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DEVELOPMENT OF A BIRDS' SCARER INCORPORATED WITH MOTION SENSORS

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ABSTRACT
The use of birds' scarer as a means of pest control has been around for centuries. However, trad5qitional methods of bird scaring, such as scarecrows and continuous noisemakers, have been ineffective and require constant maintenance. This project investigates and constructs a birds' scarer to mitigate the menace of birds on the farms. The birds' scarer is a device that uses sound, movement or combination of the two to scare birds. This device consists of a solar panel to a power the unit, a frame that anchors all the components, speakers, solar charger control, an amplifier, a battery, and motion sensors to activate the sound and movement only when birds are present. The effectiveness of the device was tested on a rice farm about getting to maturity and being attacked by birds. The results of the testing show that the device is more effective at scaring birds than the previous known methods. The device is effective, easy to maintain, and environmental friendly. The device could be used to protect crops, livestock, and other property from predator's, thief and bird damages. It is recommended that multiple motion sensors could be incorporated on larger farms by extending it's with wires.

Keywords: *Birds, Scaring, Sound, Movement, Solar Panel, Sensor.*

INTRODUCTION

Birds attack have been a persistent challenge in the realm of agriculture, posing a significant threat to crop production and causing substantial economic losses worldwide (Smith 2022) In agricultural settings, birds not only consume valuable crops but also disrupt their growth by pecking, trampling, or contaminating the crops. Consequently, farmers have been seeking effective bird deterrence methods to protect their yields and ensure the sustainability of agricultural practices (Bouslama *et al.*, 2016; Swaddle *et al.*, 2018).

Conventional bird deterrent techniques, such as scarecrows, reflective materials, and noise-based devices, have demonstrated limited success in providing long-term solutions (Glahn *et al.*, 2011; Zanón *et al.*, 2019). These methods often suffer from reduced efficacy over time due to habituation by birds, necessitating the exploration of novel approaches. Against this backdrop, the development and testing of birds' scarers emerge as a promising avenue for addressing this problem. Birds have long been a significant concern to farmers, as they can cause substantial damage to agricultural crops. Their feeding habits, such as pecking at fruits, grains, and vegetables, can lead to reduced crop yields, economic losses, and compromised food availability (Smith *et al.*, 2018; Dolbeer, 2019). Therefore, the development and implementation of effective bird control methods are crucial for protecting agricultural fields and ensuring optimal productivity.

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Bird damage in agriculture has been a long-standing issue, and extensive research has been conducted to understand the behavior of birds, their impact on crops, and effective deterrence methods.

The reason behind fabricating solar-powered birds' scarer is to help in tackling the problem of unwanted birds and substitute the methods that were used before which were either very labour intensive as the case when people have to guard the fields to manually chase away the birds or methods which with time become inefficient.

Therefore, there is a need to develop a birds' scarer that is no lethal in nature and harmful to the environment but very effective in scaring birds also not too expensive that the farmers could afford.

Statement of the Problem

The problem addressed in this study is the need to develop effective birds' scarers for use in agricultural settings. Bird damage to crops can lead to significant economic losses and food insecurity, making effective bird scaring methods essential to farmers. Bird scarers are devices designed to scare birds from agricultural fields by emitting audio, visual, or mechanical stimuli that are meant to mimic predator behavior or create discomfort. However, existing birds' scarers have limitations in terms of their efficiency, reliability, or adaptability to different crop types and bird species.

MATERIALS AND METHOD

Materials Selection

Materials selection is an important step in design and fabrication. Corrosion is one of the main criteria that need to be taken into consideration when it comes into choosing the right materials for agricultural equipment. The materials used for this work were selected based on the following criteria:

Strength and rigidity: Materials with high strength and rigidity were selected for the construction of this project so that the machine could withstand compressive and shearing forces. The joining of the component parts was perfectly done by welding so that the machine becomes strong and rigid.

Vibration stability: The component parts of this machine were firmly joined together by using welding and bolt and nut to prevent unnecessary vibration that may result from poor welding of the component part.

Durability: The components selected were strong and durable. They were corrosion resistant and would be able to last longer in other to give the user the expected satisfaction with profitable useful life span.

Machinability: The materials selected were easily machined and easily worked upon. The materials with this property were selected so that the materials can be fully maneuvered.

Cost: Cost is an important factor in materials selection. The materials selected were considered based on available capital. The local and readily available materials were used for the bird scarer to reduce cost. The cost of fabrication was brought lower without lowering the machine efficiency so that the local farmer can afford the machine.

Weight: The weights of the materials selected were considered so that the weight imposed to avoid load failure and could not be easily blown off by strong wind.

Materials

The materials used for this project work were 80W solar panel, 30Amp charger controller, frame which was made of galvanized iron, 12 volts battery, 16meters sensitivity motion sensor, high amplitude loud speaker 12volts battery, amplifier, MP3 loaded with deferent

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domestic birds predators and other distress calls, wires for connecting.

Methods

The frame was constructed using appropriate engineering principles and the other components parts were coupled together as shown in figure 3. Other bought out components were assembled and fitted as shown in figure 1.

Bill of Engineering Measurement and Evaluation for the Birds' Scarer

Table 2 below shows the breakdown of the Bill of Engineering Measurement and Evaluation for the Bird Scarer.

S/N	Names of component	Types	Specification	Quantity	Unit cost(N)	Total Cost(N)
1.	Solar panel		80W	1	35,000	35,000
2.	Charge controller	Solar controller (body)	12v/24v	1	13,000	13,000
3.	Angle iron	Metal		1/3	5100	5,100
4.	Pipe	Galvanize		½	6,000	6,000
5.	Bolt and nut			3	100	300
6.	Catcher			1	200	200
7.	Hinges			3 pair	200	600
8.	Iron rod	25mm		½	7,000	7,000
9.	Mild steel	FED	G12	½ pack	50	2,500
10.	electrode			½ pack	1,500	1,500
11.	Saw blade			2pices	550	1,100
12.	Rod	12mm		¼	7,000	7,000
13.	Battery	Rechargeable battery	12v	1	1,100	1,100
14.	Speaker	Speaker	Driver-unit	4	4,000	16,000
15.	Memory card	Chupez	8 gig	1	4000	4,000
16.	Wireless engine	Amplifier	Dc	1	16,000	16,000
17.	Wire	Professional	2 x 2.5mm	5	200	1,000
18.	Metal sheet	Galvanize		½	7,000	7,000
19	Angle bar	Mild steel	2 x 2	1	5,000	5,000
Total						**128.400**

The total cost of producing the bird scarer is one hundred and twenty eight thousand, four hundred naira only.

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ISOMETRIC VIEW

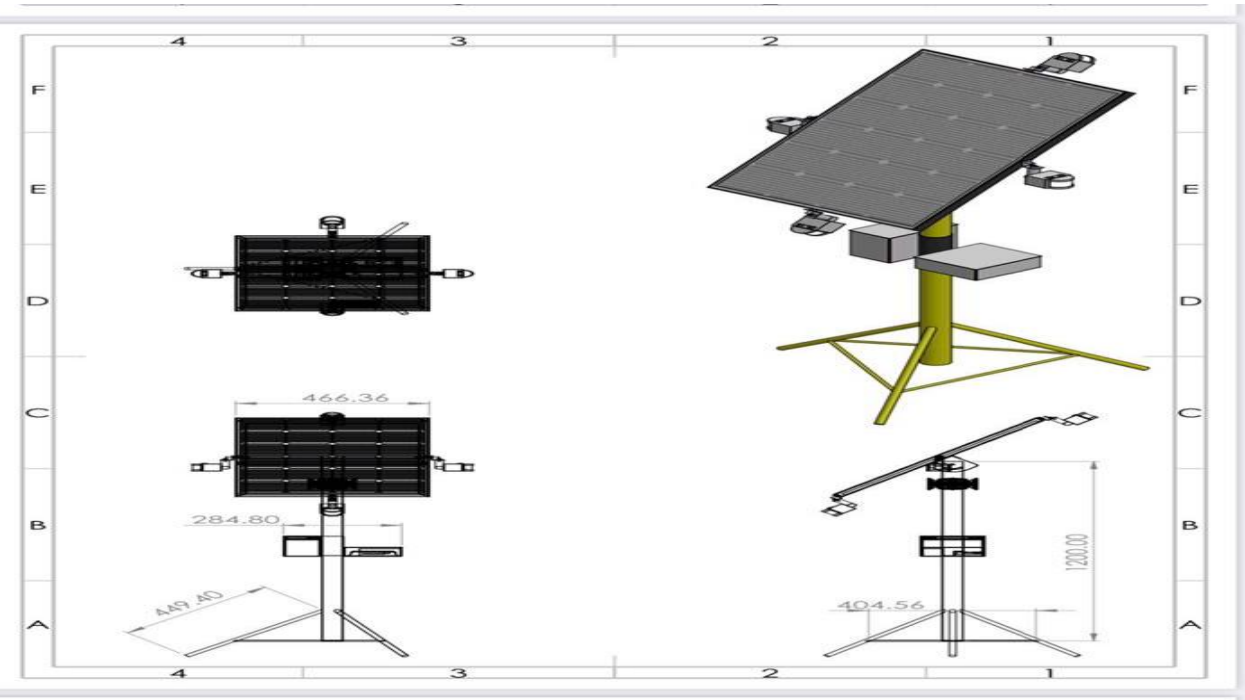
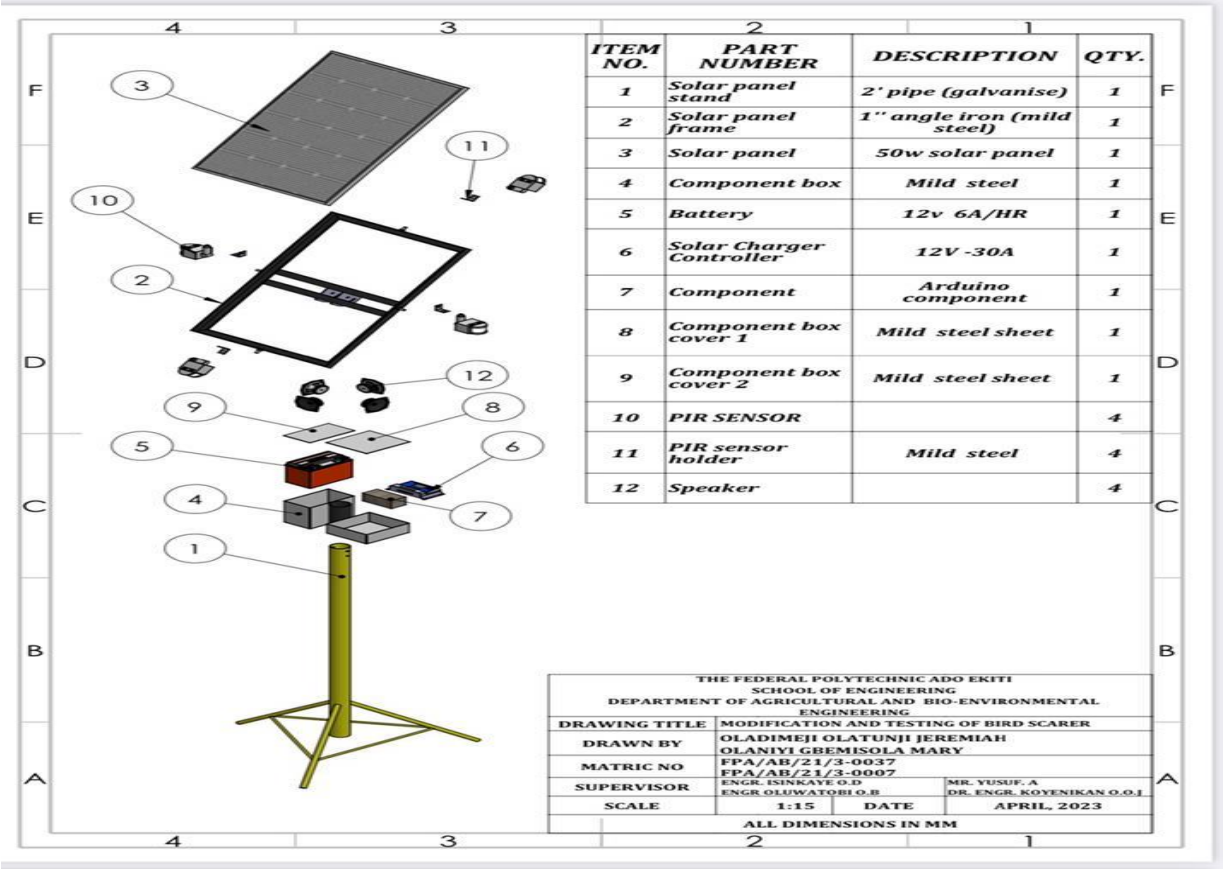


Figure 1: Isometric view



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Solar panel stand	2' pipe (galvanise)	1
2	Solar panel frame	1'' angle iron (mild steel)	1
3	Solar panel	50w solar panel	1
4	Component box	Mild steel	1
5	Battery	12v 6A/HR	1
6	Solar Charger Controller	12V -30A	1
7	Component	Arduino component	1
8	Component box cover 1	Mild steel sheet	1
9	Component box cover 2	Mild steel sheet	1
10	PIR SENSOR		4
11	PIR sensor holder	Mild steel	4
12	Speaker		4

THE FEDERAL POLYTECHNIC ADO EKITI SCHOOL OF ENGINEERING DEPARTMENT OF AGRICULTURAL AND BIO-ENVIRONMENTAL ENGINEERING			
DRAWING TITLE	MODIFICATION AND TESTING OF BIRD SCARER		
DRAWN BY	OLADIMEJI OLATUNJI JEREMIAH OLANIYI GBEMISOLA MARY		
MATRIC NO	FPA/AB/21/3-0037 FPA/AB/21/3-0007		
SUPERVISOR	ENGR. ISINKAYE O.D ENGR. OLUWATOBI O.B	MR. YUSUF. A DR. ENGR. KOYENIKAN O.O.I	
SCALE	1:15	DATE	APRIL, 2023
ALL DIMENSIONS IN MM			

Figure 2: Exploded view

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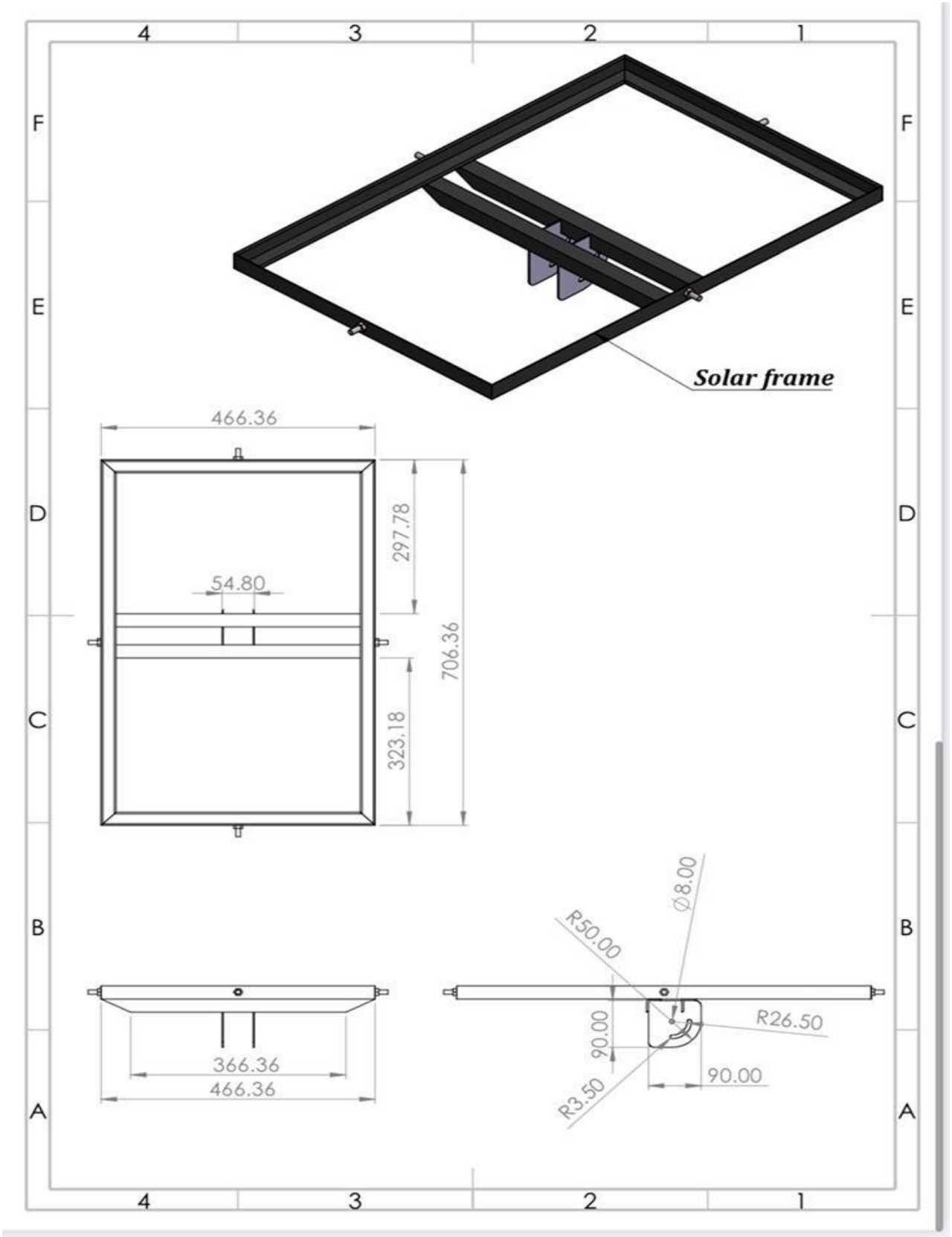

Figure 3a: Orthographic view

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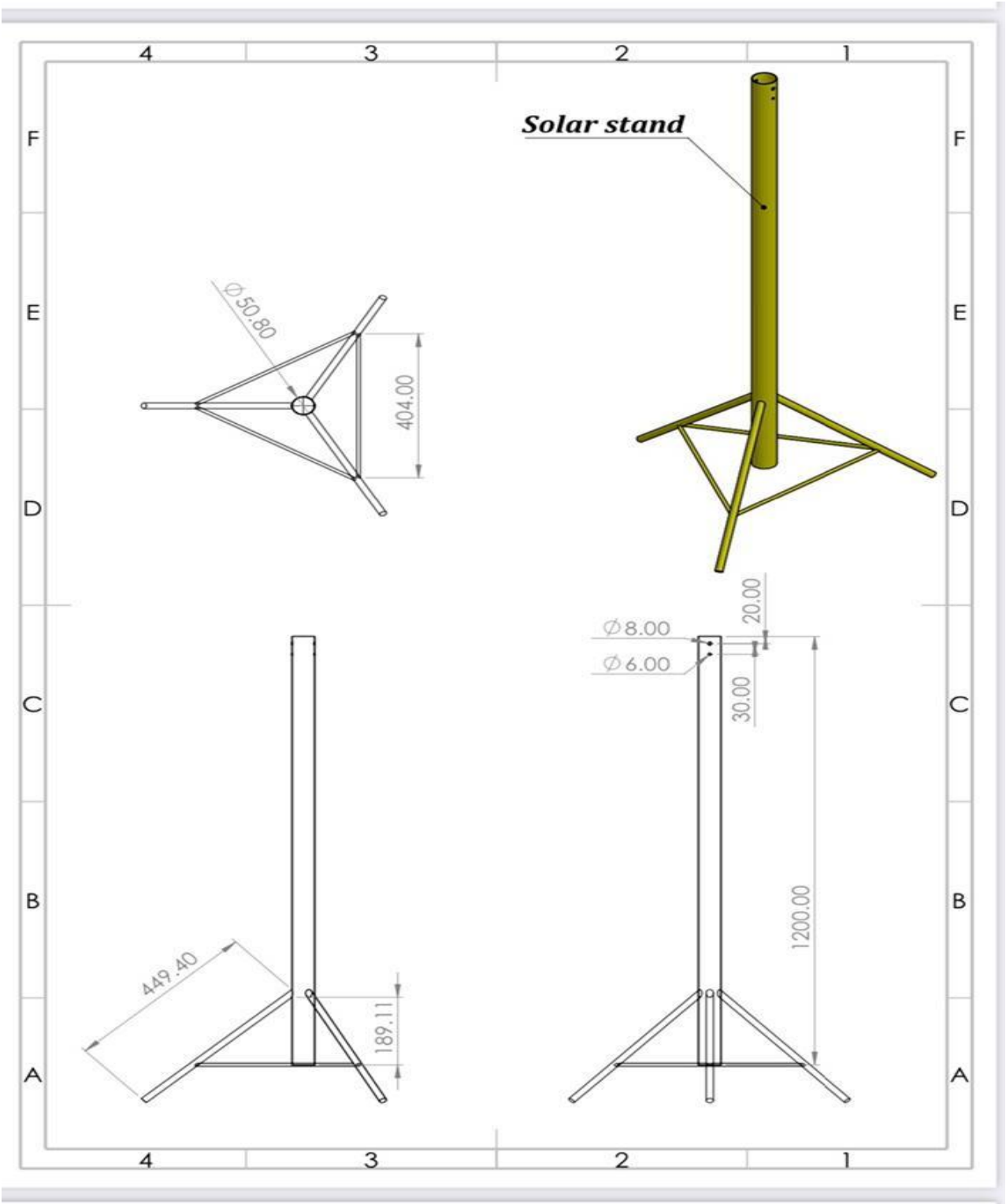

3b: Orthographic view

Testing/ Experimentation

The birds' scarer was tested on a rice plantation as shown in Plates 1 and 2. Before mounting the birds' scarer, pegging of the farm land was done as shown in Plate 2. This was done in order to know the distance covered by the sensors.

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RESULTS AND DISCUSSION

Results

Plate 1: Completed Birds' scarer on rice farm.

Plate 2: Marking out and pegging on the field.

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Table 3. The response of birds scared at different intervals

Experiment Number	Period of time	Observation	Reaction of birds
1	5	Bird scared	Scared and flew away
2	5	Bird scared	Scared and flew away
3	20	Bird scared	Scared and flew away
	30	Bird scared	Scared and flew away
5	50	Bird scared	Scared and flew away
6	40	Bird scared	Hanged around
7	45	Bird scared	Scared and flew away
8	35	Bird scared	All flew away
9	25	Bird scared	All flew away
10.	20	Bird scared	All flew away from the Field.

Discussion

The machine was conveyed to a rice farm plantation where it was positioned at the centre of the farm, the sensors were extended from the machine by 16meters to each other. The extension of the sensor which is 16meters was measured with tape and was demarcated with pegs. The sensors were fixed at the four-cardinal points of the farm.

The experiment carried out on the developed birds' scarer as shown in Table 6, indicated that when the motion sensor captured the movement of birds, it sent the signal to the machine and speakers made noise and scared the bird away from the field. The noise stopped as soon as the bird flew away beyond the visibility of the sensor. At 0 to 5minutes when the birds came to the field, the machine made noise and all the birds flew from the field. After 30minutes the birds came back and the machine made noise again all the birds flew, after 50minutes the birds came back, the machine made noise and all the birds flew. At another 40mimutes they came back and the machine made noise all the birds flew but hanged around. At 35minutes interval, the birds came back as the machine made noise all the birds flew away from the field. The machine made different noise at each time it sensed the moving object. The sensor was so sensitive even to sense the movement of a butterfly. It was discovered that when a butterfly flew within the range of the sensor the machine started making nose until it flew out of the range of coverage of the sensor. The machine was incorporated with five different kinds of noses: gun shooting, human shouting, dogs barking, siren and a very loud horn. Each sound was produced differently each time the sensor sensed the moving object on the farm. The noise does not continue endlessly unlike the previous works and was not monotonous that the birds could not get used to the sound as they do to the previous bird's scarer.

CONCLUSSION AND RECOMMENDATIONS

The solar-powered birds' scarer was designed and fabricated. The test was carried out on the machine on a rice plantation farm. The farm was intensely disturbed by birds before bringing in the scarer. The developed scarer effectively drove them out of the farm. It was discovered that that the bird's scarer does not make noise when the birds enters an area outside the covering range of the sensor. Therefor it is recommended that multiple sensors could be used on a large area of farm to ensure total coverage of the farm. It could also be adapted to scar other animals and alert farmers of the unwanted visitors on the field because it was discovered that the sensor

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react to any moving object that comes within the covering range of the motion sensor.

REFERENCES

Bouslama, M., Toujani, K., & Ben Hamida, A. (2016). Bird damage to sorghum, sunflowers, and maize in semi-arid Tunisia. International Journal of Pest Management, 62(4), 315-321.

Dolbeer, R. A. (2019). Wildlife and agriculture: Challenges and opportunities. The Journal of Wildlife Management, 83(6), 1321-1325.

Glahn, J. F., Andersson, A. M., & Lokhorst, K. (2011). Scarecrows and other non-lethal methods of bird control. In A. A. Dhondt, R. A. Dolbeer, K. C. Rowe, & T. A. Sterrett (Eds.), Problem animal control (pp. 251-258). Springer.

Smith, K. G., Verboven, H. A. F., & Suleman, M. (2018). Bird damage to agriculture: A review of current research and future directions. European Journal of Agronomy, 96, 98-113.

Smith, R. J. (2022). Modern methods of bird control. In Bird damage to crops (pp. 321-350). World Pheasant Association.

Swaddle, J. M., & Gill, R. J. (2018). Crop protection from birds: A review of current methods and their future potential. In C. J. Aebischer (Ed.), Bird damage to crops: Proceedings of the 15th International Bird Pest Control Seminar (pp. 289-301). World Pheasant Association.

Zanón, J., García-Expósito, M. C., & Sánchez-Zapata, J. A. (2019). Efficiency of acoustic bird deterrent systems in vineyards. Agriculture, Ecosystems & Environment, 274, 19-26

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