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DESIGN AND FABRICATION OF SOLAR BASED AGRICULTURE VEHICLE

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ABSTRACT

The last century the earth experienced a huge booming of its population. The rate of this growth is the biggest ever and all major predictions estimate that it will continue. Goods are becoming more and more valuable, thus their management requires precise and accurate decisions. After the huge industrial revolution, the next huge step from mankind was to invent new ways of transforming the energy from the sun, into useful energy for all kinds of activities. Practically, sun will not expire before the end of earth's life. It seems that the future of both goods will find them bonded and especially food production will be directly dependable to the energy. Adding to this, the demand for food production industry will increase and require more energy; hence it will add to the environmental depletion, by releasing co2 to the atmosphere. The aim of this study is to present, a potential alternative solution regarding the covering of energy needs, required for farming activities related to the arable lands. As the car industry, gradually heads to the electric engines and electric vehicles, the farming tractor industry will not fall behind with traditional diesel engines. Assuming that it is possible to manufacture electric farming tractors, this paper is studying the energy balance between solar energy generation and the demands of the farming activities in the field. The main parts of this concept are, the solar array scheme, the electric motor of the tractor and of course the battery that will store the energy from panels and produce it to farming tractor, while operating in the field. Except from evaluating the technical and financial feasibility of this project, this paper aims to enforce the combination of two fields into one; agriculture and sustainable engineering to sustainable agriculture practices

KEYWORDS: Solar Energy, Renewable, Food, Agriculture, Co2, Farming Activities, Electric Engines, Farming Tractor, Batteries.

1. INTRODUCTION

The attempt of this study is to examine if an electric tractor can fulfil all the farming activities in equal quality and efficiency as the classic farming tractors. Currently there is no specific model of an electric farming tractor in commercial size production. Hence for the needs of this study the electric tractor will be assumed to be a classic farming tractor with electric motor and no technical design details of any particular model will be discussed. The traditional fossil fuel, which is diesel, will be replaced from electricity from solar PV panels and the fuel tank will be the battery. Innovation and modification is the nature of engineering. Hence we have introduced "SOLAR SEED DRILL". Main purpose of our project is to provide less maintenance in the vehicle and available in low cost easy to transport at affordable cost for common man. Our project is totally based on solar and DC electricity. Our project in which no need of AC supply, mostly in today era big problem is highly fuel consumption and regularly CO2 producing that is why we made solar based project.

2. TRADITIONAL SOWING METHODS

Outdated methods include distribution manually, opening troughs by a country furrow and dropping seeds hand, known as 'Kera', and dropping seeds in the furrow through a bamboo/mental funnel attached to a country plough (Pora). For sowing in minor areas dibbling i.e., making holes or splits by a stick or tool and dropping seeds by hand, is practiced. Multi row outdated seeding device with physical metering of seeds are quite popular with experienced farmers. Outdated sowing methods have following drawbacks;

1) In manual seeding, it is not possible to attain regularity in distribution of seeds. A farmer may sow at wanted seed rate but inter- row and intra – row spreading of seeds is likely to be uneven resulting in gathering and gaps in field.

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2) Poor control over depth of seed location.
3) It is essential to sow at high seed rates and bring the plant population to wanted level by thinning.
4) Labour necessity is high because two persons are essential for dropping seed and fertilizer.
5) The effect of falseness in seed placement on plant stand is better in case of crops sown under dry farming conditions.

During kharif sowing, location of seeds at irregular depth may result in poor growth because succeeding rains bring additional soil shelter over the seed and affect plant.

3. LITERATURE SURVEY

In recent years, there has been an acute shortage of agricultural labourers during sowing season due to increased employment opportunities in urban areas for rural youth. Due to non availability of labour and work animals during sowing seasons, in many places the seed is sown even when the soil is at a low moisture content which affects the germination, plan I. Stand and yield. Therefore in order to mechanize crop sowing operation under rain fed conditions, a suitable seed drill is vital as it places the seed in the zone of adequate moisture and at desired depth. The bullock drawn seed drill gives proper seed rate, uniform distribution and correct placement of seed resulting in higher yield and reduces human physical strain.

4. COMPONENTS OF SEED METERING DEVICE

- Solar Panel: Solar energy is the most abundant, renewable energy source in the world. Solar energy systems refer to technologies that convert the sun's heat or light to another form of energy for use.
- Battery: In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy.
- Differential: A differential is a gear train with three shafts that has the property that the rotational speed of one shaft is the average of the speeds of the others, or a fixed multiple of that average. In automobiles and other wheeled vehicles, the differential allows the outer drive wheel to rotate faster than the inner drive wheel during a turn.
- U Clamp: U-clamp is a clamp in the shape of the letter U with screw threads on both ends. U-clamps have primarily been used to support pipe work, pipes through which fluids and gasses pass.
- Chain sprocket: A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material.
- Shovel: Shovel is a tool used to dig as well as to move loose, granular materials (like dirt, gravel, grain, or snow) from one spot to another.
- Cup Set: Seed picking cups or spoons are provided on periphery of a vertical plate. When the plate rotates, cups pick seeds from seed hopper and drop them in seed funnel.
- Ground Wheel: The ground wheel is a wheel it is used to drop the seed in the cup set then the soil.
- Seed Tubes: Seed tubes may be either of the collapsible type or rigid type. The seed tube can be made of plastic (Which if clear, allows the seed flow to be monitored) or metal.
- Motor: A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.
- Controller: A Motor Controller is a device that acts as intermediary between your robot's microcontroller, batteries and motors
- Throttle: The motor acceleration system study is an important area in terms of electrical engineering. It measures proper starting and running of motors on load with given system inertia without causing tripping or instability in the system
- Bush: A bush is a mechanical fixing between two, possibly moving, parts, or a strengthened fixing point where one mechanical assembly is attached to another

5. METHODS AND PRINCIPLES

Method

The first requirement of every customer is that get cheaper and best working product and our model fulfils both requirements. If we buy any ordinary tractor of 5Hp then we need 1.5lakh and we purchased seed drill then we need 30k, if we purchased the solar seed drill of 1Hp then we need only 64k .We will be operating it by solar

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energy and we can also use it at night with the battery which is stored by the solar energy, this model doesn't requirement any maintenance.This system does not require fuel it's fully based on renewable energy, And in the solar seed drill also gain the power from solar panel in this condition we control the battery supply .It is used form multipurpose use like we connect Trolley, Cultivator .In this seed drill we fitted the 900W and 48Volt Motor is fitted and there are 4 battery are connected in series and the one battery specification is 48Volt and 100Aph is connect. And we made the seed drill box of 31inch in length and 12inchare in breadth

Principles

Fleming's left-hand rule

A machine that converts DC electrical power into mechanical power is known as a Direct Current motor. DC motor working is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force.

The direction of this force is given by Fleming's left-hand rule and magnitude is given by;

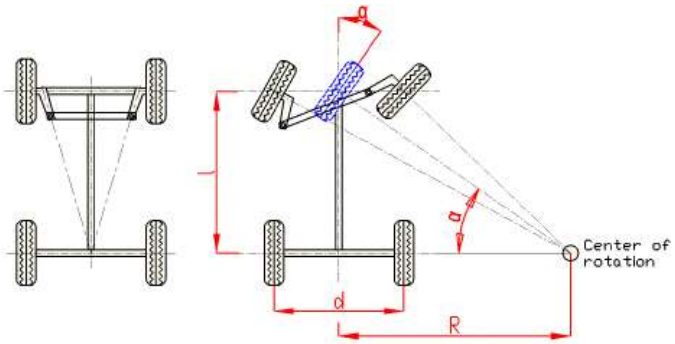
F = BIL Newton's

According to Fleming's left-hand rule when an electric current passes through a coil in a magnetic field, the magnetic force produces a torque which turns the DC motor.

Ackermann principal for steering

When a vehicle is turning, the inner front wheel needs to turn at a different angle to the outer because they are turning on different radii. The Ackermann steering mechanism is a geometric arrangement of linkages in the steering of a vehicle designed to turn the inner and outer wheels at the appropriate angles. This model is fully parameterized, allowing customization and component sizing. Using this model, the ideal Ackermann Angles can be identified, providing an effective starting point for further analysis in Maple.

Figure



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6. RESULTS AND DISCUSSION

Seed Distance Measurement

Sr.No	Entered Distance between two seeds(in cm)	Actual Distance between two seeds (in cm)
1	10	10
2	30	30
3	50	50

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7. CONCLUSION

Concluding this study it is important to comment all important points that stemmed out. The first is that this project is proved feasible. Although many assumptions occurred, the results can be judged as rational and realistic. From a technical aspect, this project is parted from matured and relatively simple technologies such, as PV panels, batteries and electric motors. Hence major problems of compatibility between technologies do not occur. This is very important when it comes to applicability in real conditions. Financially the project is feasible and under certain conditions it can be very profitable. Last but not least the project, as an idea, seems to comply with the EU environmental standards and goals, while offering solution to the matter of the environmental degradation from farming activities. As mentioned in the previous paragraph, this study proves that the project has a lot of potentials regarding its application. All technologies that were combined have proven their reliability and of course their drawbacks (battery unreliable technology) through last decades.

It is important for example to have for granted that the proposed PV panel will produce the electricity that is predicted, because it is generally acceptable that polycrystalline technology can reach electric efficiency of 12%. Although the technical details of the farming tractor are not analysed in this study, the simplicity of the technology (e.g. motors, cables, charging controllers, meters, batteries etc.) offers margin in success of the functionality of a real electric farming tractor that resembles the hypothetical one, which is used in this study. A very popular advantage in EV industry is the available torque that the electric motors produce from zero rpm. This can be more beneficial in farming tractors, where large traction forces are required in order to pull the heavy farming machinery.

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