An economic analysis of the crop losses induced by wild animals in Netolpitiya, Hambantota district

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1. Introduction

The conflict between human and wildlife is one of the greatest challenges these days owing to the crop-damage by wild animals. It leads farmers' economic loss causing into expanding of food insecurity and poverty across the country (Emongor, Maina, Nyongesa, Ngoru & Emongor, 2021). There is an extensive variation throughout the world in the type and the nature of damage to crops by wild animals (Fang, Hong, Zhou & Chen, 2021). Sri Lankan agriculture had forest-based shifting cultivation in the uplands and small scale rice farming in the lowlands. Therefore, the land use has changed considerably during the last few decades (Zomer et al., 2007). In the wet zone, shifting cultivations have been replaced by large crop plantations. In the dry zone, extensive irrigation projects have been promoted for rice farming. In this process poor farmers have been driven into more marginal lands close to wildlife reserves. Therefore, wild animals are seen as a prodigious threat to agriculture toward 40% annual local production and economic losses (De la Torre et al., 2020). The livelihood of people in Netolpitiya area of Hambantota district mainly depends on agriculture. Farmers in this area mostly cultivated rice and vegetable under the huge wild animal constrains (Ehelepola, Ariyaratne & Dissanayake, 2021). The study offers some important insights into overcoming the wildlife problems which have a huge impact on their livelihoods toward fulfilling unreported information on different crop types, major wild animals that damage each crop type and related economic losses referring to past researches as (Awasthi & Singh, 2015). Henceforth, this study aims at identifying the major types of wildlife and their damage in Netolpitiya area, to calculate the economic loss of crops due to wildlife and to propose appropriate suggestions to minimize crop losses due to wildlife.

2. Materials and Methods

The target population of this study was farmers in Netolpitiya, Hambantota district. 60 farmers who are cultivating rice and vegetables were selected using simple random sampling technique. The farmers list prepared by the Agriculture Instructor of the area was used as the sample frame. The empirical data for the study were gathered through a well- structured questionnaire, direct field observations, interview and discussions. Secondary data were collected using reports from the Department of Agriculture, journal articles and other published materials. The calculation of crop loss caused by wild animals was done under the following assumptions and equation:

AS: Crop losses are exclusively caused by wild animals, and other losses such as weed, insect, and disease assault are preventable in the region at the time of data collection.

$$TL = \frac{L1 - W1}{L1} \dots\dots\dots\dots\dots (i)$$

TL = Crop loss amounts / ac/ person (kg)
W1 = Actual yield received /ac/ person (kg)
L1 = Possible expected yield/ ac/person in the area (kg)

Using the above equation, the crop loss amounts (kg) were calculated and the values were multiplied from the "selling price" for each crop. The total economic loss per acre per farmer was calculated using the following equation (ii). Finally, an average value was calculated per acre per farmer.

$$EL = TL * Ps \ldots\ldots\ldots\ldots\ldots\ldots\text{(ii)}$$

EL = Average actual total economic loss per acre per farmer
Ps = Selling price
Descriptive methods of analysis were followed using SPSS version 16 software. In statistical analysis, the value of p <0.05 was selected as to be statistical significance.

3. Results and Discussion

Results revealed that 85% farmers cultivated more than one crop types while 15% cultivated only one crop type. The crop damages were caused by wild animals in descending order from peacock (75%), monkey (50%), rat (39%), parrot (20%), giant squirrel (15%) and jungle fowl (5%). Figure 1 illustrates the percentage of farmers who faced losses of crops by each animal type. It was clear that Peacocks, monkeys and rats were the major animals damaging the cultivation in the study area. Wild pigs were not reported as a harmful animal to agriculture in the area.

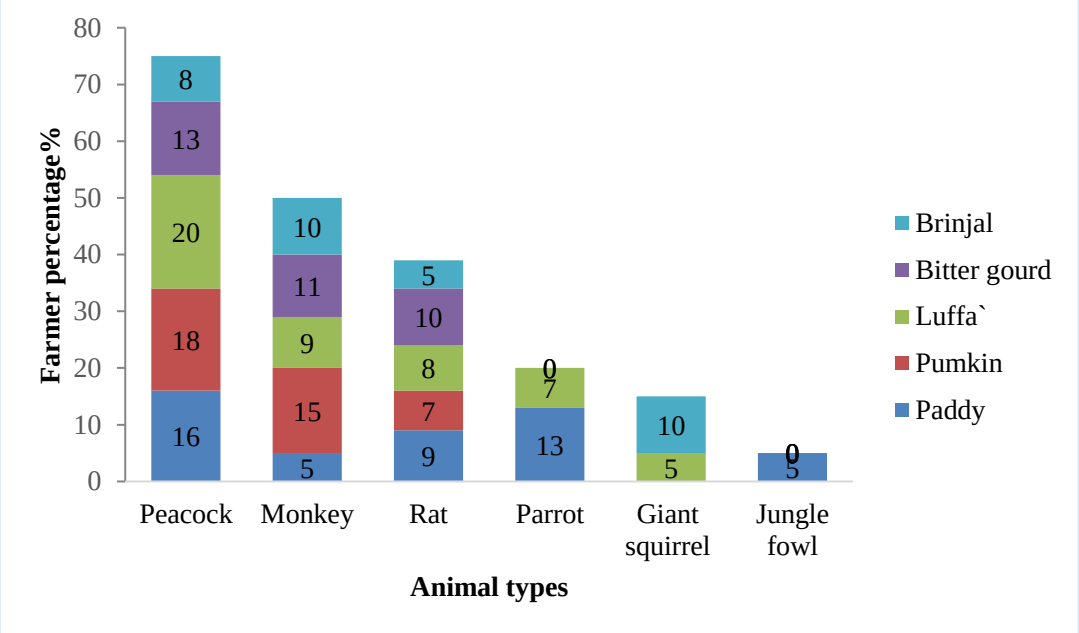

Figure 1. Percentage of farmers and crop losses by each animal

Luffa was highly damaged by peacocks while pumpkin by monkey, bitter gourd by rats, rice by parrot, brinjal by giant squirrel and rice by Jungle fowl. Further, jungle fowl only damaged rice.

According to the perception of the farmers, the average economic loss per season per acre per person was LKR 8849.45 for Rice (*Oryza sativa*), LKR. 16400.00 for Pumpkin (*Cucurbita moschata*), LKR 7537.56 for Luffa (*Luffa aegyptiaca*), LKR 6011.59 for Bitter gourd (*Momordica charantia*), LKR. 7277.94 for Brinjal (*Solanum melongena*). Table 01 illustrates the calculated loss and the differences as compared to the farmer's perception of crop losses for each crop. The highest calculated crop loss was reported in Luffa while the lowest actual

loss was recorded in brinjal. According to the difference, it was realized that the farmers have underestimated their economic crop loss of each crop.

It was observed that farmers have used both modern and traditional technologies. An attempt was made to recognize the cost of controlling the damage. Furthermore, the average cost for using modern technologies (Rs. 3900/acre) was high when compared to average cost of using traditional methods (Rs. 1850/acre). The majority of farmers (95.7%) applied traditional methods and only 4.3% farmers used modern technology to minimize crop losses caused by wild animals. The mostly used traditional methods were guarding, using crackers and using nets. The usage of air riffle was the modern technological method used by farmers.

Table 01. Calculation of expected loss per acre per farmer

Crop type	Actual economic loss (Rs./acre/person)	Differences (Rs./acre/person)
Rice	10487.23	1637.55
Pumpkin	31272.58	14871.74
Luffa	38259.58	30722.05
Bitter gourd	17439.85	11428.26
Brinjal	9550.17	2272.23

The ideas of the farmers regarding the following suggestions were tested by using the Wilcoxon signed rank test interpretation of SPSS Statistics software. From the tested criteria, farmers were marked of their willingness level for different suggestions that help prevent crop damages by the wild animals. They gave the highest priority to Trans-locate wild animals (mean= 1.709, p= 0.00). Other than that, they are willing to accept the support of government institutions to minimize crop losses (mean= 1.636, p= 0.00) and willing to spend money on new technologies to minimize crop losses (mean= 1.254, p= 0.00). However, the farmers give positive response to kill animals (mean= -1.182, p= 0.00).

4. Conclusions

The highest crop loss was caused by peacock (50%) and the lowest crop loss was done by jungle fowl (5%). The highest calculated crop loss was reported in Luffa while the lowest loss was recorded for Brinjal. Farmers that cultivated Luffa have highly underestimated while those cultivating rice were found to be the lowest underestimated group. Further, most of the farmers were mainly using traditional methods to minimize crop losses by wild animals. Furthermore, there is a high preference among the farmers to Trans-locate wild animals to other protected places. Therefore, proper awareness on crop losses, estimated methods, prevention methods with new technologies and suitable methods to translocate animals should be established towards food security and economic uplift by minimizing crop losses.

5. References

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