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ORIGINAL ARTICLE

STUDY ON EFFECTIVENESS OF AIR-HORN DEVICE FOR BIRD DETERRENT IN PADDY CULTIVATION AREA

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ABSTRACT – Pest birds that have adapted well in paddy cultivation area create problems to rice farmers. Among sound-based bird deterrent device, air-horn could be used since it generates high sound intensity. This study is conducted to evaluate performance of portable air-horn in open-area test condition conducted. This study successfully identifies three dominant pest birds in Pekan's paddy cultivation area i.e lesser whistling-duck (itik belibis), white-headed munia (pipit uban) and barn swallow (walet). Other than that, site test for portable air-horn device shows that air horn able to produce around 100 dBA sound level. It is enough to frighten bird over 40 metre during daytime and reduce to 20 metre during a night. Further investigation on birds response on different sound quality and setting are still needed for thorough understand for best solution of the pest birds problem in paddy cultivation area.

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INTRODUCTION

In Malaysia, paddy cultivation covers about 600,000 hectares of area, in which two-third of this area is located in Peninsular Malaysia. Most of the paddy field have been developed on flat wetlands area due to geographical features and more productive soil for paddy cultivation. This transformation contributes to unbalanced ecosystem issues where inhabited likes bird and insects live in cultivation area becomes a threat to paddy production. A major problem is caused by local and travel birds occurs from seeding until matured stage, where farmers bear high agricultural losses each year. Passive methods to deter birds, such as scarecrows, installation of nets or fences, and hunting, have already been proved to be inadequate without significant effects. In this study, the authors develop a portable air-horn device to deter bird. The device performance was tested in paddy field area in Kg Lepar, Pekan, Pahang.

LITERATURE REVIEW

Pest birds are among the most destructive factor for crop damage in agriculture industry (Clarke, 2004). Lots of methods have been deployed to control bird threat in crop industry especially to paddy cultivation area. Traditional methods such as simple pan banging, rifle shots, explosive and whistle are some examples of noise-based technique have been used for a long time by local farmer. Research by Elliot and Bright (2007) show that 20 % of produce is still lost with these traditional methods proving its inefficiency. In recent years, an electrical product such as a sound-based bird deterrent device gains more popular to frighten, irritate, and disorient birds, forcing them to flee away from the cultivation area. Cost, sound quality, coverage distance, repetitions and practicality among the issue in selecting the best technique in bird deterrent device.

Birds with large flock size normally create harmful effect to local farmer. Many previous studies have shown that application of electrical sound-based device capable to encounter crop damage from birds. According to (Ribot et al. 2016), some growers use synthetic sounds that offer unambiguous messages that elicit interspecific responses, like distress calls. In this study of alarm calls from crimson rosellas in orchards, Ribot et.al found that these birds were effectively deterred in the short- to medium distance.

Koyuncu and Lule (2009) opted for a solar powered audible bird scaring system. Their system employed 17 predatory calls to scare birds for an experimental study area. Falcon cries were identified to be most effective for bird scaring by the study. The same method was adopted by Suryawanshi (2015) but 22 sounds were used instead. He designed and tested of a solar powered audible bird scarer and studied various sound ranges using MP3 player and a loudspeaker. Form the study, it was found that falcon is the most effective but depends on the climatic characteristics of the day.

With the latest technological advancement, better sound based device air horn also be adopted as another sound-based device to deter bird. Air horns operate with compressed air to produce a loud, braying blast. Such units often are made up with a n12-volt air compressor and two trumpets to intensify the noise produced. The longer trumpet (8.5 inches) produces sound at a frequency of 1000 cycles per second (cps). Commercial units for bird control have not been marketed

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extensively and are difficult to find if available at all. However, they can be easily made by anyone handy with such equipment.

Zajanc (1963) tested air horns against birds feeding on grapes in a 57-acre vineyard. Birds, including about 500 starlings (sturnus vulgaris) and lesser numbers of the house finch (Carpodacus mexicanus), mockingbird (Mimus polyglottos), mourning dove (Zenaida macroura), and sparrows, had been feeding in the field for about 10 days prior to the test. Two air horns were elevated 10 feet above ground, and blasts were staggered to increase their effectiveness. Birds had been feeding in the field for about 10 days prior to the test. During the first morning of the test, most birds soon left the field. Only 20 birds returned in the afternoon, but they soon departed when the horns blasted, and none subsequently returned prior to harvest. The only species not apparently deterred was the mourning dove. Little other information exists on the effectiveness of air horns and sirens for repelling birds. Wright (1963) mentioned that Klaxon horns were tried at an airport in England in 1955. Twenty horns were placed at 100-yard intervals along a runway where gulls appeared to be more disturbed by the noise.

According to the arbitration cases of the National Environmental Dispute Resolution Commission, the sound exposure criteria for ornamental birds is 50 dB(A), while the criteria for the effect of deterrent sound is 70 dB(A) for actual farmhouses with an open environment in all directions considering the scattering effect of sound.

In this study, the objective is to establish data of the pest bird and evaluate actual air-horn performance in paddy field cultivation area. The performance of air-horn device to produce high sound intensity is major element to be discussed in this paper.

METHODOLOGY

This research begins with field study at the paddy field managed by Integrated Agriculture Development Are (IADA) Pekan. The surrounding test area is located in Kampung Lepar, Pekan, Pahang as in the Figure 1. Study approach of this study combined of an interview session with local farmers and video recording to gather bird flock behaviour during daylight and night time. Based on the obtained data, there are five major bird types that consistently presence in the paddy as shown in Figure 2. Some of the species are come in group, while the other were individually consistently present at the observed area. Three dominant pest bird in this area are Lesser whistling duck (itik belibis /*Dendrocygna arcuate*), White - Headed Munia (pipit uban/ *Lonchura maja*) and Barn Swallow (walet/*Hirundo rustica*) as in Figure 2.

Figure 1. Block 7A, Kampung Lepar, Pekan Paddy Field

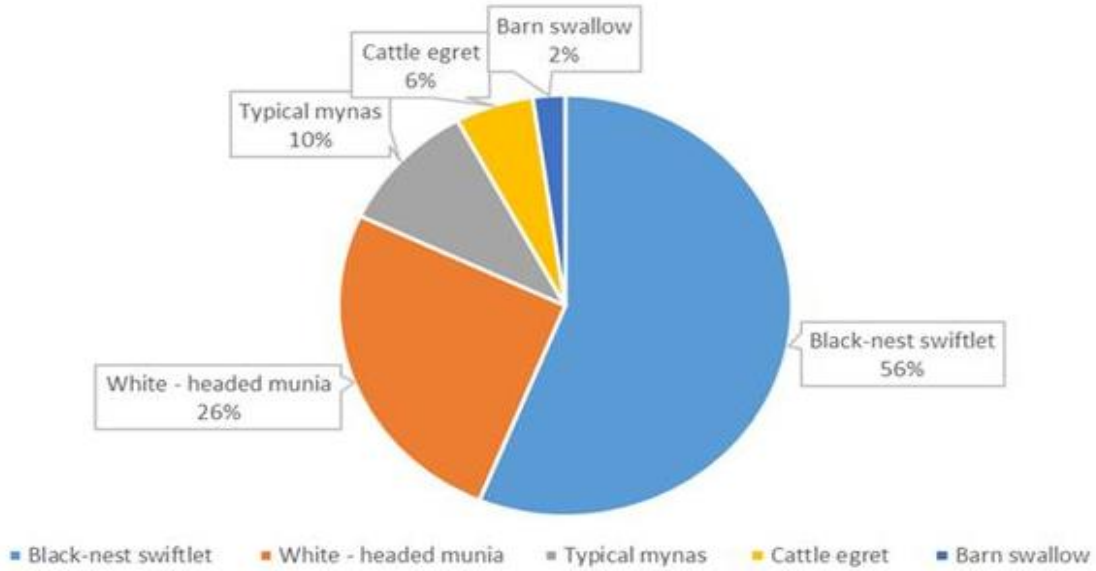

Figure 2. Bird population in the observed area.

Based on bird population present at that area, three species that are causing problem for them. are lesser whistling-duck, white-headed munia and barn swallow as shown in Figure 3.

Figure 3. Three main types of the pest bird in Pekan's paddy cultivation area

All species appear at different stage of paddy grow stages. The Lesser whistling-duck are nocturnal feeders, so during the day, they may be found in wet paddy fields. They are plant eating animals such as grains, thus their presence at the paddy field eating the planted paddy seeds in the beginning of paddy season. White-headed munia has small blackish eyes with a white-grey beak and has a white mark on the head. They like to live in open areas like seeded grass plants. Normally, this bird eats the spikelet of paddy and their attack are in group. Barn Swallow usually easy to identify iridescent navy-blue above with a rich orange throat and forehead with its long, forked tail and dark rump. Live in open habitat, especially large fields and wetlands. This bird contributes to crop damage by breaking the paddy stalks.

The design and fabricated equipment separated into three separated partition where the bottom level to place battery as the power source, the device storage at the middle and top level to put the camera for for video recording as shown in Figure 4. The main component is 12V on-the market air-horn system as in Figure 5. Air-horn fitted into customised casing with some additional features such as built-in fuse and relay.

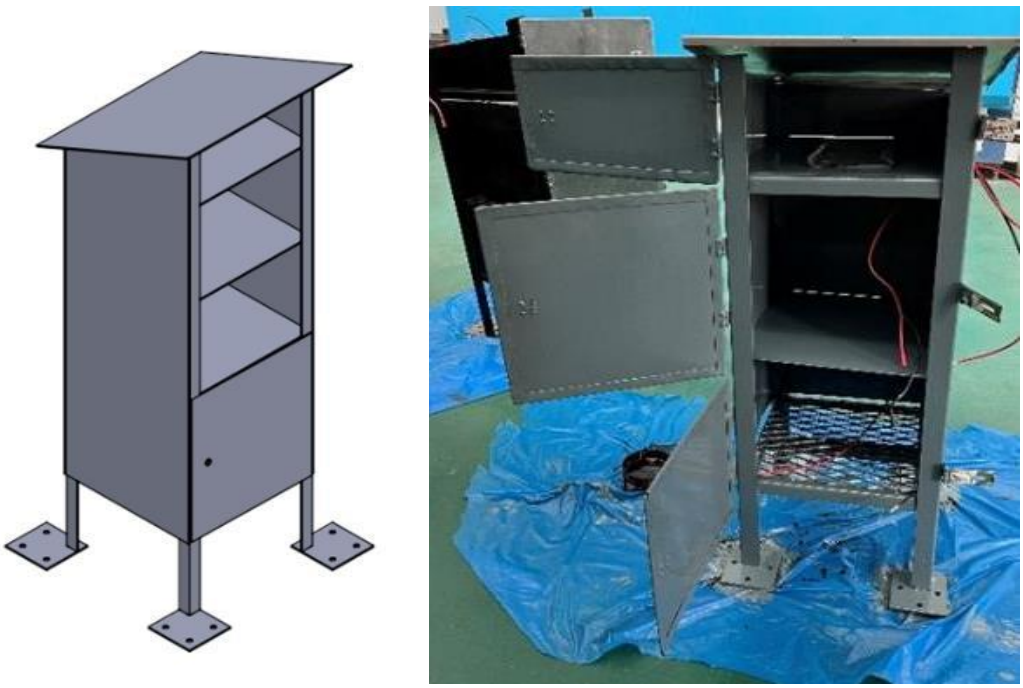

Figure 4. CAD design and fabricated test equipment

Installation of the completed unit for site test as in Figure 5. The equipment was stationed at several selected point in paddy area depends on higher present flock of bird.

Figure 5. Internal parts of air horn device and Field test setup

RESULTS AND DISCUSSION

Air-horn device performance in open-space area has been tested to obtain sound intensity data during day and night time. It was measured using portable noise measuring instrument capable to detect up to 130 dBA. The obtained result is shown in Figure 6 a and 6B

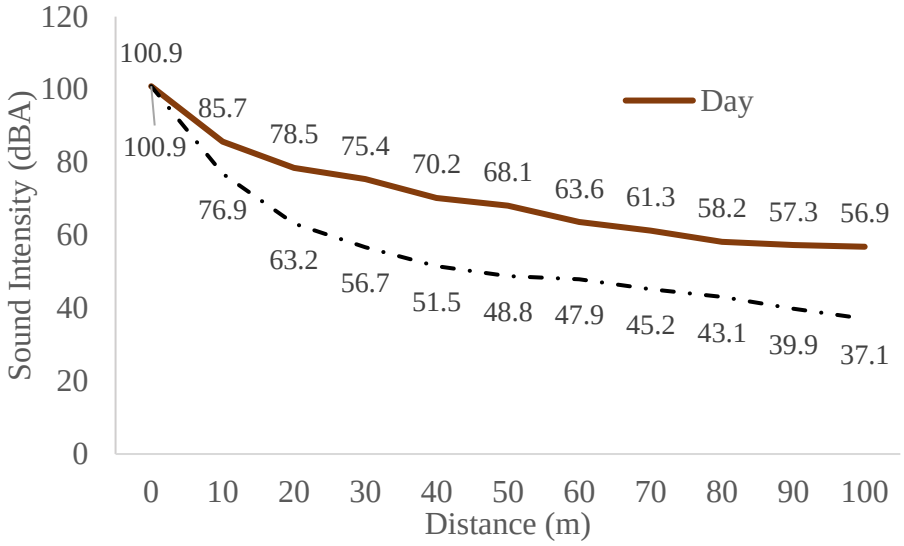

Figure 6. Sound intensity (dBA) value from source during day and night time

From the results, the sound intensity during daytime is higher than night time. The main contribution factor is the effect of ambient sound level that higher during day time. Based on the National Environmental Dispute Resolution Commission, the minimum sound intensity to frighten bird is 70 dBA. Comparing to the obtained result, sound level at daytime reach 40 metres while maintaining sound intensity above 70 dBA. On the other hand, it is only at 15 metres distance from source to keep the 70 dBA sound intensity. This result does not present the actual requirement of the developed system since the frighten factor also depends on the generated sudden noise under different surrounding sound environment. This actual result will only can be observed through video recording that will not be discussed in this paper.

CONCLUSION

This study successfully meets our initial objectives to identify fundamental issue related to the pest birds problem in paddy cultivation area. The most dominant pest birds have been identified as lesser whistling-duck, white-headed munia and barn swallow. The second part of this paper discusses site test results of portable air-horn unit tested at open-area environment. The obtained results shows that sound level at daytime reach 40 metres while maintaining sound intensity above 70 dBA. On the other hand, it is only at 15 metres distance from source to keep the 70 dBA sound intensity. Further investigation is needed to relates the pest birds response to different sound quality and setting.

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