Development and Fabrication of Locust Control System - A Review

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***Abstract*— Locusts, a group comprising specific species of short-horned grasshoppers within the Acrididae family, undergo a phase where they swarm together. Typically solitary, these insects undergo a behavioural shift under certain conditions, becoming gregarious. These swarms of locusts pose a significant threat to agriculture, causing extensive damage to crops. Addressing this challenge, we're developing a simplified solution: a box equipped with ultraviolet light to attract locusts. As the locusts are drawn towards the light, they fall into the box, which then automatically closes to contain them. Subsequently, a high-voltage current is applied to the box to eliminate the locusts. To deter theft of the device, we're incorporating a security system. Additionally, the resulting locust ash can be easily decomposed.**

Keywords*— *Locusts management, Grasshopper, Locust bacterial. Desert locust, Locust hate.

I. INTRODUCTION

Locusts, known as Tiddi in Hindi, are a type of insect belonging to the Acrididae family, which is the primary family of grasshoppers, encompassing approximately 10,000 out of 11,000 species. However, locusts differ from grasshoppers. They can fly over distances ranging from 30km to 150km per day, at speeds of 16km/hr to 19 km/hr, whereas grasshoppers can only jump or hop short distances and fly negligibly. Locusts can be found on nearly every continent on Earth except for North America and Antarctica. In India, locusts have emerged as a significant problem for humans and farmers. To address this issue, various methods have been employed, each with its drawbacks and level of effectiveness. Our project involves developing a device with fewer drawbacks that can swiftly and efficiently eliminate locusts. This device is cost-effective and easy to use, with the potential for further modifications due to its simple design. We believe that it will garner significant attention in the market. Locusts congregate in vast swarms that spread across regions, consuming crops and causing extensive agricultural damage.

When locusts embark on crop raids, leading to the decimation of entire agricultural sectors, it's termed a locust

plague or invasion. The current surge in locust invasions is attributed to two meteorological factors: abnormal heavy rains during the primary spring breeding season in March-April and intense westerly winds. Historically, farmers attempted to repel locusts by igniting fires and excavating their eggs. Nowadays, insecticides can be applied to crops via ground vehicles or aircraft. Scientists are actively seeking ways to enhance locust control by either preventing swarms or dispersing them. Establishing early detection systems such as surveillance, monitoring, and swift targeting of locust nymph bands proves effective in limiting their proliferation. Following outbreaks, the use of biopesticides helps address prior environmental concerns. Reports indicate that over 3.5 lakh hectares of crops in Rajasthan and Gujarat were impacted by locust attacks. The damage incurred during the 2019-20 locust infestation is considered one of the most severe in India, devastating crops like mustard, cumin, and wheat, thereby affecting numerous farmers. In Rajasthan, the hardest-hit districts include Jaisalmer, Barmer, Jodhpur, Jalore, Hanumangarh, Ganganagar, Bikaner, and Sirohi.

II. LITERATURE REVIEW

1) According to Mr. Peter Kairu Kariuki[1],a study in Nakuru County, Kenya, examined grasshopper and locust diversity across ecological zones. A total of 456 individuals from Acrididae and Pyrgomorphidae families were recorded, with Ailopus thalassinus being the most abundant species. While abundance varied among zones, species diversity correlated strongly with abundance, emphasizing the importance of ecological zoning for biodiversity conservation.

2) According to Mr. Swapnil A. Meshram [2], novel solar light trap models are proposed in this paper as highly effective Integrated Pest Management (IPM) tools for monitoring and controlling insect pests in agriculture. These traps, featuring an iron structure and solar-powered LED bulbs, offer a cost-effective and environmentally friendly solution with minimal harm to nature, providing an efficient alternative to conventional pest control methods.

3) According to Ms. Ananya M [3], addressing the challenge of insect control in agriculture often involves harmful chemical pesticides, leading to financial and environmental concerns. Transitioning to organic and integrated farming methods utilizing automated solar-powered insect traps offers an effective and sustainable solution. These traps, with their simple design and operation, provide efficient pest control across various crops, offering practicality and ease of transport for farmers.

4) According to Mr. Harinder Makkar [4], locust infestations pose a severe threat to agriculture and livelihoods, yet locusts and grasshoppers offer valuable protein sources. However, their potential as animal feed is hindered by insecticide contamination. Despite challenges in mass rearing, various harvesting methods present opportunities for utilization in animal feed. Integrating insecticide use with strategic harvesting approaches could effectively manage pests while promoting sustainable agricultural practices.

5) Insects are vital to our planet's ecosystems as pollinators, recyclers, and food sources. Collection methods vary based on purpose, whether for hobby, study, or research. Dr. Manoj Kumar[5] emphasizes that expert techniques are essential for optimal preservation of insect specimens, ensuring their scientific and aesthetic value.

6) Mr. M. Krishnamoorthi [6] highlights the ecological importance of insects. Proper collection methods depend on the intended use. Expert preservation techniques are crucial for maintaining the scientific and aesthetic integrity of insect specimens.

7) Mr. Makinde Kayode [7] presents a 200-liter solar-powered freezer addressing unreliable power in rural areas. This self-sufficient system utilizes a DC compressor, solar panels, battery, and charge controller. A microcontroller optimizes efficiency. Key features include a 26-hour runtime without sunlight and ample storage space.

8) Dr. Aung Ze Ya [8] details a solar PV system designed to electrify a small village. The system addresses diverse community needs, including lighting, household appliances, and a clinic's refrigerator. Careful load calculations and expert component selection ensure optimal functionality, reflecting Dr. Aung Ze Ya's extensive design experience.

9) Mr.Brian Halubanza [9] examines challenges in locust control within Zambia's Sikaunzwe Agriculture Camp. Despite early warning systems, issues like incorrect species identification, limited staff, and inaccessible terrain hinder management. Brian Halubanza explores potential technological solutions including machine learning, drones, geospatial technology, and the Internet of Things to address these challenges and mitigate locust threats to food security.

10) Mr. J.P. Egonyu [10] highlights the potential of harvesting locust swarms for food and sustainable pest management. With a long history of consumption, locusts offer nutritional benefits comparable to traditional meat. While safety concerns necessitate regulation, this approach could provide food security, economic opportunities, and reduce insecticide reliance.

11) Ms. Eman A. Khalifa [11] investigates the impact of electrocuting insect traps (EITs) on the spread and viability of microorganisms carried by houseflies. Lab-reared flies were contaminated with Cryptosporidium oocysts and non-lactose enterobacteria. Their exposure to EITs was followed by assessments of microorganism dispersal and survival, informing potential disease transmission risks.

12) Mr. Brigitte Poulin [12] explores mosquito traps as a less harmful alternative to insecticide spraying in France's Camargue region. 16 CO2/octenol traps reduced targeted mosquito populations significantly, with minimal impact on non-target insects. While less effective against certain species, this approach avoids the environmental damage of Bti spraying, as demonstrated by its lack of effect on a house martin colony.

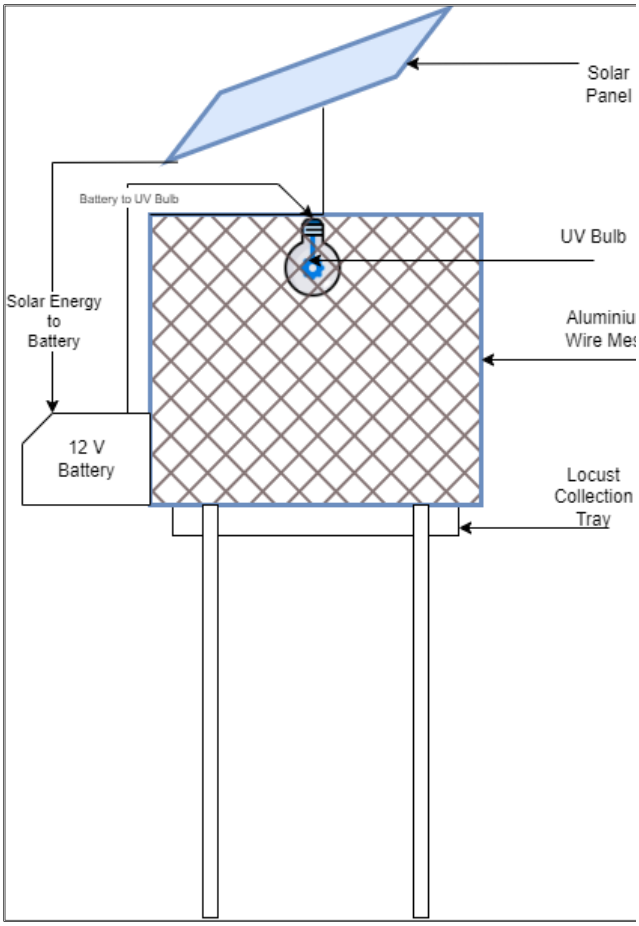

Fig. 1. 2D Concept Diagram of The Model

III. PROBLEM IDENTIFICATION

The old ways of dealing with locusts were a major bummer. Blasting everything with harsh chemicals kills off good bugs too, leaves nasty stuff in the environment, and can even be risky for people. Plus, spraying from planes is expensive and it's tricky to get those chemicals everywhere a massive swarm is hanging out. Let's face it, we need a way to target just the locusts, do it in a way that's safe for nature, and be able to act fast to save crops. That's the whole reason we came up with our new and improved locust control system.

IV. OBJECTIVES

- To study the present system of locust control.
- To design various component of locust control system.
- To fabricate and assemble the various component of the system.
- Experimentation on the system

V. METHODOLOGY

- The study of present locust control system.
- Drawing of various component and the complete assembly drawing.
- Designing of various component of the system.
- CAD Drawing of all components and assembly.
- Fabrication and assembly of all the component.
- Experimentation of the setup.

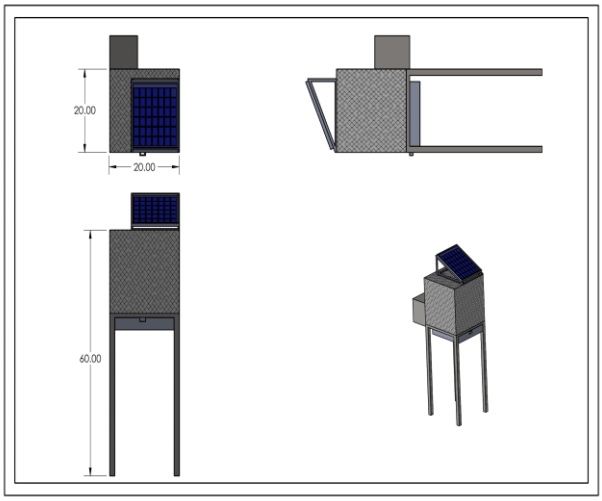

Fig. 2. 3D Concept Diagram of The Model

CONCLUSION

The locust-killing machine offers an innovative, proactive approach to combating destructive locust swarms. By exploiting locust behavior and integrating advanced technology, this device provides a promising alternative to traditional pest control. Its focus on attracting, trapping, and eliminating locusts – while prioritizing safety and minimizing environmental impact – makes it a valuable tool for protecting crops and promoting food security in affected regions.

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