N_1 = 26.54$ Rpm

$N_2 = 26.54$ Rpm

..($N_1 = N_2$, because mount on same shaft)

$\frac{D_2}{D_3} = \frac{N_3}{N_2}$

$\frac{75}{50} = \frac{N_3}{26.54}$

$N_3 = 39.81$ Rpm

Case-2: -

Speed of machine = 1.390 m/sec

$1.390 = \frac{\pi * 0.5 * N_2}{60}$

$N_2 = 53.08$ Rpm

$\frac{D_2}{D_3} = \frac{N_3}{N_2}$

$$\frac{75}{50} = \frac{N_3}{53.08}$$

$N_3 = 79.62$ Rpm
 $N_3 = N_4 = 79.62$ Rpm ($N_3 = N_4$, because Mount on same shaft)

- From case-1 and case-2, it can be concluded that if speed of machine will double then speed of the rotor will also double. There is no effect of machine speed on seed placing, I will get uniform distance between each seed.
- The test is also performing into farming place for verification of above cases. For this test I am testing machine at same speed of above both cases and I get same result i.e. placing seed at uniform distance. And The test is performing successfully on farming field.

h) Design of plough tool:

calculation have been carried out for the selection of matching implements for a machine when engine power is known:

Engine parameters chosen

Rated Power = 1 hp

Max. Torque= 7.3 N-m @ 5000 rpm

Available Power = 80% of rated power

$$= 0.8 \times 1$$

$$= 0.8 \text{ hp}$$

Axle power = transmission efficiency x available power hp

$$= 0.9 \times 0.8 \text{ hp} = 0.72 \text{ hp}$$

Tractive efficiency=drawbar power/axle power

Or,

drawbar power = (axle power) x (tractive efficiency)

So, drawbar power = 0.72 x 0.6 = 0.432 KW

Assuming operating speed 2.5 km/hr.

Optimum pull = drawbar power/operating speed = 432 / (2.5 x 1000/3600) = 622.08 N

So, Draft=Optimum pull = 622.08 N~ 622 N (Rounded off)

Considering, SAE 1020 Steel as the material for plough strip of rectangular crossection

(b x t),

$S_{yt} = 246 \text{ N/mm}^2$ [Table-II-7]

$$\sigma_t = s_{yt} / F.S. = 246/3 = 82 \text{ N/mm}^2$$

$$\sigma_t = P/A$$

$$82 = 622/b \times t$$

$$82 = 622/ 4t \times t$$

$$t = 1.37 \sim 2 \text{ mm}$$

$$b = 4 \times 2 = 8 \text{ mm}$$

Plough Bolt:

considering tensile failure of bolts,

$$\sigma_t = P/A$$

$$\frac{\pi}{4}$$

$$= P/(\frac{\pi}{4} \times d_c^2)$$

Considering a material for bolt is SAE 1010

$S_{yt} = 218 \text{ N/mm}^2$ [Table-II-7]

$$\sigma_t = S_{yt} / F.S.$$

$$= 218/3$$

$$= 72.6$$

$$\sigma_t = P / A$$

$$\frac{\pi}{4}$$

$$218 = 622/(\frac{\pi}{4} \times d_c^2)$$

$$d_c = 3.39 \text{ mm}$$

$$d_c = 0.81 \times d_o$$

$$3.39 = 0.81 \times d_o$$

$$d_o = 4.37 \sim 5 \text{ mm}$$

The outer diameter is 5mm and Select the Standard Size of bolt from Design Data Book 10mm. it is safe for design.

IX. MULTIPURPOSE FARMING MACHINE
IX. MULTIPURPOSE FARMING MACHINE



Actual Image of Multipurpose Farming Machine

X. DISTINGUISH BETWEEN MANUAL FARMING (TRADITIONAL METHOD) AND MULTIPURPOSE FARMING MACHINE (MODERN METHOD)

Manual farming (traditional method)	Multipurpose farming machine (modern method)
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1. The farming is done by traditional method takes 16 hours/acre for ploughing and 3 hours/acre for seed sowing operation.	1. In our multipurpose farming machine takes 6 hours/acre for ploughing and 1 hours/acre for seed sowing.
2. In manual farming labour cost is more. Because for ploughing operation 1 labour and for seed sowing 5 labour is required.	2. In our machine labour cost is less. Because for ploughing and seed sowing only 1 labour is required.
3. In traditional method farming is done by a pair of bullock and the horse power of two bullock engaged in ploughing varies from 0.29 to 1 hp.	3. In our machine farming is done by engine and the engine is produce 1 hp power for ploughing and seed sowing.
4. Seed to seed distance is varying and depth of seed also varying therefore, maximum number of seed is damage.	4. Seed to seed distance is uniform and depth of seed is also uniform or the depth is adjusted as per requirement. Therefore, no wastage of seed.
5. The production of crops is less and takes more time.	5. The production of crops is more and takes a less time.
6. In one time one row is plough and sow.	6. In one time two rows are plough and sow.
7. The plough tool is made up of wood and life of the tool is less.	7. The plough tool is made up of iron and life of the tool is more.
8. In traditional method the row to row distance in not adjusted.	8. In our machine row to row distance is adjusted as per requirement.

XI. ADVANTAGES OF MULTIPURPOSE

FARMING MACHINE

- The seed can be placed at any required depth uniformly with the help of adjuster wheel.

- Seed can be placed uniformly in a row with required distance between plants.
- It was made of durable and cheap material affordable for the small scale peasant farmers.
- Time required to seed sowing and ploughing is also decreases.
- Requirement of labor also decreased.
- Increase in crop yield and cropping reliability.
- Seed flow can be controlled.
- Pumping water from river, well, canal, etc. to farming place.
- Transporting cost is low.

XII. CONCLUSION

This multipurpose farming machine has considerable potential to greatly increase productivity of crops. So, I am designing and fabricating a multipurpose farming machine which will do multiple-operation simultaneously i.e. ploughing, seeding, irrigation and carrying or transporting goods. The machine is successfully tested into farming field and reduces time 62.5% for ploughing and 66% for seed sowing as compare to the traditional method. Less manpower needed to operate this machine i.e. 1 person to operate. Therefore, the cost of production crops is less. Design and fabricate machine at affordable price for small farmer. The main task now is to promote this technology and have available to farmers at an affordable price. The multipurpose farming machine can be readily made from local components in workshops. This machine is more beneficial to small farmer who cannot afford farming equipment at higher cost. And one person can be easily handle this machine.

XIII. FUTURE SCOPE

1. In the multipurpose farming machine in place of petrol engine, the diesel engine and other gasoline engine can be used for improving performance and the environmental friendly.
2. In multipurpose machine in addition to ploughing and seed sowing, the arrangement for fertilizer and manure can be made.
3. In this machine instead of sowing in two rows it may be increased further.
4. In our machine farmer is walking with machine during seed sowing and ploughing, providing seating arrangement into the machine will be beneficial.

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