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Research Article

Knowledge, Attitudes, and Practices of Cereal Farmers about Rodent Damage and Management in Ife Central Local Government, Osun State, Nigeria

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ABSTRACT

Rodents are one of the constraints of crop production in south western Nigeria. Some species have also been implicated as the vector of zoonotic diseases. In Nigeria, farmers usually contend with the problem of rodent damage and management. The present study was therefore aimed at harvesting the experiences of farmers about damage due to rodent and its management in the cereal crops farming system in Ife Central Local Government, Ile-Ife, South-West, Nigeria. Data were collected using questionnaires which were administered to 100 randomly selected farmers in the study area. The data collected were analysed using Statistical Package for Social Sciences (SPSS) version 20.0 and descriptive statistics (Frequency and percentages) were computed. The cereal crop identified to suffer rodent damage was maize - field (54.0%) and store (61.0%). Maturity stage was identified as the most susceptible stage to rodent damage in cereal crop production (38.0%). Inputs used for rodent management were obtained from Agrovets (48.0%) and local markets (43.0%). Most farmers (38.0%) usually start rodent management after noticing damage. Most frequently used rodent management method was rodenticides (44.0%). Most of the farmers (87.0%) were willing to cooperate for management of rodent. Majority of the farmers (83.0%) have enjoyed government support in rodent management in the past. Conclusively, rodent species usually attack maize crop both on the crop fie.

Keywords: *rodent pests, economic losses, vector, zoonotic diseases, damage, management*

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INTRODUCTION

One of the major constraints limiting the crop production in Africa is rodent pest species. They are identified as the most noxious vertebrate pests that cause economic losses to farmers. Some species are identified as the vectors of zoonotic diseases. In other words, they serve as intermediate hosts to about 60 different diseases transmittable from animals to humans (Buckle and Smith, 2015). Some of the zoonotic diseases include plague, leptospirosis, toxoplasmosis, trichinosis, hantavirus pulmonary syndrome (HPS), rat bite fever, and Lassa fever which actually originated from Nigeria in the town called Lassa in 1969. Not only the farmers that feel the negative impacts of the rodent pest species but also their households (Buckle and Smith, 2015). The rodent pest species are usually favoured by their high reproductive potential (Happold, 2013; Odeyemi and Daramola, 2000). They have short oestrous cycle and short gestation period. They larger litter size and more litter are produced by the females in a year (Happold, 2013; Aplin *et al*., 2003).

Some studies have reported the knowledge, attitude, and practice of rodent management in some crop cultivations and urban areas. For example, Meheretu *et al*. (2010) worked on farmers' perspectives of rodent damage and management from the highlands of Tigray, Northern Ethiopia. It was reported that most of the farmers indicated rodents as the predominant pests in the crop field and storage. Barley was identified by the farmers as the most vulnerable crop to attack by rodent. and that the booting stage recorded major abundance and

damage. Rodenticides application was the mostly utilised method of control in cultivated field. However, in storage, domestic cats were usually kept around granaries (Meheretu *et al*., 2010). In the same vein, the report of the study carried out by Badmus and Ala (2020) on rodent and its management by cereal crop farmers in Oyo State, Nigeria, showed that majority of the respondents have knowledge of rodents as pests and the most commonly used method of control was the use of chemical rodenticides. Estimations of the losses incurred as a result of rodent damage have also been documented. For example, about 5-10% of crop damage has been reported to be as a result of rodents across Asia (Singleton *et al*., 2010b). It was also reported that yield losses of 4.8% and 12.6% due to rodent damage were recorded in 1990 and 1991 respectively in rice in Nigeria (Rabiu and Rose, 2004). Ali *et al*. (2003) reported losses in coconut and sugar cane crops of about 15% and 7% respectively from Sindh, Pakistan. The present study was aimed at investigating the knowledge, attitudes, and practices of Cereal farmers about rodent damage and management in Ife Central Local Government, Osun State, Nigeria.

MATERIALS AND METHODS

Ethical issues: Consent was sought from the participants before they were recruited for the study. Only farmers that consented were enlisted for the study.

Study location: The present study was conducted in Ife central local government, Osun State, Nigeria. It has latitude 7˚ 33' 0'' N and longitude 4 ˚ 31' 60'' E. The predominant climate of Ife Central is Tropical savanna climate. Farming is the main occupation of the people in Ife Central Local Government Area where varieties of crops are cultivated including Maize.

Target population: The target population of the people that participated in this study were cereal crops farmers. Informed consent was sought from the study participants before being recruited into the study.

Data Collection Instrument: The data collected in this present study was through the use of structured questionnaires previously described by Tomass *et al.* (2020). The questionnaire was modified and comprised three sections which include: socio-demographic profile, farmers' knowledge about rodent damage, farmers' knowledge about rodent management. The questionnaire was pretested using 20 questionnaires and necessary corrections were made before it was validated by an expert in the Department of Agricultural extension and rural development, University of Ibadan, Ibadan, Nigeria.

Estimation of the size of the sample: The formula below was used to compute for the size of the sample used:

$$\mathbf{n = \frac{z^2pq}{e^2}}$$

where n = the required sample size,
z = the critical value (1.96) at 95% confidence level,
p = an estimated proportion,
q = 1-p,
e = the error margin which is fixed at 0.05 (Cochran, 1963)
93% estimated proportion for sample size computation for this study. It was used because it was perceived that the farmers were well experienced about the rodent damage and management. Calculated sample size for this study was estimated to be approximately 100.

Method of data collection: Questionnaires were administered to one hundred (100) farmers who were randomly selected in the study area. All the administered questionnaires were collected back from the respondents upon completion. Those who could not fill the questionnaire were assisted in filling.

Data analysis
Data obtained were analysed using Statistical Package for Social Sciences (SPSS version 20.0). Descriptive statistics - frequencies and percentages - of the respondents' responses were computed and data were presented using figures and tables.

RESULTS

The results of the present study revealed that 53% of the respondents who participated in the study were 41 years and above (Table 1). Years spent in farming by the respondents was such that 27% of them reported to have spent more than 21 years while 10% reported to have spent less than a year in farming. Majority of the respondents were married (72%) while none of them was divorce (0%) as at the time this present study was carried out (Table 1). Most of the participants in this study (73%) were of family size between 1-5. More than two third of the respondents were males (89%). More than half of the respondents (61%) indicated to have attained tertiary level of education while only 2% had informal education (Table 1).

The farm data of the respondents in Ife Central as revealed from the study was that few respondents (3%) owned farm plots of more 21 plots each while more than one-third of the respondents owned about 1-5 plots each (Table 2). 37% of the respondents owned about 1-5 ha each as the total farm size. More than one-third of the respondents (40%) allocated less than one hectare to cereal crop cultivation. The cereal crops mostly grown by the respondents was Maize as it was indicated by 81% of the respondents. Almost half of the respondents (46%) reported to have about 1-10kg/ha annual crops yield (Table 2).

The result of the present study showed that 35.9% of the respondents attributed low crop yield to the rainfall pattern experienced throughout the planting season (Fig. 1). Variation in the precipitation adversely affect cereal crop production followed by pest infestation which account for 35.2% of the respondent encounter on the field during production. 7% of the respondents were faced with challenges of waterlogged farmland which may be due to land texture (Fig. 1).

Table 1:
Socio-demographic profile of respondents in Ife Central, Osun State, Nigeria in 2021 (N =100)

Category		Frequency	Percentage
Age (years)	18-22	5	5.0
	23-28	9	9.0
	29-34	13	13.0
	35-40	20	20.0
	41 and above	53	53.0
Years spent in farming	Less than one	10	10.0
	1-5	8	8.0
	6-10	22	22.0
	11-15	19	19.0
	16-20	14	14.0
	21 and above	27	27.0
Family size	1-5	73	73.0
	6-9	11	11.0
	10-13	4	4.0
	14-17	6	6.0
	18 and above	6	6.0
Gender	Male	89	89.0
	Female	11	11.0
Education	Informal	2	2.0
	Primary	5	5.0
	Secondary	32	32.0
	Tertiary	61	61.0

Table 2:
Farm data of Respondents in Ife Central, Osun State, Nigeria in 2021 (N = 100)

Category		Frequency	Percentage
Number of farm plots owned	Less than one	20	20.0
	1-5	42	42.0
	6-10	14	14.0
	11-15	13	13.0
	16-20	8	8.0
	21 and above	3	3.0
Total farm size (ha)	Less than one	26	26.0
	1-5	37	37.0
	6-10	13	13.0
	11-15	13	13.0
	16-20	5	5.0
	21 and above	6	6.0
Farm size for cereal (ha)	Less than one	40	40.0
	1-5	34	34.0
	6-10	17	17.0
	11-15	4	4.0
	16-20	4	4.0
	21 and above	1	1.0
Cereal crops mostly grown	Maize	81	81.0
	Wheat	6	6.0
	Rice	4	4.0
	Sorghum	3	3.0
	Millet	1	1.0
	Others	5	5.0
Annual crops yield (kg/ha)	1-10	46	46.0
	11-20	15	15.0
	21-30	8	8.0
	31-40	7	7.0
	41-50	8	8.0
	51 and above	16	16.0

15.5% of the respondents attributed to the constraint of cereal crop production to infertile soil. Meanwhile, only 6.3% of the respondents attributed the constraint to infertile soil (Fig. 1). The conditions identified to favour rodent occurrence among other factors in crop fields include not weeding frequently, presence of nearby soil mounds, and having non-crop areas very close to farmland. Of all the conditions, infrequent weeding was indicated by most of the respondents (65.0%) to be the favourable condition for rodent occurrence in crop field (Figure 2).

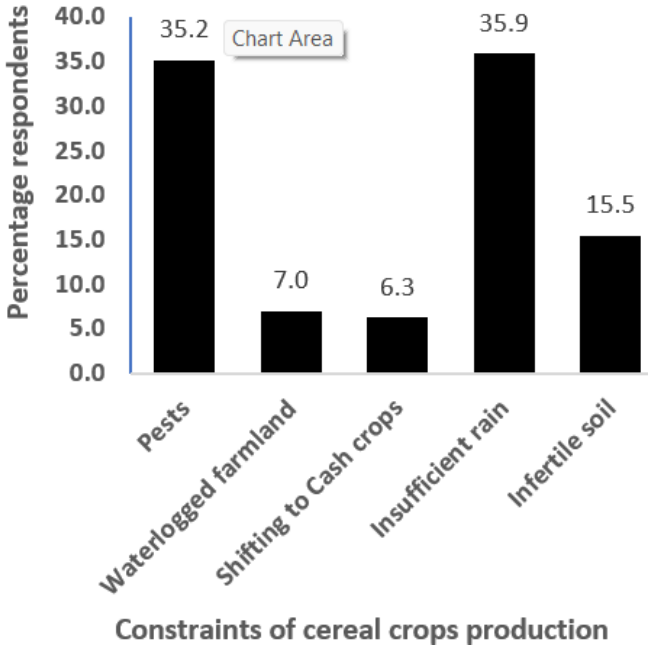

Figure 1:
Perception of the respondents about constraints of cereal crop production (N = 142)

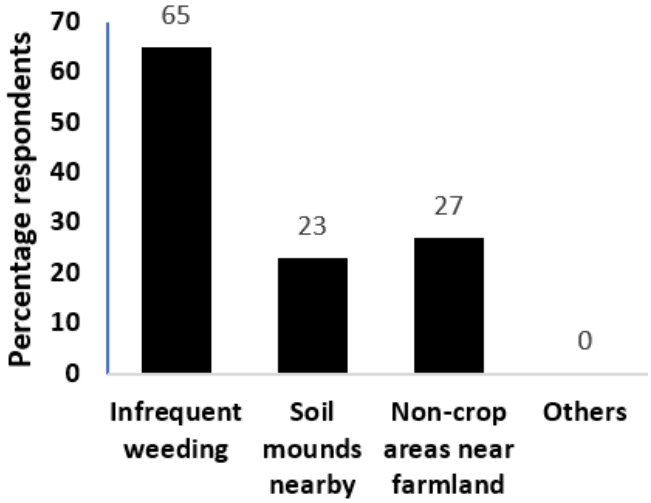

Figure 2:
Farmers' Perception about the favourable conditions for rodent occurrence in crop fields (N =100)

The management strategies deployed by farmers are hinged on several information based on sources at their disposal through extension workers to informal pesticides and personal experiences on rodent infestation. Most of the respondents (40.0%) relied on their personal experience with rodent damage on cereal crops over the years (Fig. 3). 39.0% of the respondents use informal pesticides to control rodents while 27.0% of the respondent got information through the extension workers who are mostly from the various government's ministries, department and agencies and 3.0% relied on other sources of information both print and other media (Fig. 3).

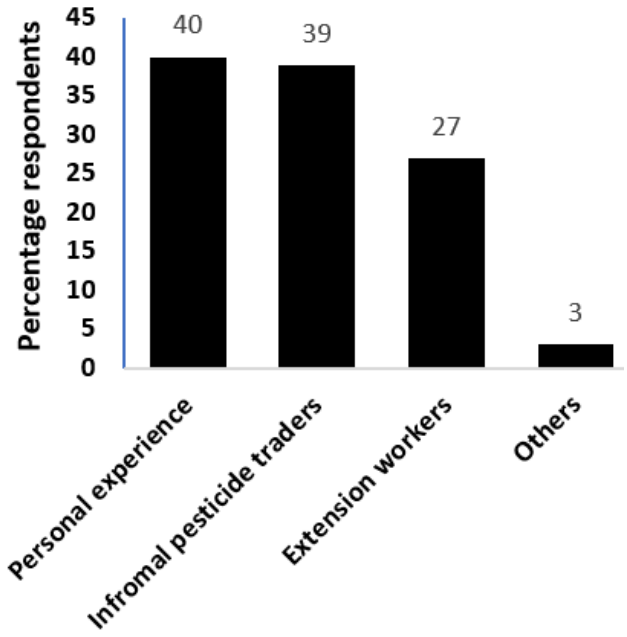

Figure 3:
Respondents' sources of information on rodent management (N = 100)

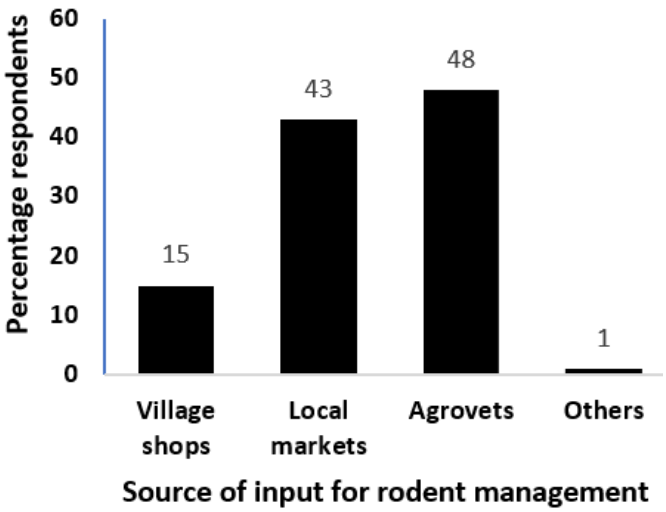

Figure 4:
Respondents' sources of input on rodent management (N =100)

Input used for rodent management are purchased from various outlets such as village shops, local markets, and agrovets. The present study showed that highest percentage of respondents (48.0%) patronized agrovets for their input for rodent management while 43.0% used local markets around them where they sourced for their inputs such chemical rodenticides e.t.c (Fig. 4). 15.0% of the respondents patronized the village shops which are closer to the farmers' residence and the field of production (Fig. 4).

The experience of farmers on cereal crop damage both on the field and in the store varies with the crop type as shown in figure 5. Majority of the respondents had experienced cereal crop damage due to rodent in maize both on the field (54.0%) and in the store (61.0%) (Fig. 5). 17.0% and 23.0% of respondents indicated experience of rice crop damage due to rodents on the field and in the store respectively. 57.0% of the respondents indicated that maize crop had the highest attack by rodent followed by household compound (29.0%) (Fig. 6).

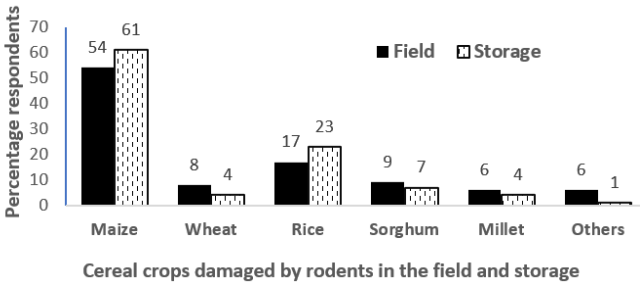

Figure 5:
Respondents' perception about the cereal crops mostly damaged by rodents on the field and in the store (N = 100).

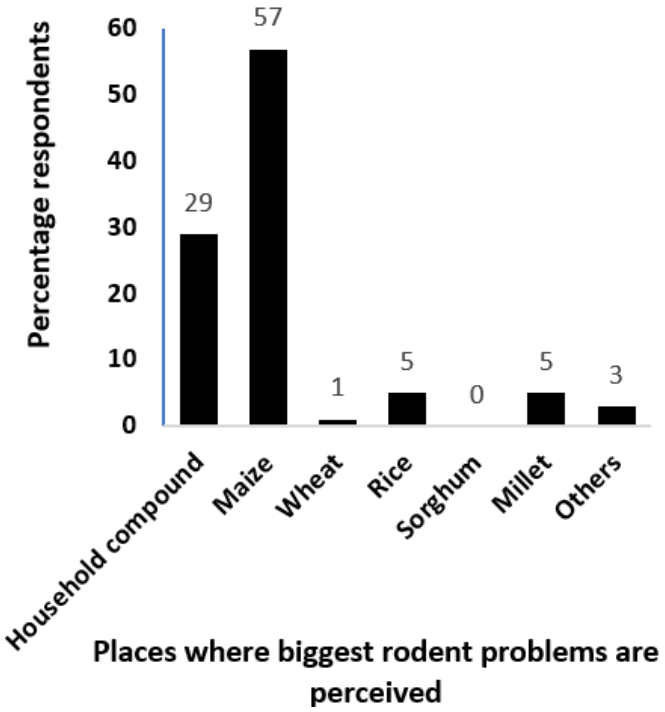

Figure 6:
Respondents' perception about the places where there are biggest rodent problems

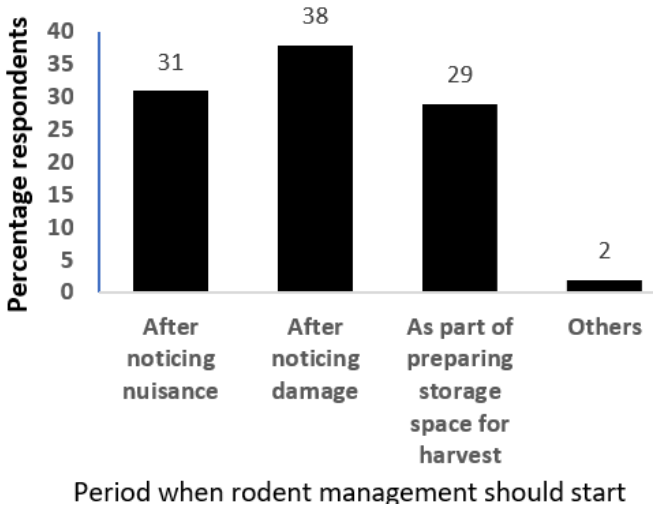

Figure 7:
Perception of respondents on when to start rodent management

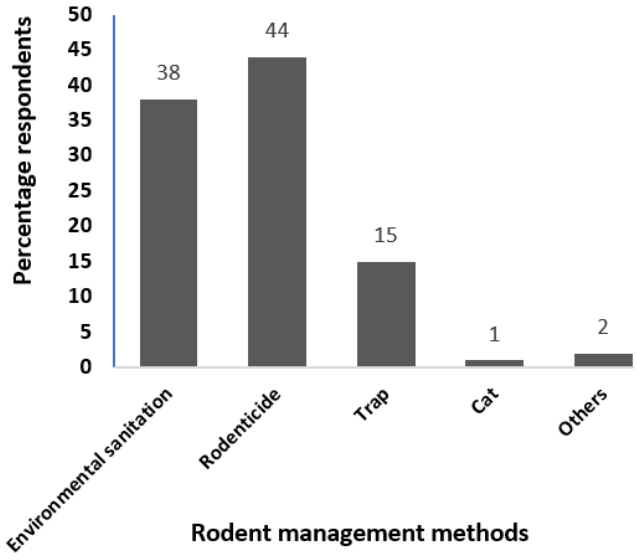

Figure 8:
Respondents' responses on the mostly frequently used rodent management methods.

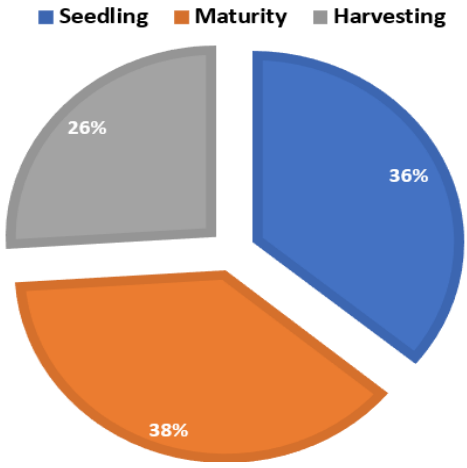

Figure 9:
Most susceptible stage to rodent attack in cereal crop production

A larger percentage of the respondents (38.0%) commence control measures after noticing damage in the cereal field or stored facility while 31.0% of the respondents react to rodent attack after noticing nuisance either sighting the rodents or through any form of nuisance that changes the state at which the crops are or within the storage facilities (Fig. 7). A smaller percentage of respondents (29.0%) initiated control measures as part of routine activities when planning a storage facility for the grains (Fig. 7).

Majority of the respondents (44.0%) used rodenticide for the control of rodents on the field and at the storage facilities (Fig. 8). 38.0% of respondents deployed environmental sanitation to control the rodents while 15.0% used trap locally fabricated to trap the rodents (Fig. 8). The use of cat, which is a domestic animal accounts for 1% in controlling rodents are basically in the house where respondents stored their cereals (Fig. 8).

The present study showed that 38.0% of the respondents reported that maturity stage was the most vulnerable stage to damage by rodent in cereal cultivation followed by seedling stage (36.0%) (Fig. 9). Most of the respondents claimed rodents attacked their crops with 87.0% respondents having experienced damaged caused by rodents and 13.0% were not familiar with the damaged caused by rodents (Table 3). Indigenous practice of rodent damage was used by 58% of the respondents to control rodent management while 78.0% were ready to make use of the indigenous practices to manage the pests on the field and at the storage facilities (Table 3). 65.0% of respondents cooperate with neighboring farmers to control the menace of rodent damage with a larger percentage of 87.0% ready to engage in joint management system by cooperating with neighboring farmers. Governmental and non-governmental intervention in rodent management was acknowledged with 83.0% respondents who were supported by public and private establishments to control the pests and 59.0% are ready to harness governmental and non-governmental supports when the opportunity is available (Table 3).

Table 3:
Respondents' experiences on the practices of rodent management in Ife Central, Osun State, Nigeria in 2021 (N = 100)

Category		F	%
Have you ever employed native practices of rodent management?	Yes	58	58.0
	No	42	42.0
Would you like to employ native practices of rodent management?	Yes	78	78.0
	No	22	22.0
Have you ever cooperated with neighbor for rodent management?	Yes	65	65.0
	No	35	35.0
Would you like to cooperate with neighbor for management of rodent?	Yes	87	87.0
	No	13	13.0
Have you ever obtained governmental or non-governmental support in the management of rodent?	Yes	83	83.0
	No	17	17.0
Would you like to obtain governmental or non-governmental support in the management of rodent?	Yes	59	59.0

F = Frequency
% = Percentage

DISCUSSION

It was revealed from the results of this present study that older adults mostly participated. This could be probably due to the fact adults were more involved in farming activities. Earlier findings gave similar report that most of the participants involved in the study were 35 years and above (Badmus, 2021). Tomass *et al.* (2020) also reported in their study that most respondents who participated in the study were older adults.

Most of the respondents that participants in this study had spent some couple of years in farming. This is in consonance with the report by Tomass *et al.* (2020) that quite a number of decades had been spent by majority of the respondents that took part in the study.

Quite a number of the respondents who took part in the present study were married and family size between 1-5 was owned by the majority of the respondents. This was probably because farming was taken as an occupation to sustain themselves and the members of their families. A recent finding by Khanam and Mushtaq (2021) also gave similar report that more than two-third of the respondents were married. Males were mostly involved in farming in the study area possibly to sustain their families. Badmus and Ala (2020) gave similar report that more males took part in the study than females. Most of the respondents were learned as majority of them attained tertiary level of education. Similar report was given by Khanam and Mushtaq (2021) that most of the participants in the study had at least secondary level of education.

It was revealed from the present study that maize was the cereal crop mostly by the farmers in the study area. This could be attributed to the fact that maize is a staple food commonly consumed in the study area. This present finding corroborates the report of the previous finding by Badmus (2021) that the mostly commonly cultivated cereal crop in Ido Local Government Area where the study was carried out was maize crop.

More respondents experienced challenge with cereal crop production due to pest infestation than infertile soil. Meanwhile, the impediment to cereal crop production was shown to be greatly affected by insufficient rainfall in the present study. Pest infestation as reported by Tomass *et al.* (2020) was said to be the most important constraint in cereal crop cultivation. However, it was reported that insufficient rain was the constraint of least importance in cereal crop production.

The cereal crop mostly affected by rodent pests both on the field and in the store was maize as revealed from the present study. This is in dissonance with the report as given by Khanam and Mushtaq (2021) that farmers indicated wheat as the crop mostly affected/attacked by rodent pests. Meheretu *et al.* (2010) also gave contrary report that Barley was the most susceptible crop to rodent attack. However, the finding from the present study is in agreement with the report by Gadisa and Birhane (2015) that farmers ranked maize as the first crop vulnerable to rodent depredation. The disparity in the reports could be attributed to the variations in the area where the studies were carried out.

The environmental conditions of the field in relation to the vegetation around the cultivated crop favours the reproduction and survival of the rodents that damage cereal crops. Among the various factors responsible for rodent's occurrence on the crop field, infrequent weeding largely served as a limiting factor that encourage rodent invasion of farmland compared to other reasons. The combined factors of soil mounds nearby and non-crop areas near farmland resorting in rodent occurrence on farmlands are less than the rate at which infrequent weeding of farmland resort to rodent occurrence in cereal crop field within the study area. However, Badmus (2021) reported that non-crop near farmland formed the main factor that favours rodent occurrence in crop field.

Maturity stage was the stage mostly vulnerable to rodent attack in cereal crop cultivation as revealed from the present study. On the contrary, harvest stage was reported by Khanam and Mushtaq (2021) to be the highly vulnerable stage to damage by rodent. Meheretu *et al.* (2010) had also earlier reported booting stage as the stage with maximum rodent abundance and damage.

Agrovet was the major source of input for rodent management. Local markets within the neighborhood also served as one of the major sources of input for rodent management due to the periodic nature of markets around farm settlements. This was in agreement with the earlier finding reported by Badmus (2021) that most of the respondents in the study indicated that they sourced input for rodent management from Agrovets.

The management of rodents to minimize the damage caused to grains either at the storage facilities in household and at the commercial centres or the field where the cereal crops are grown, the farmers approach to control measures and their choice of time necessitated by their experience shows that higher percentage of the respondents commence activities on management of rodents after noticing certain parts of the crops on the field have been damaged by the rodents or there are signs at the storage facilities that the grains stored are accessible to the rodents through grains littered around.

The management of rodents depend on the environments they lived in, the habitat dictates the management methods farmers used to control rodents damage to cereal crops on the field and in the storage facilities within the economic threshold level.

The use of rodenticides is aggressively used by farmers to urgently address field crop damage from reaching the economic injury level. Badmus and Ala (2020) had also earlier reported that the most commonly used method of rodent control was the use of rodenticide. Meheretu *et al.* (2010) also gave similar report that rodent control using rodenticides was the most regularly practised rodent management strategy in crop field. It was, however, further reported that domestic cats were kept around granaries in storage. The environmental sanitation involved clearing of the field used for cultivation of crops and the borders of the field to scare the rodents from entering the field for damage,

Traps were also indicated to be used by some of the respondents as the captured rodents were killed and such was safe as a source of meat for the farmers. Pest is a major threat to food production and rodents are notable vertebrate pests that damage food crops both at the planting period as well as post-harvest period when the grains are stored.

Rodents thrive in forested area where they could hide. Thus, effective management requires joint intervention as revealed from the present study. Similar finding by Gadisa and Birhane (2015) reported that most farmers responded that they must work together for effective control of rodent pest. Quite a number of the respondents in the present study have enjoyed governmental and non-governmental supports in rodent management. This is not in line with the report given by Badmus (2021) who reported that no respondents in the study area indicated to have received or enjoyed supports in rodent management either from governmental or non-governmental organization.

In conclusion, he factors identified to be the main limitations of cereal crop production include pests and insufficient rain. Rodent species usually attack maize crop both on the field and in the store. Maturity stage was identified to be the most vulnerable stage to rodent attack in cereal cultivation. Rodenticides and environmental sanitation have been the commonly used rodent management methods.

Reliance on chemical rodenticides as the rodent management approach should be discouraged due to their attendant risks such as effect on non-target species, problem of secondary poisoning, and development of resistance to the rodenticides over time. In other words, there should be a swing to a more sustainable rodent management strategy to reduce rodent numbers and damage. Joint efforts should be continuously encouraged among the farmers in the effective management of rodent. Governmental and non-governmental organization should continue to support the farmers in the management of rodent pests.

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