

INTELLIGENT AGRICULTURE ACCOUTREMENT

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ABSTRACT

At present more than 75% population of India live in rural areas. As India is the largest producer of pulses and second largest producer of rice in the world. But the condition of farmers in our country is not so good. They are still struggling for their livelihood. They still prefer conventional methods of farming like the use of bullock carts, handmade tools, and labor work. Because machinery which was invented for the agriculture sector is too expensive for small scale farmers. Observing this condition, the concept of multipurpose agriculture machine arises. An accoutrement that can be attached easily to tractors, engines etc. which can perform three different agricultural process simultaneously Like cultivation of land, sowing of seeds, irrigation and spraying of pesticides on the field. It requires motor and battery for operating the vehicle, the battery can be recharged through renewable energy sources like solar panel and this accoutrement can be remotely controlled. This accoutrement will save the time and energy of our farmers and enhance the productivity of crops. It will reduce the labor work and the overall cost of farming. This accoutrement will be helpful for small scale farmers for improving the crop yield. An innovative intelligent agriculture accoutrement that will enhance the productivity of crops, reduces the efforts of farmers, and minimizes the load on less financially stable farmers.

KEYWORDS: *Accoutrement, Intelligent Agriculture, Smart Agriculture Equipment*

1. INTRODUCTION

Agriculture is a major part of Indian economy about 50% of total economy is obtained from rural areas by agriculture. As we all know that the 75% population lived in rural areas and their living is based on agricultural. But the poverty rate in rural areas is high, so many farmers are not able to purchase costly equipment or machine or trolley etc. for the cultivation of the field. Mostly rural farmers used traditional methods for farming. These methods are time consuming and take too much effort of the farming which cause pain in their back, hand etc. The increasing rate of population day by day causes the need for food for everyone so for that the output of the agricultural should be increased. But when the traditional methods were used the output from the agricultural is remain less and take too much effort of the farmers. If we see from the history of agriculture most of the work done by the labor or some tools made by the people for their support to complete their work easily. Manually operated machines help the farmers not much lies at their expectations the same energy and labor still required for the completion of their work. But when the automatically machine comes in this scenario the agricultural life change up to an aspect thought by the farmers or labor who work for hours. Some machines are operated by tractors by attaching with them. But most of the Indian farmers are not wealthy the amount related to tractor or tractor related equipment break the idea of farmers to accept that technical technology.



Figure 1 (a) Digging for seed sowing (b) Sowing of seeds(c) Irrigating the seeds

Intelligent agriculture accoutrement works feasibly performing three operations automatically without any requirement of labor, it digs the ground for seed sowing, after that the seed is sowed in the ground and supply waters for the initial needs for the seeds as shown in figure 1. In this paper, architecture for intelligent agriculture accoutrement is discussed. Rest of the paper is organized as follows section 2 depicts literature review followed by Section 3 describing proposed methodology of developing the intelligent agriculture accoutrement. Section 4 comprises of results and discussion and finally section-5 covers conclusion and future research direction followed by the references used during the work.

2. LITERATURE REVIEW

R. Chougule et al., in their studies of design and fabrication of multifunctional agriculture vehicles, stated that the proposed machine can perform 4 agriculture processes like sowing, weeding, ploughing, and spraying. For this purpose, motor and battery are used. The cost of this machine will be approx. 24000 Rs, which is less than other machinery which is used in the agriculture sector. It cannot be afforded by small scale farmers. It consists mainly of four components' chassis frame rotavator, sprayer, battery, and motor [1]. Kashyap et al., in their studies of Multi-Tasking Agricultural Machine Tool stated that this paper proposed a machine which can perform different processes like spraying of pesticides, plugging or cutting process. The most important factor of this machine is it does not require fuel to run. It is a manually operated machine. It does not require any skilled labor, also it converts rotatory of wheels into reciprocating motion for spraying pesticides. As it does not use any external energy resources the cost of this machine will be very small. It uses carbon steel as a frame material [2]. C. N. Sakhale et al., in their studies of a review paper on multipurpose farm machine proposed a machine

which uses 24 cc engine for the digging process and uses 12v battery for spraying the pesticides and other two processes like cultivation and sowing it perform manually. This machine consists of hopper, fertilizer tank, cultivating too; sprayer and 24cc engine [3]. Kartik Krishnamurthy et al. in their studies of Arduino based weather monitoring system stated that temperature, humidity, light intensity, dew point, and heat index are among the weather/environmental variables measured by three sensors in this paper [4]. A. K. Rajamanickam et al. in their studies of development of multipurpose agricultural machines, stated that a machine which uses AC motor chain drive and hydraulic system none return valve tube. This machine will run with the help of a tractor. This machine is divided in to 3 sections of 400mm first section consists of gearbox which uses worm gear to provide required speed ratio and second section consists of hopper which is used to sowing the seeds inside the soil and third section is used for ploughing and consists of chopper and pump [5]. M. V Achutha et al., in their studies of “Concept Design and Analysis of Multipurpose Farm Equipment” stated that in this research paper they majorly focus on the cost of the vehicle, so they don’t use any external source [6]. N.K. Mishra et al., in their studies of, multi-Purpose Agriculture Machine” stated that they proposed a machine which uses solar energy to run the vehicle. Solar energy is used to recharge the battery which performs spraying process [7]. R. Patel et al., in their studies of “Review on Design and Fabrication of multipurpose agriculture machine stated the aim of this machine as to add automation in the agriculture sector, so they proposed a machine which is fully automatic and use different sensor for their working [8]. A. Jadhav et al., in their studies of “Design and Fabrication of Multipurpose Agriculture Machine” stated that in this paper, they use BLDC motor, lithium-ion battery and controller to control the speed of the motor [9]. S.B. Jagtap et al. in their studies of multipurpose agriculture robots by using solar stated that this machine consists of ESP8266 controller to control the motor speed. It performs three processes cutting, pumping, and seeding [10].

3. DESIGN FRAMEWORK

This intelligent agriculture accoutrement can perform three farming processes like sowing seeds, spraying pesticides and water and ploughing. This machine is designed in such a way it does not require any skilled labor. Multipurpose intelligent agriculture accoutrement reduces the workload on farmer of doing different process through labor work. This intelligent agriculture accoutrement is affordable for small scale farmers who cannot afford costly machines. This intelligent agriculture accoutrement reduces the cost of farming and reduces labor work also. There is concern that agricultural production in developing countries will cause environmental threats in the future, as production will have to increase to satisfy the growing demand for food. Intensification leads to high inputs of nutrients in the form of mineral fertilizers and animal feed. Important parts of these inputs leak from the system in the form of nutrient leaching to groundwater and gaseous losses to the atmosphere. Pressure on the existing agricultural land may increase by growing demand for productive land and degradation of the existing agricultural land base. Expansion of agriculture generally leads to massive deforestation. A chassis or frame is considered to be one of the basic structures of a machine in automobile which supports the equipment as well as body. It is the framework which holds the body of the machine and other parts mounted on them. Various parts are bolted on the chassis. It’s basically a structure made up of steel or mild steel rod joined with the help of welding. A motor is a device which converts electrical energy into mechanical energy. Motor is mounted on the chassis which is used to run the machine. A 12 v DC motor is used for operating the machine with the help of the battery, which is used to give power to the rear wheel. It uses power sources, a battery and a controller. A battery is used to provide power to the motor through which they run. A 12V lithium-ion battery is used. The battery is rechargeable. Able to provide power to the motor easily. The water tank is situated on the chassis near the rear axle. The water tank is used to wet the soil for the seed sowing operation. The water tank relates to a pipe mechanism which is attached to the rod which has holes to pour the water on the ground. A seed Sower is a roller like box which is mounted on the front axle of the machine. The main work of the seed Sower is to sow the seed to the soil. The Seed Sower box design is made in such a way that several small holes made on the box

are capable of releasing seeds. To release the seed from the ground while rolling only a small action of sliding the latch must be done. It connects through chain and gear mechanism to the front or rear wheel. Tiller is used to dig the ground for the cultivation of the soil or for the sowing of the seed. Tiller is placed on the front axle of the machine which is attached with two rods to the front axle of the machine. Wheel is a circular frame of hard material that may be solid, partly solid, or spoked and that can turn on an axle. The power delivered by motor to the axel is capable of moving the machine with the help of wheel easily without any discomfort.



Figure 2 Intelligent Agriculture Accoutrement

4. RESULTS AND DISCUSSION

Figure 2 shows the implemented hardware of the intelligent agriculture accoutrement. Intelligent agriculture accoutrement can perform three farming processes like sowing seeds, spraying pesticides and water and ploughing. Intelligent agriculture accoutrement is designed in such a way it does not require any skilled labor. Multipurpose agriculture intelligent accoutrement reduces the workload on farmers of doing different process through labor work. This machine is affordable for small scale farmers who cannot afford costly machine. This machine reduces the cost of farming and reduces labor work also.

To run intelligent agriculture accoutrement, farmer must use controller and connect with the machine through Bluetooth module. Now the farmer controls this machine through his controller. Farmer must give command like to start the intelligent agriculture accoutrement or to stop the intelligent agriculture accoutrement, when intelligent agriculture accoutrement (shown in figure 3) moves these three-process done simultaneously like when intelligent agriculture accoutrement moves cultivators starts cultivation the land with the rotation of its blade followed by sowing of seeds and pump also start spraying pesticides on the field. So, in this it can make farming process easy and save time and energy of farmers also it can enhance the productivity of farmers lead to economic growth of farmers. Typical agricultural cycle for Intelligent Agriculture Accoutrement is shown in figure 4.



Figure 3 Intelligent accoutrement attachment

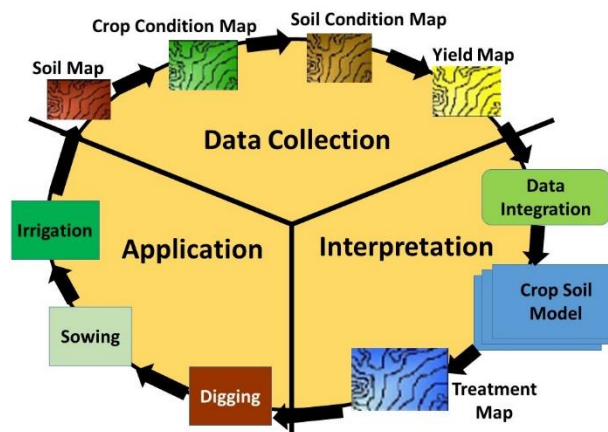


Figure 4 Y Chart of Intelligent Agriculture Accoutrement

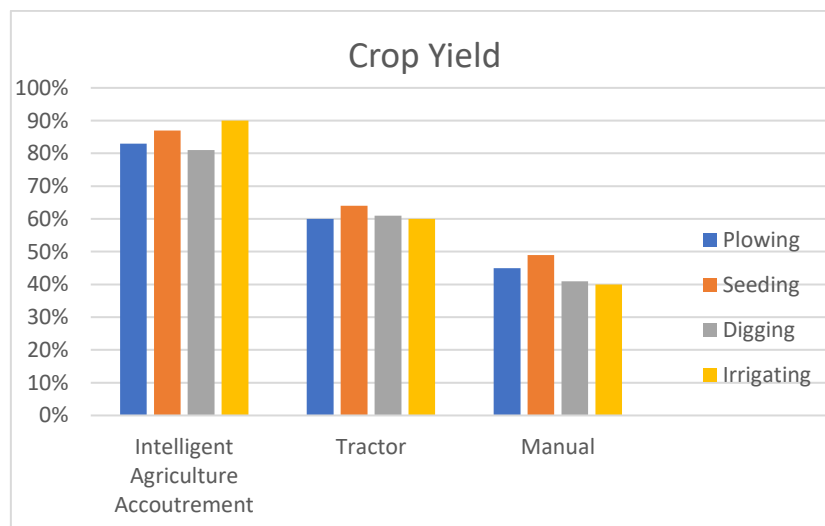


Figure 5 Crop yield for agriculture done through various means

Based on the results depicted in above figure it is clear that the crop yield increases while using the proposed intelligent agriculture accoutrement. It is around 83% if the proposed system is used for plowing and moves to 88% if the system is used for seeding and roughly 80% & 90% if the system is used for digging and irrigating the field. However the crop yield obtained by using tractors for plowing, seeding, digging and irrigating was found out to be around 60%, 63%, 61% and 60% respectively. The

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crop yield obtained through manual agricultural techniques was around 45%, 49%, 41% and 40% for plowing, seeding, digging and irrigating respectively. The above results predicts that the proposed intelligent agriculture accoutrement has higher impact on crop yield for different stages of agricultural process in comparison with traditional methods such as using tractors or manual techniques. The intelligent system offers advantages such as improved efficiency, precision, and optimized resource utilization. By leveraging advanced technologies and automation, it enables better plowing, seeding, digging, and irrigation practices, resulting in higher crop productivity. It is important to note that the percentages provided are relative increases in crop yield and represent the improvement achieved when using the proposed intelligent system compared to traditional methods. The exact crop yield values will depend on various factors such as crop type, soil conditions, climate, and other local variables.

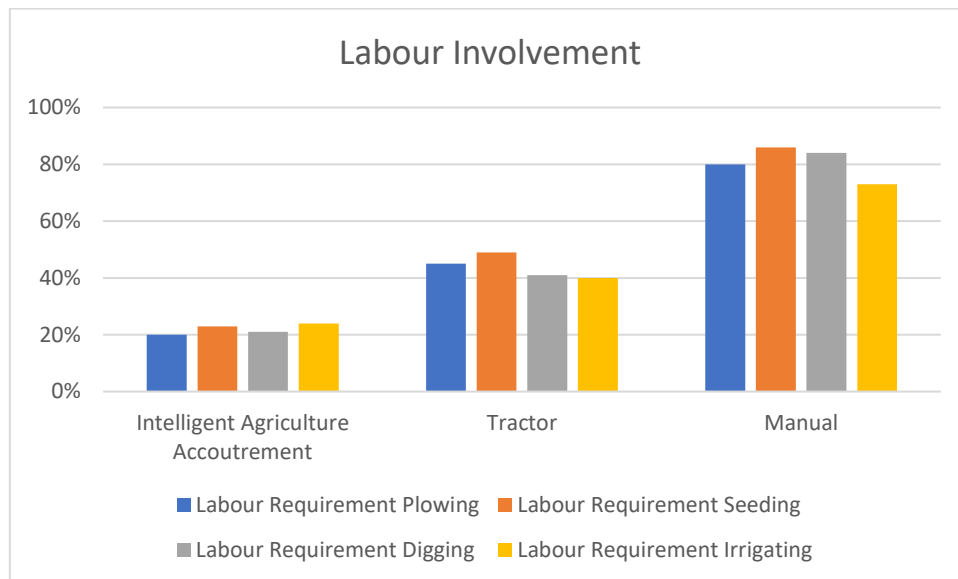


Figure 6 Percentage of labour involvement for different stages of agriculture

The figure above shows the percentage of labour involvement for different stages of agricultural process. It was around 20% labour involvement if the proposed system is used for plowing and moves to 23% if the system is used for seeding and roughly 21% & 24% labour involvement if the system is used for digging and irrigating the field. However the labour involvement if agricultural techniques such as using tractors for plowing, seeding, digging and irrigating was found out to be around 45%, 49%, 41% and 40% respectively. The labour involvement if through manual agricultural techniques used was around 80%, 86%, 84% and 73% for plowing, seeding, digging and irrigating respectively. These results indicate that the proposed intelligent agriculture accoutrement reduces the labor involvement in various stages of the agricultural process compared to using tractors or manual techniques. The intelligent system offers advantages such as automation, efficiency, and optimized resource utilization, which can reduce the need for manual labor.

5. CONCLUSION AND FUTURE WORK

The intelligent agriculture accoutrement presented in this paper concentrated on the interactions between digging, sowing and irrigation of seeds. The link between digging, sowing and irrigation of seeds and crop production is through the demand for crops. This paper presents long-term scenarios describing these interactions and the possible consequences for crop production and digging, sowing and irrigation of seeds. The most recent information on the irrigation potential is the estimate for digging, sowing and irrigation of seeds and how it can help in improving crop yield. Soon analysis of the digging, sowing and irrigation requirements of seeds and resources will yield revised estimates for all developing countries. In future intelligent agriculture accoutrement can have wireless technology

enabled control with the help of embedded controllers like raspberry pie, a provision for adding additional sensors can be made for measuring some essential parameters like PH value, Humidity etc. A drill and type of wheel according to surface of field can also be added. Further provision for use of renewable energy like solar panel as an energy source.

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