

A Multipurpose Agriculture Equipments

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Abstract- Presently, small land holding farmers use work bulls mostly for land preparation. Farmers can do much to increase crop production especially grains if drudgery can be reduced or totally removed from their planting operations. Generally cultivation of any crop involves various steps like seed selection, field preparation, fertilizing, sowing, irrigation, germination, thinning and filling, weed removal, vegetative stage, flowering stage, pesticide spraying, fruit or pod formation stage, harvesting and threshing. Farmer has to use various agricultural equipments and labours for caring out those steps, our purpose is to combine all the individual tools to provide farmers with multipurpose equipment which implements all the scientific farming techniques and specifications and suitable for all type of seed to seed cultivation with as minimum cost as possible. This project work is focused on the design and fabrication of multipurpose equipment which is used for land preparation, sowing, fertilizing, levelling and weed removal process. 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 consist of the main frame, adjustable handle, seed hopper, seed metering disc, adjustable furrow opener, adjustable furrow closer, drive wheels, seed tube. Seed metering disc was designed to be interchangeable to allow for sowing of the different varieties of seeds. The multipurpose agricultural equipment is very simple to use, the various adjustments are made with ease, and it is maintenance free.

Keywords- sowing, fertilizing, levelling, weed removal, Seed metering disc and adjustable furrow opener

I. INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. —A man without food for three days will quarrel, for a week will fight and for a month or so will die. Agriculture is a branch of applied science. Agriculture is the science and art of farming including cultivating the soil, producing crops and raising livestock. It is the most important enterprise in the world. Over the years, agricultural practices have been carried out by small-holders cultivating between 2 to 3 hectare, using human labour and traditional tools such as wooden plough,

yoke, leveller, harrow, mallet, spade, big sickle etc. These tools are used in land preparation, for sowing of seeds, weeding and harvesting. Modern agricultural techniques and equipments are not used by small land holders because these equipments are too expensive and difficult to acquire. By adopting scientific farming methods we can get maximum yield and good quality crops which can save a farmer from going bankrupt but majority of farmers still uses primitive method of farming techniques due to lack of knowledge or lack of investment for utilizing modern equipment. The use of hand tools for land cultivation is still predominant in India because tractors require resources that many Indian farmers do not have easy access to. The need for agricultural mechanization in India must therefore be assessed with a deeper understanding of the small holder farmer's activities. There is huge gap in technology adoption and Implement used with small and marginal farmers. Sustainable improvement in the livelihoods of poor farmers in developing countries depends largely on the adoption of improved resource conserving cropping systems. While most of the necessary components already exist, information on the availability and performance of equipment is lacking and effective communication between farmers and agricultural research and development department is unsuccessful.

II. EXISTING METHOD

A frame is made up of carbon steel which gives the desired strength and lightness, it includes all the three equipment together i.e. Seed feeder, pesticide sprayer, and crop cutter. In this frame, a retractable link is fixed to the top end of which a solar photovoltaic panel is fixed that converts solar power into electricity. This electricity is then provided to the battery via a charging circuit and is used for charging the battery. Electric power from this battery is given to an electric motor via control switches, by controlling which entire device can be operated. The pump is connected spray pipe. Liquid insecticide is sprayed on the crops using Spray pipe, which receives liquid from a reservoir with the help of a pump. This pump is driven by another DC motor that receives power from the same battery. Thus insecticide in liquid form is sprayed. A separate chamber for seeds has been made, which is used for feeding the seeds to the farm field. The multipurpose agro machine equips a crop cutter for cutting out the crops. The

handle casing on it makes it more comfortable. It consists of a cycle wheel in the front. The equipment thus serves as a friendly tool for the farmer and also making it economical.



Fig.1 The top view of multi- purpose agro equipment

III. PROPOSED WORK

Generally cultivation of any crop involves various steps like seed selection, field preparation, fertilizing, sowing, irrigation, germination, thinning and filling, weed removal, vegetative stage, flowering stage, pesticide spraying, fruit or pod formation stage, harvesting and threshing. Farmer has to use various agricultural equipments and labours for caring out those steps, our purpose is to combine all the individual tools to form a multipurpose equipment which reduces the overall equipment cost and labour cost and also increases the yield of the crop by implementing scientific farming method.

Initially plough is connected to the beam using fasteners and tilling of the soil is performed, later during sowing seed drill is attached to the beam along with level for levelling of soil for sowing and fertilizing, the seed and fertilizer are stored in the primary seed and fertilizer box. The seeds and fertilizer are provide to the secondary seed box to maintain the level of seeds in the box and the disc picks up the seeds from the seed hopper and fertilizer hopper and drop them to the furrow through the seed tube. When the seed is dropped at a specific distance then seed covering device covers soil over the seed and after germination of seed takes place, weeds are also developed in the field. By replacing the seed drill by weeding tools for the same beam arrangement we can use it for weeding purposes. Weeding blade is attached in inclined position such that it uproots the weeds and simultaneously weedicide is applied on the field by the weedicide container attachment.

IV. DESIGN AND FABRICATION PROCESS

1. Yoke

To reach the optimum depth and width of cut when plowing high draft power is required so the animals should be yoked close together. On a plowing yoke the animals should be placed 90 cm apart (centre to centre) on the yoke shaft. If the yoke is too long (animals >90cm apart) a strip of unplowed land will be left at the centre during plowing, and if the yoke is too short (animals <90cm apart) the share cuts a narrow slice of unplowed land. This means that it will take more time to plow a given area of land. Hence our equipments requires a yoke of 6feet in length.

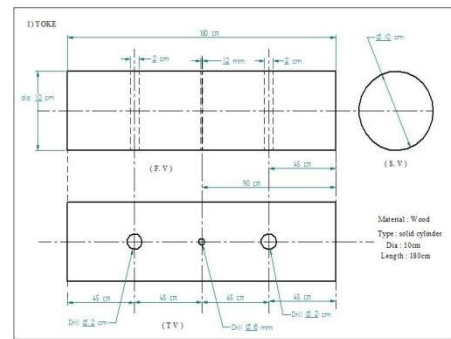


Fig.2 Yoke design



Fig.3 Yoke and beam after fabrication

2. Beam

An average Indian ox will be having 5 feet in height and 6 feet in length. Hence for easy operation of the equipment a 9 feet long beam is required so that a safe distance is maintained between animal and the equipment.

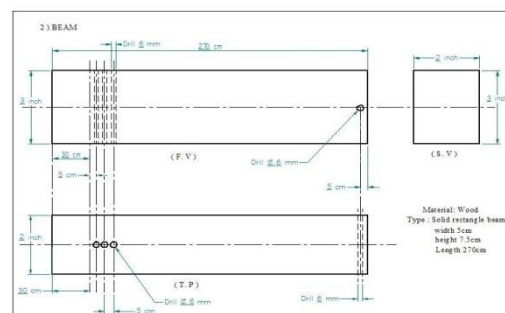


Fig.4 Beam design

3. Plough

Construction is simple, sturdy & durable. It is useful for all soils and also useful for ridging and clod breaking. It is drawn by a pair of bullocks.

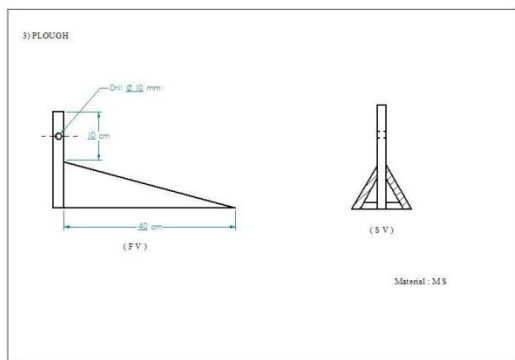


Fig.5 Plough design



Fig.6 Plough after fabrication

4. Handle

Handle acts as an armrest for farmer and also helps him in guiding the animal in straight path.

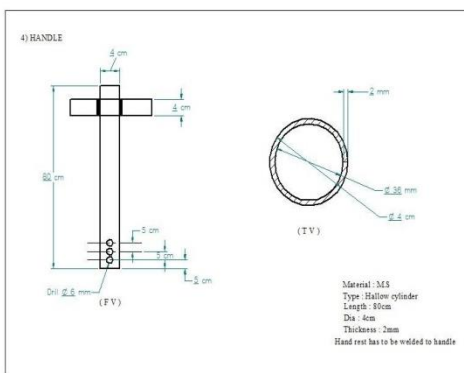


Fig.7 Handle design



Fig.8 Handle after fabrication

5. Weeder Assembly

Weedicide containers consists of weedicides which helps in avoiding of weed formation by dripping it along the path between the crop.

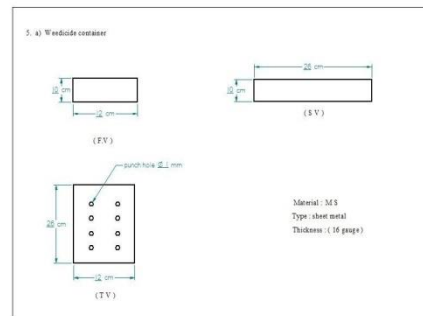


Fig.9 Weedicide container design



Fig.10 Weedicide container with weeder frame after fabrication

6. Weeder frame

This small frame helps in the attachment of leveler and weeding equipment.

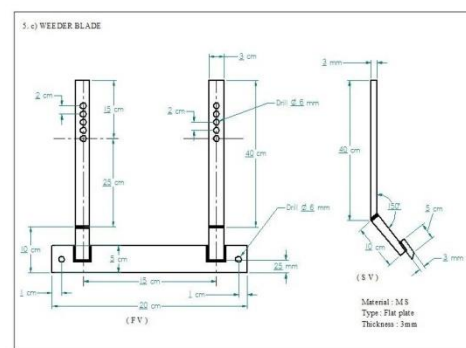


Fig.11 Weeder blade design

7. Leveler blade

Weeder blade is extended by attaching the leveler blades with the help of fasteners.

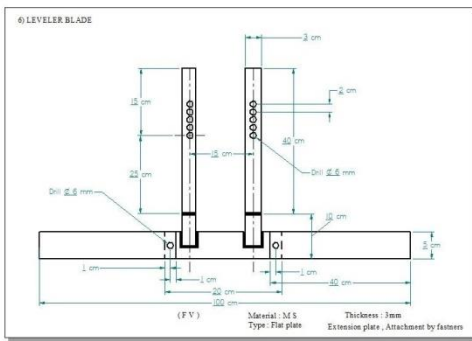


Fig.12 Leveler blade design



Fig.13 Leveler blade after fabrication

8. Spike wheel

Spike wheels are used in order of preventing slip and to convert the linear animal drawn power into rotational mechanical energy.

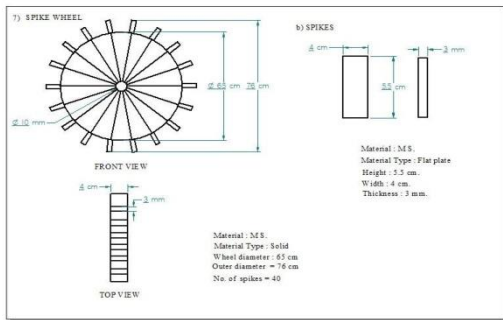


Fig.14 Spike wheel design



Fig.15 Spike wheel after fabrication

9. Seed metering disc

Cell feed mechanism: It is a mechanism in which seeds are collected and delivered by a series of equally spaced cells engraved on the periphery of a circular plate or wheel. Seeds can be easily classified based on its average diameter of the seeds, hence our cell feed mechanism consists of two types of cells. A series of 14mm diameter and 8mm depth cells are machined in order to pick large seeds and a series of 8mm diameter and 4mm depth is created in order to pick small seeds.

The cells are designed such that the angle between one cell to another is 15degrees, such that the seeds are placed at every 10cm apart. If there is need of altering the distance between one plant to another plant, then close every alternative cells such that the seeds are placed at every 20cm apart and close two alternative cells such that the seeds are placed at every 30cm apart. This mechanism is the only mechanism in which all type seed to seed cultivation is possible and capable of operating under various seed spacing specification. Closing of the cells can be done by using any simple tape or plaster.

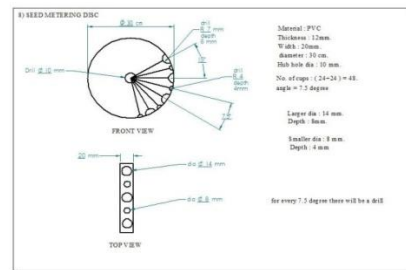


Fig.16 Seed metering device design

10. Fertilizer metering disc

Fertilizer metering disc consists spikes in the circular disc which acts a stopper for the flow of the fertiler though the fertilizer metering container. The stopper allows the fertiler flow for every 15 degree rotation in the disc.

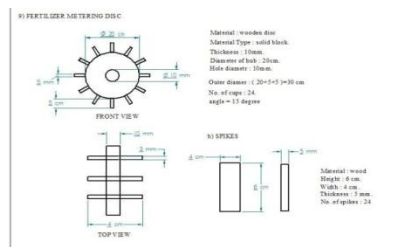


Fig.17 Fertilizer metering disc design

11. Shaft

Shaft is made up of a 120cm long threaded rod of 10mm diameter. It connects the two spike wheels on either

side of the equipment and all the seed metering and fertilizer metering discs are mounted upon the shaft, such that when the wheel rotates, metering of seeds and fertilizer takes place.

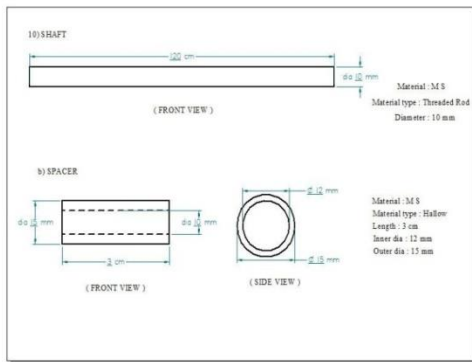


Fig.18 Shaft design

Fertilizers are filled into the seed metering container with the help of hopper. Seeds are pushed from the stopper type mechanism of the fertilizer metering disc. Container is made up of CR sheet metal of gauge 16.

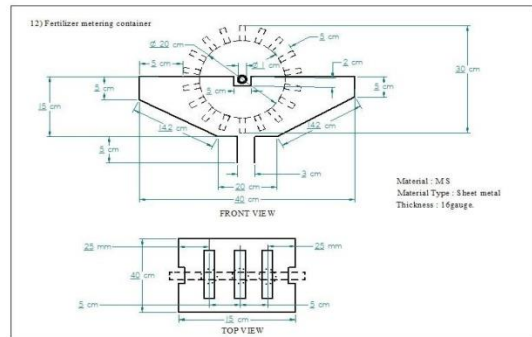


Fig.21 Fertilizer metering container

12. Seed metering container

Seeds are filled into the seed metering container with the help of hopper. Seeds are lifted from the cell type mechanism of the seed metering disc.

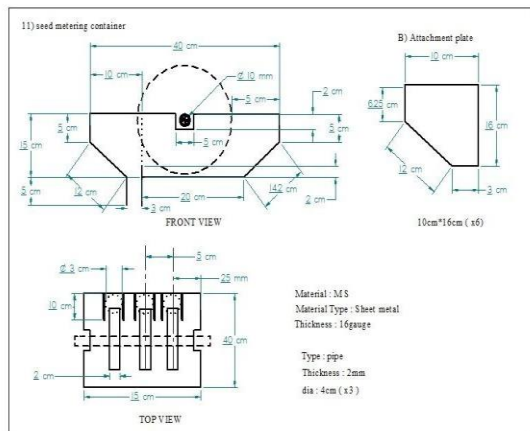


Fig.19 Seed metering container



Fig.22 Fertilizer metering container after fabrication

14. Seed hopper

Hopper is also made up of CR sheet metal of gauge 16. Seed hopper maintains a uniform and continuous flow of seeds in the seed metering container.



Fig.20 Seed metering container after fabrication

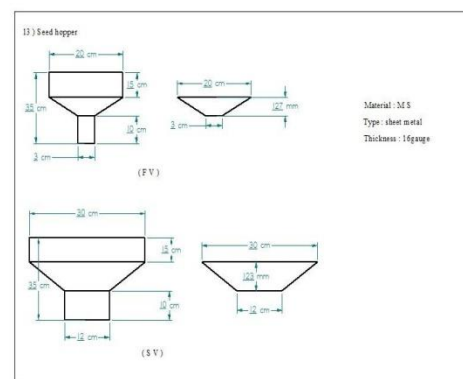


Fig.23 Seed hopper design

13. Fertilizer metering container



Fig.24 Seed hopper after fabrication

15. Fertilizer hopper

Hopper is also made up of CR sheet metal of gauge

16. Fertilizer hopper maintains a uniform and continuous flow of seeds in the fertilizer metering container.

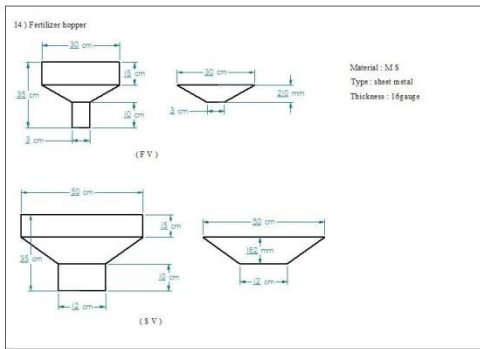


Fig.25 Fertilizer hopper design

16. Furrow opener

Shoe type furrow openers ensure deeper seed placement in moist zone for sowing under dry land condition. Shoe type furrow openers are provided for easy operation. The proper depth of seed and fertilizer needs to be maintained for the proper germination of the seeds. The depth of seed and fertilizer is controlled with the help of a stud on which four numbers of Nuts are given to control the depth. The seeds are to be sown at a depth of 2-3 cm and fertilizer to be placed at a depth of 3-4 cm. The depth control arrangement controls the depth of the seed and fertilizer.

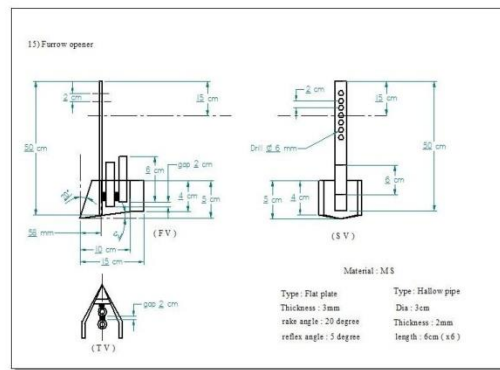


Fig.26 Furrow opener design



Fig.27 Furrow opener after fabrication

17. Seed cum fertilizer frame

The frame is made of mild steel angle section and flats. It is strong enough to withstand all types of loads in working condition. All other parts of a seed drill are fitted to the frame

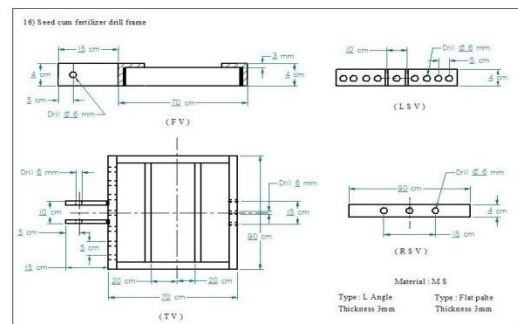


Fig.28 Seed cum fertilizer frame

V. RESULT AND CONCLUSION

Practically our multipurpose agricultural equipment can be used for tilling, fertilizing, sowing, leveling and also used for weed removal purposes. All the parts are connected in such a way that in every stage of agriculture the equipment can be rearranged or easily assembled with fasteners to required length and specifications of field operation.

Our team has successfully combined many ideas from various fields of mechanical engineering and agricultural knowledge to improve the yield and by reducing the labour effort and expenses. The whole idea of multipurpose equipment is a new concept, patentable and can be successfully implement in real life situations.

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