AN EXPERIMENTAL STUDY ON LOW COST AUDIO BASED SOLAR POWERED BIRD SCARER

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Abstract : The study was evaluate the damages caused in the crops viz., Sunflower, millets and paddy. In the developed bird scarer device, a FM transmitter has been built inside the kit which enables the farmer to use it at the time of relaxation. The solar bird scarer was developed with 12 V battery,5 watt solar panel with IC 440, 22K resistor with remote sensors. The efficiency of the device was tested in maize field and the efficiency ranged from 81.25 ton 84.62 per cent and in sorghum field it ranged from 78.95 to 85.71 per cent. The decibel level of various audios were played through the developed system in the field were 90 to 95 dB and it was found that increasing the decibels to scare more birds. Different audio sounds like explosives, crackers, wolf, lion and some bird predators sounds were played to scare the birds in the field. The more efficient scaring sound is found to be the sound of Hawk, followed by the Eagle and the siren sound. The cost of the developed kit is Rs.4250/- and it can be easily adoptable to utilize the system to deter the bird with low cost of the farming community.

IndexTerms - Bird scarer, Solar scarer, Electronic bird scar.

I. INTRODUCTION

. Birds are intelligent creatures and can rapidly become habituated to initially frightening sights or sounds - once they realize these pose no real threat. This is why cheap, simple and unmanaged bird scaring devices are not as effective as often perceived by the public. Cheap visual bird scaring devices like plastic owls simply do not work. In order to reduce the damage of farmers and grain storage activity, various bird killing techniques are used such as chemical repellent, net, spike guards, traditional methods such as shooting the birds with gunshot, making sound with help of crackers in order to scare birds. All these birds management methods are less effective and cause great damage to the certain threaten species and migratory bird which produce the adverse effect on conservation of biodiversity on a local, regional and global scale.

Damages inflicted by harmful birds can be reduced using a variety of methods which can be categorized as lethal and non-lethal methods. Lethal methods involve killing of birds, shooting, trapping, fumigation, poison baiting, egg and nest destruction, etc. The lethal methods of bird management are not recommended these days. Non-lethal methods include habitat manipulation, the use of repellents and provision of alternative food to pest bird species. One the successful methods are the auditory repellents which causes sounds like distress calls to scare away the birds. To view the above points, this study was taken to attempt to develop the solar powered bird scaring device and performance evaluation of developed bird scaring device in different locations.

MATERIALS AND METHODS

The materials used for the development of the solar bird scarer with FM transmitter, IC 4440, Remote sensor, Regulator, 22K resistor,5W solar panel,7.2 Ah battery. The amplification is done by an amplifier, whereas the modulation and carrier signal generation is done by the variable frequency oscillator circuit. The frequency is set at anywhere between the FM frequency range from 88MHz to 108MHz. The power of the FM signal from the oscillator is then amplified using a power amplifier to produce a low impedance output, matching that with the antenna. The frequency of the oscillator generated circuit varies with the application of an input signal, producing a frequency modulated signal. This circuit is designed for to operate one speaker but with same two circuits near each other anyone can build a big size amplifier. The IC which is used is LA or LM 4440 its very cheap and commonly available and all Variable pots are 47k only the Volume pot its 100k actually it's better to use a 100k pot rather than 47k as volume.22k variable resistor are used for controls

- a prime example is the volume control on a radio, television of hi-fi unit. The system consists of 5 watt solar module are charging 12 volt batteries for telemetry, fence chargers, automatic feeders, electric gates or for battery maintenance. The battery used in this project is a lead acid battery of 7.2 Ah capacities and is rechargeable. The battery is here since the device is standalone solar device and hence the electric charge obtained from the panel in the daytime can be stored in the battery and is used whenever the scaring device is in need.

It has been observed that the birds are scared in wide range by rising noises; we adopted the same methodology of rising voices in an electronic way. Using the above mentioned materials our kit is capable of producing different sounds that would scare the birds away. The entire circuit diagram and the block diagram are as follows. When the solar panel receives the solar radiation it generates electricity in the DC form which is stored in the battery for the timely use. The sounds that scare the birds are recorded in definite time intervals in a memory card and it is set inside the kit using an USB port. Whenever the birds start to prey on the crops the kit is switched on which makes the kit to get DC current from the battery and start to produce the sounds. The farmer can change the sound by pressing NEXT button in the remote or by pressing any key from 0 to 9 since each number produces a sound in definite intervals. When the bird menace is over the farmer can switch the mode through the remote so that the mode changes to FM which relaxes the farmers' tension.
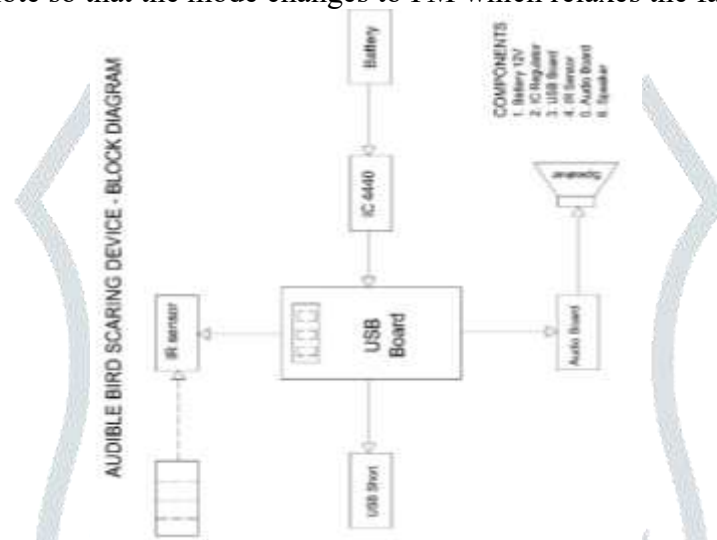

fig.1 Schematic diagram of the solar operated bird scarer

RESULTS AND DISCUSSIONS

The experimental study involves the development of the innovative bird scarring device, the materials were assembled properly to get the required output. The required voltage for the transmitter is 3V. The input voltage from the battery will be 12V and this is regulated and stepped down by the regulator to 3V and is sent to the transmitter. The total power consumption of the kit is 4W. During the operation of the kit, it is found that heat is liberated from the regulator and hence a heat sink is provided for the regulator. The speaker capacity is 8W. The sound level is around 97 dB (maximum) and can be adjusted by adding another speaker of lower power consumption. The different sounds used in the device to scare the birds are as follows:

Table.1.Specifications of the bird scarer

PARAMETERS	VALUE
System voltage	12V
Power consumption	4W
Installed power capacity	5W
Speaker capacity	8W
Sound decibel	90 – 97 dB (max) 60 – 70 dB (min)
Height of the kit	8 feet (max) 4.5 feet (min)
Variable height	Possible (adjustment provided)
Weight of the kit	40 kg
Total radius covered by the sound	90 ft

Evaluation of the developed solar bird scarer

The device has been tested in various fields for its efficiency to scare the birds. The fields in which the device was tested were Millet farm, Sunflower field, and eastern block, TNAU, CBE.

The data has been collected and has been plotted in the graph for the determination of efficiency of the device.

The efficiency is given by the following expression:

$$\eta = \frac{No.\,of\ birds\ initially\ in\ the\ field}{No.\,of\ \boldsymbol{birds}\ scared} \times 100$$

Table.2. Efficiency of the device in maize field, **birds :** Crows, White Naroon, Mynah

S.No.	Days	Area under test (ft^2)	No. of birds initially at the field (approx.)	No. of birds scared (approx.)	Efficiency
1	Day 1	64	13	10	84.62
2	Day 2	64	16	12	81.25
3	Day 3	64	21	17	85.71
4	Day 4	64	24	19	83.33
5	Day 5	64	17	13	82.35

Table 3. Efficiency of the device at Millet farm,CROP : Sorghum,**BIRDS :** Crows, Naroons

S.No.	Days	Area under test (ft^2)	No. of birds initially at the field (approx.)	No. of birds scared (approx.)	Efficiency
1	Day 1	48	21	18	85.71
2	Day 2	48	18	15	83.33
3	Day 3	48	24	19	79.17
4	Day 4	48	22	18	81.82
5	Day 5	48	19	15	78.95

From the above mentioned tables the average efficiency of the device is 83% in an area of 64 ft^2 and is 81% in an area of 48 ft^2.
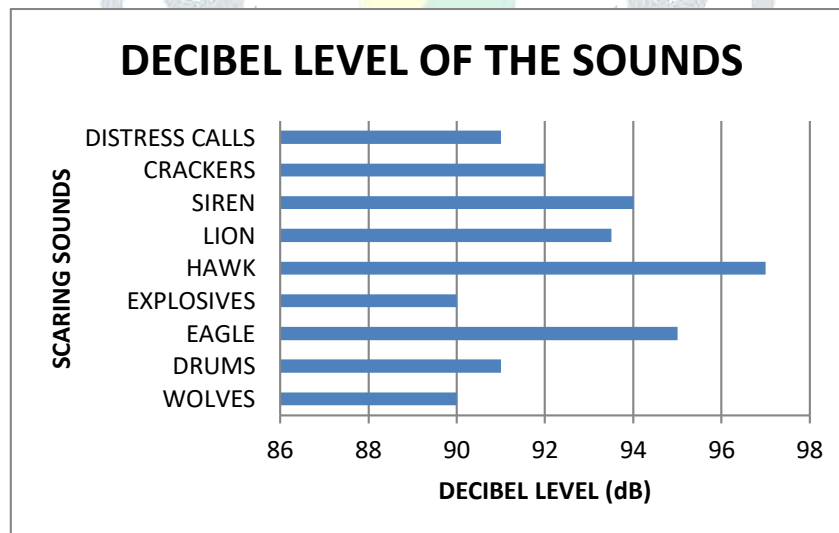
Fig.1. Decibel level of the scaring sounds
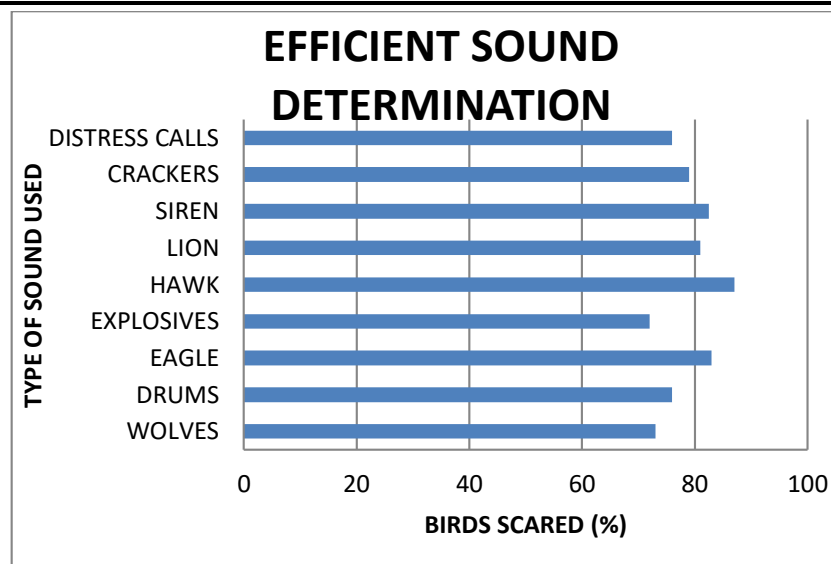
EFFICIENT SOUND DETERMINATION

Fig.2. Efficient sound determination

From the above mentioned chart and table the more efficient scaring sound is found to the Hawk sound, followed by the Eagle sound and the siren sound.

Table.4. Cost estimation for the fabricated Solar powered dird scaring device:

S.NO.	ITEM NAME	QUANTITY	TOTAL COST (Rs.)
1	FM Transmitter with USB port	1	200
2	Remote sensor with remote	1	50
3	IC 4440	1	70
4	Regulator	1	10
5	Solar panel 5W	1	550
6	Battery 7.2Ah	1	700
7	Connection wires	2m	15
8	Plastic box	0.3m x 0.3m	100
9	Iron stand	8 ft	1000

SUMMARY AND CONCLUSION

The developed device was tested and surveyed the damages caused in the crops viz., Sunflower, millets and paddy. In the experimental study it has been inferred that almost 5% of yield is been deteriorated because of the birds. In this device, a FM transmitter has been built inside the kit which enables the farmer to use it at the time of relaxation.

The solar bird scarer was developed with 12 V battery,5 watt solar panel with IC 440, 22K resistor with remote sensors. The developed unit was tested in various fields in Tamil Nadu Agricultural University, Coimbatore.

The efficiency of the device was tested in maize field ranges from 81.25 ton 84.62 per cent and in sorghum field it ranges from 78.95 to 85.71 per cent. The decibel level of various audios were played through the developed kit in the field were 90 to 95 dB and it was found that increasing the decibels to scare more birds.

Different audios like explosives, crackers, wolfs, lion and some bird predators sounds were played to scare the birds in the field. The more efficient scaring sound is found to the Hawk sound, followed by the Eagle sound and the siren sound. The cost of the developed kit is Rs.4250/- and it can be easily adoptable to utilize the system to deter the bird with low cost of the farming community.

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