



## Wild Boar Management in Paddy Fields using Repelling Equipment

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### ABSTRACT

The present study focused on the effectiveness of mechanical methods to deter the wild animals from the paddy fields in the Palakkad district of Kerala state, India. An experiment for comparing the efficacy of three sound repellents (pot and stick, fan and plate, bio-acoustics equipment) and one light repellent against unprotected fields was conducted to determine the most effective method for deterring wild boar. All the mechanical methods were found effective in reducing crop damage incidences compared to unprotected fields. Sound repellents, bio-acoustics equipment (2.50), and fan and plate (4.25) reduced the crop damage incidences compared to the light repellent (7.25) and the fields without protection (18.50). It was found that bio-acoustics equipment protected a larger area, 4.4 ha, with a single unit. The best two equipment from the study, bio-acoustics and fan and plate, along with olfactory repellent, Bo Rep, and bio-fencing, were used to demonstrate wild boar management in a large area. It was found that the integrated use of mechanical and other repellents was very effective in preventing the wild boar from entering the paddy fields.

**Key Words:** Bio-acoustics equipment, Bio-fencing, Bo Rep, Fan and plate, Pot and stick, Flickering light, Wild boar.

### INTRODUCTION

Conflicts between wild animals and humans over food crops are as old as agriculture. Elephants, wild boar, blue bulls, monkeys, etc., are wild animals that cause massive damage to cultivated crops (Rao, 2015; Tarvydas and Belova, 2022). Most farmers considered the wild boar a common pest and wished for its complete elimination from crop areas (Khattak *et al*, 2022). Wild boar has become a serious threat to major crops like paddy, banana, and tuber crops in Kerala. Several methods to protect crops from wild boar attacks other than culling (Schlageter and Haag-Wackernagel, 2012). Farmers usually adopt Indigenous Technical Knowledge ITKs to restrict their entrance into crop fields (Rao, 2015). Most of these methods are not properly tested for their efficacy. Scientific methods were also derived from long-term studies (Ananya *et al*, 2020; Balakrishna *et al*, 2021; Naik and Basavadarshan, 2020). Physical barriers, olfactory repellents, and

sound repellents like bioacoustics are some of them (Sreeja and Chellappan, 2017). Electric fencing is reported as the most effective physical barrier (Schlageter and Haag-Wackernagel, 2011). Mohamad *et al* (2021) developed a blast explosion sound jig that produced sound between 88.77 dB and 100.14 dB over an area of 0.26 to 9.35 acres. The sound was in the hearing sensitivity range of wild boars and could be used as a repellent. Recently, IOT-based methods have also emerged to reduce crop damage due to wild boar attacks (Balakrishna *et al*, 2021).

Wild boar management is a big problem for the paddy farmers in Kerala, especially in Palakkad district. Hence, an experiment was conducted in farmers' fields to study the efficacy of some mechanical methods, including farmer innovations and scientifically proven equipment, to eliminate crop damage caused by wild boar in paddy fields.

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### MATERIALS AND METHODS

An experiment to compare the efficacy of various repelling equipment for wild boar in protecting paddy fields was conducted in the Muthalamada Panchayath of Kollengode block in the Palakkad district during the year 2020–21. Three sound repellents and one light repellent were compared with an unprotected field. The sound repellents were a fan and plate, a pot and stick, and bio-acoustic equipment (Kethi Rakshak). The fan and plate and pot and stick are farmer innovations, and Professor Jayashankar Telangana State Agricultural University developed the bio-acoustics equipment. The features of the different equipment tried were as follows:

#### Pot and Stick

This was a farmer's innovation to avoid wild boar in the crop field by making a sound with the help of the wind. A pot made of stainless steel was used. It was hung upside down, and two or three steel rods were also hung inside the pot. The position of the iron rods was such that they could strike the mouth of the pot when the wind blew. It makes a sound that deters the wild boars from entering the paddy field.

#### Fan and Plate

This was also a farmer innovation to prevent wild animals from damaging crops. The main component of the equipment is the leaves of a table fan, which are fitted in such a way that they rotate as the wind blows. One iron rod with two metal rings at both ends is fixed on the other end of the fan's axis. Hence, as the fan rotates, the rod also rotates. The fan and rod are mounted on a pipe shaft. A stainless-steel plate is fitted to the shaft. When the fan rotates, the metal rings attached to the iron rod strike the plate and make a sound. The sound repels the wild boar from entering the field. The pipe shaft makes fixing the equipment in the field at the desired height easy.

**Bio-acoustics equipment (Kethi Rakshak):** The equipment was developed from the All-India Network Project on Vertebrate Pest Management studies at Professor Jayashankar Telangana State Agricultural University (PJ TSAU). This is an eco-

friendly technology for deterring wild animals from farm areas. The equipment uses the natural sounds of predators, distress, and alarm calls of wild boars or related species. The wild boars start to avoid the area while hearing the sounds of their predators produced by the equipment. The equipment produces a fixed volume of 110 dB dissipating in an area of 3.2–4.0 hectares at an ambient noise level of around 42 dB. It can cover up to 7.6 hectares at 37 dB of ambient noise.

#### Flickering Light

Apart from the three sound repellents, one light repellent was also included in the trial to keep wild boar away from paddy fields during the night. The bulb used in the repellent produces a colorful and flickering light. Seeing this light, wild boars were reluctant to come near it. It is operated using electric current. In addition to material costs operational charges are also present in the case of this light repellent.

The experiment was conducted in paddy fields during the second crop season, from December to March. Uma was the variety cultivated during the season. A complete randomized design with five treatments and four replications was selected for the trial. Fields with the above four repellents and fields with no repellent (control) formed the five treatments. The number of crop damage incidences, area protected by a single piece of equipment, yield, loss due to crop damage, and net return were observed in the trial. The observations were analyzed statistically.

### RESULTS AND DISCUSSION

#### Number of crop damage incidences

The results revealed that mechanical repellents effectively reduced the number of crop damage incidences in paddy fields. Wild boar avoided fields fitted with different equipment for up to three weeks. Then they started entering the fields occasionally. Sound repellents reduced the number of attacks by 77 per cent compared to the control fields, whereas light repellents reduced crop damage incidences only by 61 percent (Table 1). The results showed that sound repellents were more effective in reducing crop damage incidences than the mechanical repellents tried.

**Table 1. Observations recorded during the experiment.**

Equipment used	Number of crop damage incidences	Area protected by a single unit (ha)	Yield (kg/ha)	Yield loss due to damage (kg/ha)	Loss due to damage (Rs/ha)	Net return (Rs./ha)	B:C ratio
Pot and Stick	5	0.99	5843.75	1656.25	46375	88825	2.188
Fan and Plate	4.25	1.08	6137.50	1362.50	38150	96550	2.282
Bio-acoustics equipment (Kethi Rakshak)	2.50	4.45	6143.75	1356.25	37975	92825	2.172
Flickering Light	7.25	1.05	5125.00	2375.00	66500	69300	1.934
Field without any equipment	18.50	0	4787.50	2712.50	75950	60050	1.811
CD (P = 0.05)	3.051	0.291	NS	NS	NS	NS	NS
CV	26.998	12.768					

There was a significant difference between the treatments.

#### **The area protected by a single unit.**

The Effectiveness of various types of equipment in terms of the area protected by a single unit differed considerably. One of the sound repellents, bio-acoustics equipment, protected the most prominent area, 4.4 ha, with a single unit. Area coverage of all other equipment was almost the same at 1ha (Table 1). Hence, bio-acoustic equipment protected a significantly larger paddy area from the attack of wild boar.

#### **Yield**

The yield of paddy obtained from the trial is shown in Table 1. There was no significant difference in yield between the fields with wild boar-repelling devices and the control fields. The effect of the reduction in the number of crop damage incidences did not reflect in the yield. This is because paddy is different from root crops like Casava. The hills were not fully uprooted by the attack of wild boar. A portion of the panicles get back to growth some days after the attack. Hence, even though the number of crop damage incidences was highly reduced in the fields with various repelling equipment, the increase in yield from these fields was not as high as the reduction in attack. Damage only near the bunds rather than inside the field was observed in the field with

sound repellent, especially bio-acoustic equipment while conducting cluster demonstrations during the successive years.

#### **Loss due to damage**

Loss due to wild boar attack was not significant between the mechanical repellents used. The results showed the same trend as that of yield obtained from the paddy fields (Table 1).

#### **Net return and B:C ratio**

Since there was no significant difference in paddy yield from the fields with and without repelling equipment, there was no significant difference in net return or B:C ratio either (Table 1). The results obtained from the trial showed that the paddy fields were not as vulnerable to wild boar attack as the root crops. The incidence of crop damage was high in control fields. Even then, the damaged hills were not fully uprooted by the wild boar. Hence, the reduction in yield observed in the control plots cannot be termed a significant reduction. The cost of the equipment (Table 2) used for experiment indicated that the bio-acoustics equipment had the highest cost, followed by the fan and plate, pot and stick, and flickering light. The life span was also the highest for the bioacoustics equipment. Hence, there was not much difference in net return and B:C ratio between the fields with this equipment.

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**Table 2. cost of the equipment.**

Name of equipment	Description	Average area covered per unit (ha)	Cost (Rs per unit)
Pot and Stick	Sound repellent made up of stainless steel pot and stick. Making sound when wind blows.	0.99	800
Fan and Plate	Sound repellent using table fan leaves, steel plate and iron rod. Making sound when wind blows.	1.08	1500
Bio acoustics equipment	Sound repellent developed by the Professor Jayashankar Telangana State Agricultural University	4.45	27000
Flickering Light	Light repellent with colourful and flickering light	1.05	300
Field without any equipment	--	0	0

**Table 3. Results of the Cluster Demonstrations.**

Parameter with unit	2021 -22		2022 -23	
	Demo nstration	Control	Demonstration	Control
Yield (t/ ha)	6.3	4.8	7.40	6.02
Number of crop damage incidents	1	7	4	11
Extent of crop damage ( % area affected )	3.5	20.0	2.0	16.8
Net return (Rs./ha)	104750	63438	135200	98560
B:C ratio	2.45	1.91	2.88	2.41

The effectiveness of the mechanical methods to reduce crop damage incidences due to wild boar in paddy fields was utilized for the protection of a larger paddy area through the integrated use of mechanical methods, olfactory repellent (Bo Rep), and fencing. Integrated use was demonstrated in an area of 50 ha during the years 2021–22 and 2022–23 in the Kollengode block and Kuzhalmannam block, respectively. It was found effective in managing wild boar. After 10–15 days, the position of the sound and light repellents changed in the field. This caused confusion among the wild boar and thus reduced crop damage. The results obtained from the two cluster demonstrations are given in Table 3. Cluster demonstrations showed that the integrated use of different methods is effective for the management of wild boar in paddy fields.

### CONCLUSION

The damage to the crops is the central issue facing the farmers. Among the different methods available for deflecting wild boar from paddy fields, some mechanical methods were analyzed for their effectiveness in an on-farm trial. The two sound repellants, bio-acoustics equipment, and a fan and plate were found to be more effective in repelling the wild boar. The results obtained were demonstrated in a large area of 50 ha in two blocks of Palakkad district in integration with other wild boar repelling methods, including olfactory repellent (Bo Rep) and bio fencing. The demonstrations revealed that an integrated approach effectively confuses and prevents wild boar from entering the paddy fields.

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