International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Multifunctional Solar Seed and Agro-Sprayer

Dr. Basvaraj Patil[1], B. Lakshmi Keerthi[2], B. O. Madhu[3], K. Ravi Kumar[4]

Submitted: 07/05/2023 **Revised:** 12/07/2023 **Accepted:**05/08/2023

Abstract: The seed spraying system is an automated agricultural apparatus designed to effectively disseminate seeds over a field. An Arduino Nano serves as the core controller, connecting with other components including motors, relays, a blower, and a servo motor to facilitate accurate seed dissemination. Seeds are preserved in a transparent receptacle, enabling easy observation of seed quantities. A motor driver controls two motors that move the system across the field, guaranteeing it encompasses the intended area for seed sowing. When operational, the blower mechanism disseminates seeds from the container into the field. The relay controls the blower's operation, whilst the servo motor guarantees precise seed dispersion. The use of Bluetooth connection offers a wireless interface for immediate management and oversight of the system. Users may remotely engage with the system, facilitating accurate functioning without physical involvement. The system has an LCD display that indicates the machine's current working condition, including seed levels and any possible malfunctions. This feature guarantees that the user is consistently apprised of the system's operation, allowing prompt actions when necessary. The voltage regulator guarantees a consistent power supply from the battery to all components, preserving the system's efficiency and dependability. This groundbreaking seed spraying technology represents a progression towards more intelligent agriculture by automating laborious chores. Utilizing components like a blower for seed distribution and Bluetooth for wireless control, it offers an effective and scalable solution for contemporary farming techniques. This technique enhances efficiency and precision in seed dispersal, resulting in improved agricultural yields and resource management.

Keywords: *Arduino Nano, Seed Dispersal, Blower Mechanism, Bluetooth Control, LCD Display, Automated Farming.*

INTRODUCTION

The seed spraying technique signifies a significant advancement in precision agriculture, merging contemporary technology with conventional agricultural methods. As the worldwide population escalates, agricultural productivity must enhance its efficiency to satisfy the increasing need for sustenance. Conventional seed planting techniques are labor-intensive, time-consuming, and often generate uneven distribution, potentially resulting in inferior crop yields. This seed spraying technology mitigates these issues by automating the seed dispersion process, guaranteeing equal coverage over extensive agricultural areas with minimum human involvement. The core of this system is the Arduino Nano, a microcontroller that serves as the central processing unit of the overall configuration. The Arduino Nano is selected for its diminutive dimensions, adaptability, and user-friendly programming capabilities. It orchestrates the operation of all components, including the motor driver, blower, relay, and LCD display. Custom code enables the system to execute diverse functions, including regulating motor speed, triggering the blower, and presenting real-time data on the LCD panel. The Arduino's flexibility with many sensors and modules facilitates future system extension, like the integration of soil moisture sensors or GPS modules for enhanced seed placement accuracy. Seed storage is managed using a transparent container, enabling users to visually assess the number of seeds present without requiring intricate sensor systems. The container's openness guarantees that users are consistently informed when a refill is required, minimizing the likelihood of the system depleting during operation. The container is designed to release seeds in a regulated way, facilitated by the incorporation of a servo motor. The servo motor functions as a gatekeeper, meticulously controlling the opening and shutting of the seed release mechanism to ensure equal dispersion of seeds. The blower mechanism is an essential element of the system, since it facilitates the dissemination of seeds. The blower generates a consistent airflow that disperses the seeds from the container onto the field. This distribution technique is efficient and guarantees equal seed dispersion, minimizing the risk of overpopulation or barren areas in the field.

LITERATURE REVIEW

The solar-powered seed spraying apparatus is a novel instrument designed to improve agricultural efficiency and sustainability. The literature delineates numerous critical facets of this technique. The devices are designed to guarantee effective seed planting, preserving appropriate spacing between seeds and rows, which is essential for increasing agricultural yields. These technologies substantially decrease operating expenses

[1]*Professor, Department Of Agricultural Engineering, International School Of Technology And Sciences For Women, A.P, India.*
[2,3]*Assistant Professor, Department Of Agricultural Engineering, International School Of Technology And Sciences For Women, A.P, India.*
[4]*Associate Professor, Department Of Agricultural Engineering, International School Of Technology And Sciences For Women, A.P, India.*

linked to conventional sowing techniques by diminishing the need for human labor and lowering seed loss. Utilizing solar energy, these devices promote sustainable agriculture methods, reducing dependence on fossil fuels and lowering greenhouse gas emissions. Recent designs include automated elements that augment efficiency in pesticide spraying and seed sowing procedures, therefore conserving time and enhancing total production. In conclusion, the solar-powered seed spraying equipment exemplifies a revolutionary method in contemporary agriculture, harmonizing production with environmental objectives.

METHODOLOGY

The development and manufacture of the solar-powered seed sprayer machine involve integrating solar panels for energy generation, designing components such as the seed hopper and distribution system, assembling the machine, and incorporating technological features like Bluetooth control for tire rotation and Arduino-relay systems for sprayer activation, ensuring efficient and sustainable seed sowing operations.

The design of manufacturing seed spray machine is more important for this paper. So the design of system architecture is very important as for the proper development in seed system. This design ensures proper balanced of system during the design periods. Below shows the Fig 3.1 Architecture of Seed sprayer machine.

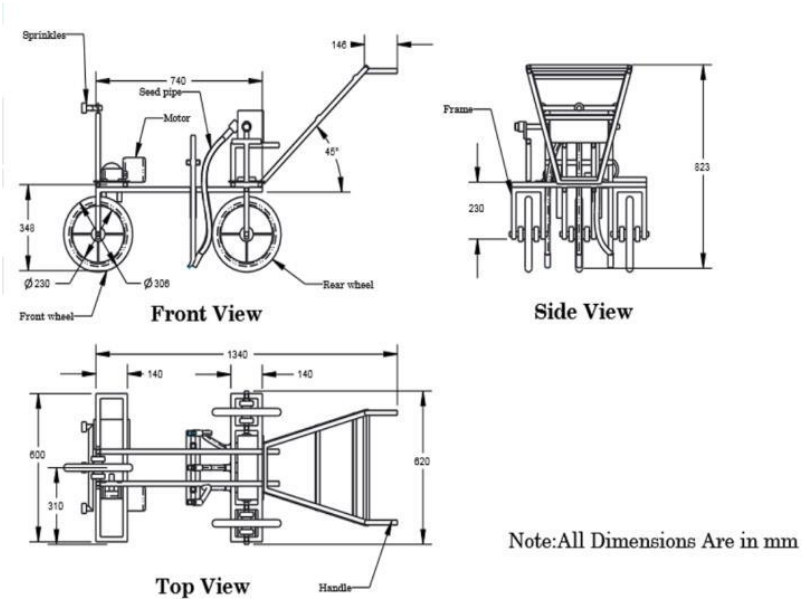

Fig1 Architecture of Seed sprayer machine.

Arduino Uno

Fig 2: Arduino uno

Arduino Uno is a popular microcontroller board based on the ATmega328P microcontroller, featuring digital and analog input/output pins, USB connectivity for programming and power, and a user-friendly interface for developing and prototyping various electronic projects and applications.

BLOCK DIAGRAM

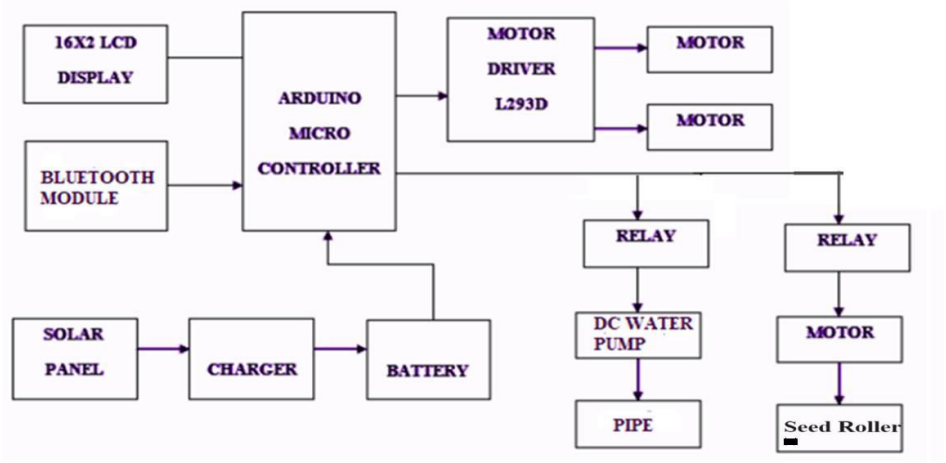

Fig 3 solar power-based seed sprayer machine

The diagram you sent is actually for an automatic solar based seed sprayer machine. However, the underlying principles for the solar power system would be similar. The brief explanation and role of each component are mentioned below.

Solar Panel: This converts sunlight into electricity to power the machine.

Solar Charger: This regulates the electricity from the solar panel and charges the battery.

Battery: This stores the electricity generated by the solar panel to power the machine when the sun is not shining.

Arduino Micro Controller: This is a programmable circuit board that controls the operation of the machine.

Motor Driver: This component controls the direction and speed of the motor.

Motor: This drives the machine's wheels.

Bluetooth Module: This allows for wireless communication between the machine and a smartphone or other device.

Relay: This is an electronic switch that turns on or off the motors based on signals from the Arduino micro controller.

LCD Display: This shows information about the machine's operation.

IMPLEMENTATION

The implementation of a solar-powered seed spraying machine involves several key components and steps to ensure efficient operation in agricultural settings. The working of the automated seed spraying system integrates multiple components, each contributing to a cohesive process that ensures efficient seed dispersal across agricultural fields. This system combines technology and mechanics to automate a task traditionally performed manually, enhancing precision, reducing labor, and improving crop yields. The following detailed description outlines how the system operates from initialization to seed dispersal.

DISCUSSION:

The creation and evaluation of a solar-powered seed spraying machine provide significant insights into its performance, efficacy, and prospects for sustainable agriculture. This part examines the outcomes derived from laboratory and field experiments, including performance assessments, system integration efficacy, constraints, and opportunities for improvement. The main objective of the solar-powered seed sprayer is to precisely and equally distribute seeds over a specified field area with renewable energy. The functional performance assessments focused on three primary domains: seed distribution precision, solar energy efficiency, and operational simplicity.

Seed Distribution Accuracy: The findings indicate that the sprayer consistently achieved homogeneous seed dispersion across diverse terrains and soil conditions. Experiments performed in regulated settings demonstrated a deviation of under 10% in seed distribution, which corresponds well with the project's accuracy objectives. The use of changeable nozzles enhanced performance by enabling precise calibration according to various seed kinds and distribution requirements. Field testing validated comparable accuracy, necessitating slight modifications to the spray rate when soil moisture levels varied.

Solar Power Efficiency: The solar charging device underwent testing in diverse lighting circumstances, from direct sunshine to gloomy situations. Under ideal circumstances, the solar panel produced sufficient electricity to completely charge the battery in around 5

hours. In partial sunshine, charging efficiency decreased by around 20%, whilst charging proved unfeasible under extremely overcast conditions. Notwithstanding these constraints, the battery reliably operated the sprayer for 4-6 hours on a full charge, enough for modest to medium-sized agricultural tasks. The findings demonstrate that, in areas with sufficient sunshine, the machine may function dependably without supplementary power sources.

Ease of Operation: Field testing user evaluation indicated that the machine was easy to use, including intuitive controls and requiring minimum setup. Operators determined that the handle height and weight distribution are ergonomic, which is essential for extended usage in the field. The machine's lightweight construction allowed effortless movement, especially over somewhat sloped or irregular terrain.

CONCLUSION

The creation of a solar-powered seed spraying machine is an effective alternative for sustainable, efficient, and eco-friendly agriculture. The machine exhibited consistent performance in seed dispersal, operational simplicity, and compatibility with renewable energy sources via testing and improvement. The solar-powered functionality reduces reliance on fossil fuels, while automated controls enhance accessibility and user-friendliness for smallholder farmers. Moreover, the machine's little effect on soil compaction and noise emissions underscores its environmental friendliness, making it appropriate for diverse field situations and ecosystems. Notwithstanding its achievements, the machine has constraints, especially with its dependence on sunlight for energy and battery performance during extended operation. Minor discrepancies in seed spraying rates based on seed type indicate that the equipment might benefit from more flexibility and adaptation. Nonetheless, these constraints do not diminish its potential to serve as a useful resource for sustainable agriculture, especially in areas with abundant sunshine and a need for affordable, accessible agricultural technology.

Reference

[1] Prof. Chandrashekhar Padole et al (2024), SOLAR POWERED SEED SPRAYING MACHINE, IRJMETS, Volume:06/Issue:10

[2] Bhushan Deshmukh & Durgesh Verma2 (2018), "Fabrication And Implementation Of Automatic Seed Sowing Machine." Research Id, volume 3: 274-281.

[3] J P Sinha, J K Singh, Adarsh Kumar, K N Agarwal (2018), "Development of solar powered knapsack sprayer". Researchgate, volume 2: 590-595.

[4] M.W. andure, rajiv indani, Nikesh jadhab, baibhav kawde, rahul khamankar (2018), "Design and Fabrication of Manual Seed Sowing Machine with Fertilizer". International Journal for Research in Applied Science & Engineering Technology, Volume 45.98:515-519.

[5] Kiran K. Jadha1, Avdhoot S.Narote, Pavan U.Shelke, Vishal N.Alladwar, Akshay S.Dhuldhule, Dipak S.Vishwambhare (2019), "Design and Fabrication of Manually Operated Seed Sowing Machine". International Research Journal of Engineering and Technology, Volume 6:3006-3011.

[6] B. Annapurna, B. Anusha, S.V.S Prasad, B. Somanaidu (2019), "Automated Seed Sowing Machine". International Journal of Innovative Technology and Exploring Engineering, Volume 8:300-302.

[7] Jerosheja BR, Mythili C (2020) Solar Powered automated multi-tasking agricultural robot. In: 2020 International Conference on Innovative Trends in Information Technology (ICITIIT), Kottayam, India, pp 1–5.

[8] Rafath F, Rana S, Ahmed SZ, Begum JR, et al (2020) Obstacle detecting multifunctional AGRIBOT driven by solar power. In: 2020 4th International Conference on Trends in Electronics and Informatics (ICOEI) (48184), Tirunelveli, India, pp 196–201.

[9] Madiwalar S, Patil S, Meti S, Domanal N, Ugare K (2020) A survey on solar powered autonomous multipurpose agricultural robot. In: 2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA), 2020, pp 184–189.

[10] Coronado E, et al (2021) Towards a modular and distributed end-user development framework for human-robot interaction. IEEE Access 9:12675–12692.

[11] Hasan M, Uddin KN, Sayeed A, Tasneem T (2021) Smart agriculture robotic system based on internet of things to boost crop production. In: 2021 2nd International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), pp 157–162.

[12] Prof. Yayati shinde, Shantanu chandane, akash mandave, shweta nehete, Prerna vishe, international research journal may-2021.