Influence of Low Intensity Education Programme on Knowledge, Perceptions and Willingness to Use Owl for Rodent Control in Agriculture

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Abstract

Rodent pests contribute significantly to pre-harvest and post-garvest crop loses. The use of owl appears to be more attractive means of rodents control in agricultural crop farming primarily due to its minimal environmental impact compared to industrial chemicals. Despite owls' potential as means to control rodents, their uptake by smallholder farmers is low due to negative perception on the owl. Therefore, this study assessed the influence of low intensity education programme on farmers' perceptions and willingness to use the owls for rodent control. This information is valuable for developing strategies to ehance the use of owls for rodents control. Longitudinal design was adopted to collect data from 200 selected maize farmers in four wards of Iringa and Mufindi districts in Iringa Region, Tanzania. Questionnaires were used for data collection on perception and willingness. Data were analysed using SPSS.The average knowledge score increased significantly from 1.9 to 4.3 after training (p=0.00). Futhermore, positive perception improved from 36% to 90% after training. The mean score responses on willingness to invest resources to create favaourable environment for attracting owl in their farms increased significantly from 1.9 to 4.2 (p=0.00). The results show that low-intensity training or education programme improved the perception and willingness to use owls for rodents control, offering a potential avenue for changingnegative perceptions and improve the adoption and use of owls to control rodent pests. The adoption of owl as biological rodents control could also serve to reduce the use of chemicals that can potentially harm other unintened animals.

Keywords: Maize farmers, Rodents, Owl, Low intensity education, Iringa

Introduction

Rodents are among the most significant agricultural pests worldwide (Makundi and Massawe 2011). They cause maize losses of 5 – 15% of maize crop in Tanzania, annually (Makundi *et al.* 1991). This is attributed to high production due to favorable environmental conditions (Singleton *et al.,* 2010). Famers have traditionally employed chemical such anticoagulant rodenticides and zinc phosphide to control rodents (Monadjem *et al.,* 2015). However, the use of chemicals to reduce rodent pest populations, has some negative impacts upon the environment. This application of chemicals can have environmental consequences (Paz *et al.,* 2013) and can cause healthy problems to human being and other animals. Likewise, chemical application can also be excessively expensive, especially for poor farmers with low income and resources (Makundi and Massawe 2011). The draw back and environmental challenges of using chemical for pest control have encouraged researchers to explore for alternative control methods that are both enromental friend and less expensive (Makundi and Massawe 2011). Thus, the use of owl for rodents contol has been extensively studied. and it appears to be an effective method for managing rodent in farms (Kross *et al.,* 2016). Given the advantages of biological control methods, researchers have demonstrated that the use of owl is an effective method for controlling rodents on garicultural settings.

The introduction of owls in rodent control

in Asian and Latin American countries has effectively enhanced the production of the agricultural sector and has significantly reduced food loss (Labuschagne *et al.,* 2016). Today, across Africa, there is a promotion on the use of owls in rodent management (Oganda and Kibuthu, 2008). Due to effectiveness of biological control methods, studies have shown that the use of owls is an effective method for controlling rodents on the farms, thereby improving food production among the farmers. However, the adoption of agricultural innovations, by smallholder is dependent upon the attitudes, knowledge and perceptions of the local people (Meijer *et al.,* 2015). Thus, superstitious cultural views about owls can act as a limiting factor to the adoption of rodent control (Williams *et al.,* 2018). Many communities in Africa hold the belief that owls are associated with superstitious practices (Alexander and Costandius, 2020). The presence of an owl can create a negative impression to some people, and the hooting of the owl is interpreted as a bad omen, signaling death or illness on the community.

There are a number of constraints facing adoption of an owl in agriculture. Williams *et al.* (2021) reported that some of the constraints include superstitious cultural beliefs about species which can make it very difficult to use it in controlling rodents effectively. Morever, Molares and Gurovich (2018) indicated that people have negative attitudes, knowledge and perceptions towards owls. This requires the need for educating them to change their perceptions towards the use of owls in agricultural activities. The adoption and willingness to use owls in controlling rodents are dependent on farmers' knowledge, attitude and belief. This calls for studies that enhance positive the perceptions on the use of wildlife animals in agricultural activities.

One tool that can enhance positive perception towards behavioral change is education (Lawson *et al.,* 2019). Long-term education training are expensive, with inadequate fund being the major limitation on many programme (Jacobson *et al.,* 2015). However, low-intensity training can be effective to change negative perceptions of birds related with witchcraft (Williams *et al.,* 2021). Low intesity education is the kind of training which took short time which involves tairoling relevent courses to the audience (Offord-Woolley *et al.,* 2016). As such the current study assessed the influence of low intensity education programme on farmers' knowledge, perceptions towards use of owls for rodent control and increase willingness to take part in a future using it for rodents control. This information will be valuable for developing strategies to ehance the use of owls for rodents control.

Methodology

Study Area

The study was conducted in Iringa region particulary in Iringa and Mufindi districts Councils. The reason for selecting this area is due to high cereals production and high populaion of rodents. Furthermore, four wards namely Maguliwa, Mgama, Nyololo and Mbalamaziwa were purposively selected due to high maize production. Statisticians have shown that a sample size of 30 or more will usually result in a sampling distribution that is very close to the normal distribution, and the larger the absolute size of a sample, the closer its distribution will be to the normal distribution (Saunders *et al.,* 2007). Therefore, in each ward, a total of 50 farmers were randomly selected making a total number of 200 respondents for questionnaire survey.

Data Collection

Data collction tool

The semi structure of questionnaires was used as main data collection tool. The questionnaire contained both closed and open ended questions. Questionnaires were ditributed by research assistants, who conducteded the interview with selected respondents. A pretest of the questionnaire was conducted by assistants in the team to assess the reliability of the research instrument. Pretest was conducted with 60 respondents (30 respondents from each distrct). Spearman-Brown split-half Cronbach's alpha was calculated and it was 0.76 which is higher than 0.7 hence the research tool was reliable as per Hair *et al.* (2010) recommendation.

To measure farmers' Knowledge on owl birds, respondents were presented with a list of

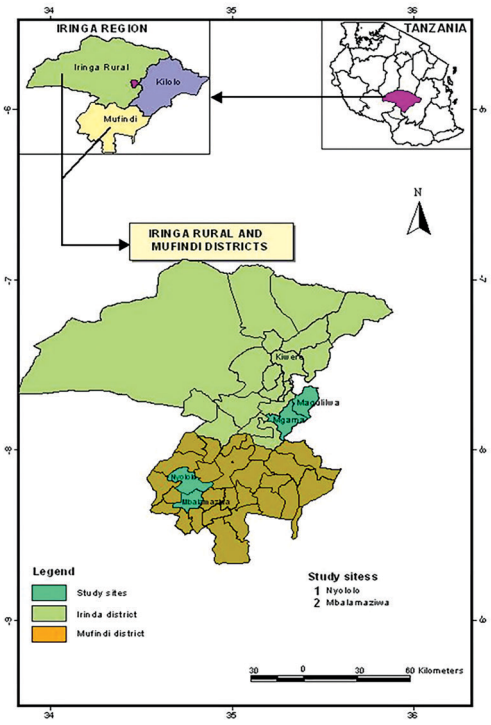

Figure 1: A map of Iringa Rural and Mufindi districts showing the study areas

four items describing characteristics of owls. Then they were asked to indicate whether "yes" or "do not know", which were later, scored 1, and 0, respectively. Each respondent's total knowledge score was calculated by adding the respose of all the aspects scores. Total Knowledge score is the combined values score of the items describing the use of owls for rodents control.The minimum score is expected to be 0 and maximum score 4. Furthermore, total score was categorised as low 0 to 2, 3 medium and 4 high knowledge.

The perceptions towards the use of owls for rodents control was measured by using a Likert scale (Ho, 2017; Adeniran, 2019). The scale has been found to be the appropriate method for assessing perceptions (Sullivan and Artino, 2013; Kidane and Zwane, 2022; Lazaridou and Michailidis, 2023). The study adopted a five points Likert scale (5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree and 1 = strongly disagree). Responses from all statements were combined to create a measurement of perception score (PS). Perception score is a single value used to represent total perception of the respondents towards the use of owls for rodents control.

The study included both negative and positive statement. Then numerical values for the response options were reversed when calculating the overall score for negative statements. The higher values indicated positive attitude towards the use of owls for rodents control, implying that the respondents were supporting the use of owls for rodents control. While low values indicated negative attitude (i.e. unfavourably response) towards the use of owls for rodents control, implying that the respondents were not supporting using owls for rodents control.

The overall scores on the attitude scale were categorised into positive, neutral and negative attitude towards the use of owls for rodents control. The highest possible score was calculated by multiplying 5 items by 5 points to get 25 points; while the middle point was calculated by multiplying 5 items with 3 points to get 15 points, and the lowest possible score was calculated by multiplying 5 items by 1 point to get 5 points. This method was used because it used five likert scale with 1 as the minimum value and 5 as the highest value (Adeniran, 2019).Therefore, the cut-off point was set at 15. Scores ranging from 5 to 14 on the overall scale were categorised as negative perceptions, while scores from 16 to 25 indicated positive perceptions. Prior to the construction of scale, the internal consistency of items were analysed using Cronbach's alpha, the results for attitude towards the use of owls for rodents control was 0.75, surpassing the minimum recommended threshold of 0.7 0.7 (Pallant, 2011).

Furthermore, the willingness of maize farmers towards the use of owls for rodents' pest management in agricultural system was measured by requesting the farmers to indicate the extent they would be willing to undertake on their farm to enable owls survive using 5 likert scale(5-Very willing, 4=somewhat willing, 3=not sure, 2 somewhat not willing, 1-very unwilling). After that a score for each aspect was computed before and after the training.

The data collection procedure

The study involved three phases

Phase 1

The first phase involved conducting baseline survey to assess the respondents knowledge towards using owls as the biological control method for rodents, their attitude and farmers willingness to use owls for biological rodents control. Data on knowledge and attitude towards the use of owls for rodents control were collected through the semi structure of questionnaires.

Phase 2

Knowledge, attitude and perceptions identified in the two stages above were critically evaluated and coming up with innovative ways of conducting low intensity education that contributes towards enhancing farmers intention to use owls on controlling rodents. The contents of the training was developed during multi-stakeholder's forum and supported by literature review and sharing ideas with experts in pests control management from Sokoine University of Agriculture (SUA). The identified contents were disseminated to famers through presentation and dicussions. The presentation covered the following aspects; geographical coverage of owls, different specie of owls, characteristics of owls, distinct feature of owls, use of owls for rodent control in farms, aspects to take into consideration during nests allocation in farms. The training and data collection were conducted in swahili and were interpreted into hehe by a local interpreter when it was needed

Third phase

Then after the three months a similar questionnaire was distributed to learners on the selected districts to assess whether perceptions had changed over the intervening three months.

Data analysis

Quantitative data were coded and analysed using Statistical Package for social Science (SPSS) vesrion version 26 (2019). Descriptive statistics such as frequency and percentages were used to analyse the socio-demographic charactsristics of the respondents. In additional, McNemar test was used to compare the farmers perceptions before and after training; t-test to examine the effects of the training on farmers willingness to set owls for rodent control on various dimensions using 95% confidence interval.

Results and Dicscussion

Socio-Demographic Variables

In this study both male and female respondents participated in the study. The results showed that more than half (64.0%) of respondents were male while only 36.0% were female (Table 1). In terms of age, the results showed that, 41.0% have age ranging between 18 and 35 years while those with age more than 55 years were 17.5%. These results imply that in the study area both youth and older people engage in agricultural activities as sources of income. In additional, the results showed that the majority(76.5%) of the farmers were married. This implies that farming in the study area attracts the married couples who engage in agriculture as a source of the household income.This is similar to the study by Malima *et al.* (2014) who found that most of the maize farmers were married.

Moreover, the results showed that more than half (66.5%) of the farmers had attained primary education level, while 5.5% had college/ university education, and 9% had no formal education. Similarly, the study by Nyamba and Mlozi (2012) in Iringa, Tanzania, revealed that most of the farmers had primary education. Furthermore, the results showed that farming experience of the famers ranged from 1 to 60 years. The results showed that less than half (43.0%) had farming experienced ranged from 1 to 10 years while few (18.0%) had farming experience more than 30 years. This implies that most of respondents have experience on farming practices.Thi conforms with the study by Malima *et al.* (2014) that most of people practising agricultural activities have relative experience with farming.

Knowledge towards the use of owl birds in controlling rodents

Farmers' responses to the questions on owls revealed several misunderstandings. For example, more than half, 69.0% of respondents

Table 1: Social economic characteristics (n=200)

Variable	Categories	N	%
Sex	Male	128	64.0
	Female	67	36.0
Marital status	Married	153	76.5
	Single	31	15.5
	Divorced	16	8.0
Age(Years)	18 - 35	82	41.0
	36 - 45	43	21.5
	46 -55	40	20.0
	More than 55	35	17.5
Education level	No formal education	18	9.0
	Primary	133	66.5
	Secondary	38	19.0
	College/university	11	5.5
Farming experience (years)	1 - 10	86	43.0
	11 - 20	51	25.5
	21 - 30	27	13.5
	More than 30	36	18.0

indicated that they know that owls feed on pest rodents such as rats, mice, gophers, and insects (Table 2). It was revealed during the interview that owls eat rats. Therefore, owls tend to come across the compound during harvest season. This is due to the lack food on the farm after harvest meanwhile there are a lot of rats which feed on reserved maize stored around the household compound. Thus owls also come around the household to search for rats to feed themselves (Pearson and Husby, 2021). After the training, the number of respondents who were knowledgeable on feeding habit of owls increased to 98.0%. The low-intensity programmes enhanced and increased farmers' knowledge on birds (Williams *et al.,* 2021).

Furthermore, before the training, few (28.0%) of respondents indicated that they know that owls can be attracted on the farm through the use of nest boxes. However, after the training, the number of respondents who indicated that owls can be attracted to the farm incresed to 91.0%. It was found that 88.5% of respondents indicated that owls have excellent vision and hearing which enable them to find the prey easily while after training the number increased to 93.0%. In additional, before the training, 62.5% indicated that they knew that

Table 2: Distribution of respondents on various aspects of owl

Statement	Before		After		P value
	n	%	n	%	
Owl eat pest rodents such as rats, mice, gophers, insects	138	69.0	196	98.0	0.000
Owls have excellent vision and hearing for finding prey in the dark	177	88.5	186	93.0	0.175
Owl hunt in more open areas as opposed to forests	125	62.5	172	86.0	0.000
Owls can be attracted on the farm through the use of nest boxes	56	28.0	182	91.0	0.00

owls prefer to hunt in open areas. It was revealed that most of the respondents do not know that owls can be attracted on the farm through the use of nest boxes. Owl tend to use the nests constructed by other birds on forest and around the houses. Therefore, an owl tends to come across the household for search for food as well as shelter (Pearson and Husby, 2021).

Furthermore, overall the total knowledge score of the respondent before the training (Fig. 2) was an average score of 1.9. This implies that most of the respondents are not knowledgeable on the owls. The results suggest that pest management and conservation scientists should pay more attention to show more details about the biology of birds such as owls. Increasing farmers knowledge of owls in terms of feeding habit, vision, ability to construct nest and preferred arrears for hunting will enhance knowledge on owls which later will change their attitide toward owls (Ogada and Kibuthu, 2008). After the traning, there was a significant increase on farmers total knowledge from 1.9 to 4.3. The findings imply that training enhanced farmers knowldge on the use of owl birds in controlling pests, and the increase was statistically significant ($p<0.05$).

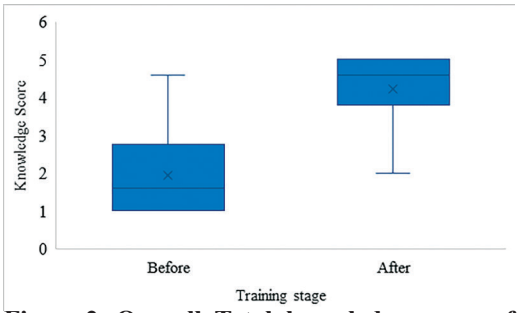

Figure 2: Overall Total knowledge score of the respondents

Perception towards the use of owl birds in controlling rodents

The results showed that perceptions of the farmers towards the use of owls were generally negative before the training. The results in Figure 3 revealed that most of the respondents demonstrated negative perceptions, while few of the respondents have positive perceptions. The results showed that farmer's perceptions on the use of owls for rodents control were changed after attending the training. After the training, the majority of respondents had positive perceptions towards the use of owls for rodents control. This implies that low intensity training or education programme enhanced farmers perceptions towards the use of owls for rodents control. Perceptions of the farmers towards the use of owls in controlling rodents were positive after the training than before the training. Therefore, there was a significant shift, which was linked to their increased knowledge on owls with regard to feeding habit, and their characteristics. These results nevertheless demonstrated that even low intensity educational programmes that involve the delivery of only short time can reduce negative perceptions on the use of owls for rodents control. These results concur with previous study by Williams et al. (2021) which found that low education changed farmers peception towards wildlife.

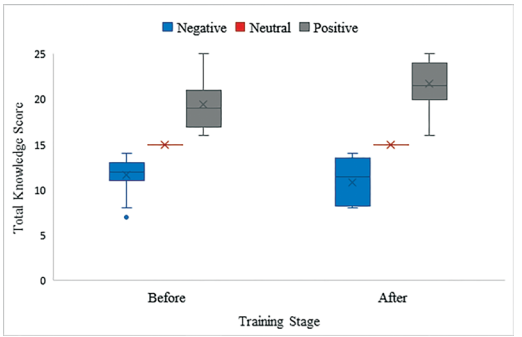

Figure 3: Farmer's perception towards use of owl for rodent control after training

Maize farmers Willing towards the use of owl birds in controlling rodents

The results showed that farmers wiilingness towards the use of owls in controlling rodents increased after the training (Table 3). The results of the responses on willingness to invest on labour, time, money, to construct owls nests in the farm, planting tree near the farm which will enable owls to live was less than 2.1 which is below 3 implying that farmers were not willing to use owls for rodents control. However, the mean score for all aspects after the training ranged from 3.8 to 4.6. This means that there is a significant increase of the average score after the training which is significant

higher than average score before the training from an average score of 1.9 to 4.2 ($p<0.05$). This implies that training enhanced farmers willingness to use their labour for using owls to control rodents. These results imply that improving adoption of owls as bilogical rodents control is reliant on delivering education that provides farmers education on the owls and their benefits. Threfore, it is significant to use low intensity education programmes because it bridges an identified knoledge gap using minimum resources, and it is cost effective with positive impact (Rakotomamonjy *et al.,* 2015).

Table 3: Maize farmers Willingness towards the use of owl birds in controlling rodents

Aspect	Mean score Before training	Mean score After	t	df	p
Willingness to invest some labour	1.9	4.3	-20.162	398	0.000
Willingness to invest some time	1.8	4.3	-21.792	398	0.000
Willingness to invest some money	2.1	3.8	-13.737	398	0.000
Willingness to construct nest for owl near	2.0	4.2	-18.377	398	0.000
Willingness to planting tree near my farm which will enable owl to live	1.8	4.6	-26.768	398	0.000

Conclusion

This study concludes that low intensity education programme enhanced farmers' knowledge and perceptions on using owls in controlling rodents. This training changed the farmers willingness and intention on using owls in controlling rodents after three months training. Therefore, it is recomended using low intensity education programme in increasing farmers' adoption on the use of biological rodents' control.

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