

Farmer's perceptions of rodents as crop pests : Knowledge, attitudes and practices in rodent pest management in Tanzania and Ethiopia

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ABSTRACT. A study was conducted using a structured questionnaire to obtain information about the nature and extent of rodent damage to crops, farmer's perceptions of crop pests and their knowledge, attitudes and practices to their management in Tanzania and Ethiopia. The study was carried out in five localities (Makuyu -Central Tanzania; Chunya-Southwest Tanzania; Ziway and Adami Tulu (south of Addis Ababa) and Gumer/Limmo-South-west of Addis Ababa, both in Central Ethiopia). In Tanzania, maize is the major crop, both for food and sale. Other crops are sorghum, rice, simsim, groundnuts and millet. In Central Ethiopia, farmers grow maize, sorghum, teff, beans, barley, wheat, potatoes and enset. The study showed that farmers in Tanzania and Ethiopia are well aware of rodent problems and considered them to be number one pest. Rodent problems are regular and maize is the most affected crop in Tanzania. In Ethiopia, maize, enset and potatoes are the most affected crops. Maize in Ethiopia and Tanzania is susceptible to rodent damage, most seriously at planting and seedling stage. Although different rodent control techniques are practiced in Tanzania, farmers prefer using rodenticides (68.7%) to other strategies. In Ethiopia, trapping, hunting and rodenticides are the most practised techniques for rodent control. Farmer's attempts to control rodents in both countries are based on economic reasons and generally, rodent control is not undertaken when there are no crops in the fields. Farmers are responsible for rodent control activities in their individual fields. The study shows that farmers in Tanzania and Ethiopia are concerned with rodent infestation and are also aware of the critical growth stage when the crops are most susceptible. A lack of multiple rodent management methods and inadequate knowledge of appropriate and sustainable techniques appeared to be the main reasons for the over dependence on rodenticides, particularly in Tanzania. Therefore, this suggests that farmers require a strong extension input to manage rodent problems.

KEY WORDS : Rodent management, knowledge, attitudes, practices, Tanzania, Ethiopia.

INTRODUCTION

In East Africa, rodent pests are considered a major problem in agriculture and public health (MAKUNDI et al., 1999). Rodents cause considerable economic losses in staple crops, particularly tuber crops and cereals. MAKUNDI et al. (1991) reported losses of approximately 15% in cereals in Tanzania. Damage of maize at sowing and seedling stage was estimated to be 40-80% in Morogoro, Tanzania (MWANJABE & LEIRS, 1997). Widespread crop damage and losses were reported in agricultural land during rodent outbreaks in Kenya (TAYLOR, 1968). Rodent outbreaks are regularly experienced in Tanzania (HARRIS, 1937, MKONDYA, 1977; MWANJABE, 1990) and are associated with severe crop losses. According to SICHILIMA et al. (2003), considerable losses of tuber crops occur in Zambia due to infestation by mole rats. Estimates of maize damage and losses in experimental fields in Central Ethiopia indicated losses of about 26% (BEKELE et al., 2003). In Tanzania and Ethiopia, rodent

control is considered the responsibility of farmers who conduct control activities individually, and rarely on a collective basis. However, in many situations, farmers have few effective technologies that can be used to reduce the impact of rodents on their crops. It has been reported, however, that the socio-economic conditions and culture of farmers influence the rodent pest management practices used (SUDARMAJI et al., 2003). Rodent pest management therefore will also be influenced by the farmer's knowledge on variables affecting crop damage, the level of crop susceptibility, the rodent pest population during the most susceptible crop stage and how much farmers are prepared to control the pests. We conducted a study in Ethiopia and Tanzania to establish farmer's perceptions and knowledge of rodents as crop pests.

MATERIALS AND METHODS

The study was carried out using a structured questionnaire developed at Sokoine University of Agriculture,

Morogoro, Tanzania. It was administered through interviews with farmers in five localities in Tanzania and Ethiopia. Two of the five localities were in Tanzania (Mvomero District and Chunya District, in Central and Southwest Tanzania, respectively). Three study locations were in Central Ethiopia (Ziway, Adami Tulu and Gumer/Limmo). Sixty farmers were interviewed in each locality. The questionnaire consisted of a series of structured questions focussing on the following :

- The size of cultivated field/family
- Ranking of the status of different pests affecting crops
- Ranking of crop damage according to crop phenology
- The proportions of fields damaged
- The rodent management techniques/approaches, and
- The most appropriate time to control rodents.

The field staff in the respective areas identified the species of rodents involved in crop damage. The data were analysed using the SPSS computer software and are presented as percentages.

RESULTS

The majority of farmers in Tanzania and Ethiopia are small landholders cultivating fields that are 1 – 2 ha in size (96.4% and 99.3% in Tanzania and Ethiopia, respectively). Most of the respondents regarded rodents as the number one pest they were least able to control. In Tanzania, 93.9% of respondents considered rodents as number one pest compared to only 3% who considered insects to be number one pest. Comparative figures for Ethiopia show that 75% of the farmers considered rodents as very important pests in their crops (Fig. 1). In both Tanzania

and Ethiopia, the frequency of occurrence of rodent outbreaks was high. Regular outbreaks were reported by 66.6% and 59.7% of farmers in Chunya and Mvomero, respectively, in Tanzania. In Ziway, Adami Tulu and Gumer/Limmo, in Ethiopia, 48.7, 26.1 and 34.3% of farmers, respectively, reported regular rodent outbreaks (Table 1).

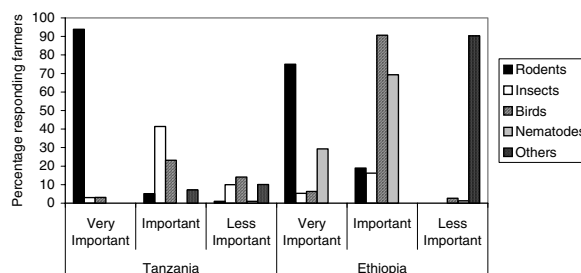


Fig. 1. – Ranking of the importance of different pests organisms in maize in farmer questionnaires in Tanzania (N = 120) and Ethiopia (N = 120)

Asked about the most susceptible crop stages, 70.4% and 82.5% of respondents in Tanzania and Ethiopia, respectively, considered seed retrieval to be most serious (Fig. 2). About 60.6% of farmers in Tanzania and 50.8% in Ethiopia indicated rodent damage to maize by seedling cutting to be serious. However, comparatively insignificant proportion of farmers in Ethiopia (1.6%) considered rodent damage to maize cobs as severe, compared to 2% of the respondents in Tanzania (Fig. 2).

TABLE 1
Frequency of occurrence of rodent outbreaks in study sites

Percentage of farmers responding					
	Tanzania			Ethiopia	
Frequency	Chunya	Mvomero	Ziway	Adami Tulu	Gumer/Limmo
Regular (occurs every season)	66.6	59.7	48.7	26.1	34.3
Occasional (Occurs every few seasons)	33.3	30.3	48.7	73.9	45.7
Rare (Occurs every few years)	0	10.0	2.60	0	20.0

TABLE 2
Rodent control techniques practised by farmers in Tanzania and Ethiopia

Technique	Percent respondents practising specific rodent control technique				
	Tanzania			Ethiopia	
	Chunya	Mvomero	Adami Lulu	Ziway	Gumer/Limmo
Rodenticides	73.5	63.9	70.8	82.1	88.0
Field sanitation	4.0	2.0	12.5	2.6	17.3
Trapping	2.3	0	70.8	84.6	96.0
Hunting	2.0	0	66.7	64.1	0
Trapping and sanitation	6.1	2.0	-	-	-
Sanitation and rodenticides	17.2	0	-	-	17.2

The majority of farmers ranked maize as the most affected crop in Tanzania, with 94.9% of respondents indicating that rodent damage to maize was very important, compared to 11.0, 3.0, 4.0 and 3.0% for sorghum, millet, cassava and pulses, respectively (Fig. 3). In Ethiopia, 42.9, 90.7, 4.5 and 98.7% of the respondents reported rodent damage as very important in pulses, enset, barley and potatoes, respectively, but not in teff (Fig. 3).

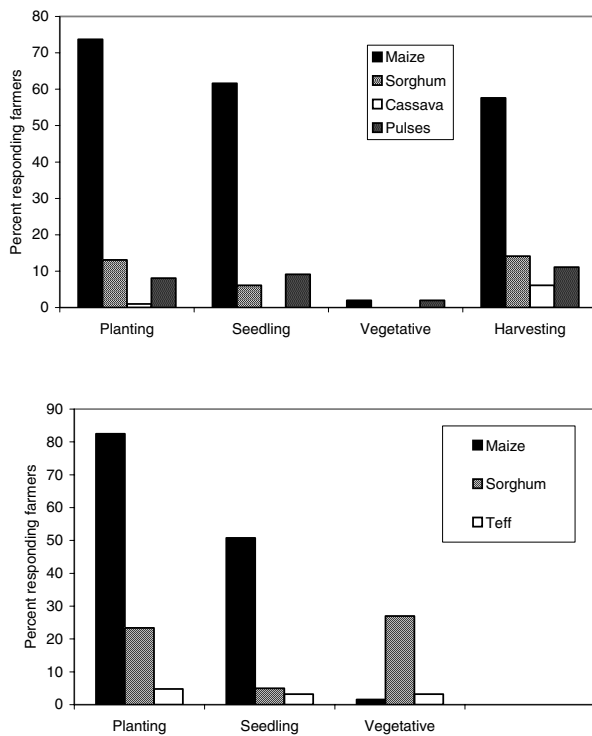


Fig. 2. – Rank of rodent damage to crops at different crop growth stages in farmer questionnaires in Tanzania (top, N = 120) and in Ziway and Adami Lulu, Ethiopia (bottom, N = 120)

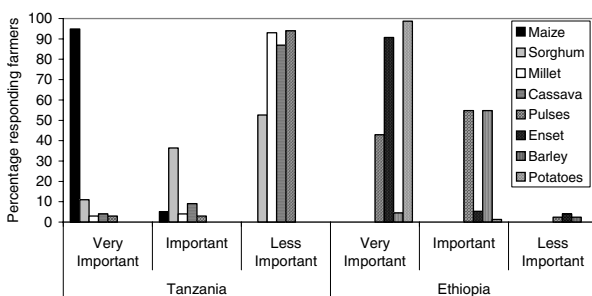


Fig. 3. – Ranking of the importance of rodent damage to specific crops in farmer questionnaires in Tanzania (N = 120) and Ethiopia (N = 180)

In Tanzania, the majority of farmers indicated using rodenticides (73.5 and 63.9% of respondents for Chunya and Mvomero, respectively) to control rodents, with much lower proportions of respondents using field sanitation/ and or field sanitation and rodenticides (17.1% of respondents for Chunya and none for Mvomero), hunting and other strategies (Table 2). Although more respondents (70.8, 82.1 and 88.0% for Adami Tulu, Ziway and Gumer/Limmo, respectively) in Ethiopia were using rodenti-

cides, the other control approaches were also more widely practised than in Tanzania (Table 2). For maize, farmers applied control measures more often before planting (Table 3). In Ethiopia more farmers continued to apply control measures after planting maize (Table 3a) than was the case in Tanzania (Table 3b).

TABLE 3A

Time most appropriate for rodent control in Ethiopia

Village	Percentage of farmers controlling rodents	
	Before planting	After planting
Adami Tulu	91.7	8.3
Ziway	97.4	2.6
Gumer/Limm	96.3	3.7

TABLE 3B

Time most appropriate for rodent control in Tanzania

Village	Percent of farmers controlling rodents	
	Before planting	After planting
Chunya	98.3	1.7
Mvomero	97.6	2.4

DISCUSSION

The damage to crops by rodents and the subsequent yield losses at harvest is economically significant since farmers in both countries are small landholders with little alternative incomes, other than from their staple and cash crops. Farmers ranked rodents as number one pest, probably because they are least able to control them compared to the other pests. In similar studies conducted in South East Asia, SUDARMAJI et al. (2003) in Indonesia and TUAN et al. (2003) in Vietnam reported that farmers perceived rodents as the most important pests in their crops. The regular occurrence of rodent outbreaks reported by the majority (64.6%) of respondents in Tanzania is consistent with earlier reports (HARRIS, 1937; CHAPMAN et al., 1959; MKONDYA, 1977; MWANJABE, 1990; unpublished reports Rodent Control Center, Morogoro, Tanzania, 1990-1998). Occurrences of rodent outbreaks in East Africa were also recorded by TAYLOR (1968) and KEY (1990). The farmer's knowledge on manifestations of rodent damage to cereals is also consistent with previous field observations reported by MAKUNDI et al. (1999); MWANJABE & LEIRS (1997) and recently by MULUNGU et al. (2003). MWANJABE & LEIRS (1997) reported maize damage of 40-80% in the seedling stage in Tanzania, while 20% damage was reported in Kenya (TAYLOR, 1968). In experimental fields in Ziway, Ethiopia, where the study was conducted, rodent damage to maize seedlings averaged 12.6% leading to 26.4% yield loss (BEKELE et al., 2003). In the current study, 82.5% of farmers in Ethiopia experienced seed retrieval by rodents, while 50.8% reported damage to seedlings. However, BEKELE et al. (2003) reported that an important part of the damage to maize occurred after the seedling stage. It is therefore possible that seed retrieval by rodents has no serious consequences on final yields

compared to seedling cutting since farmers replant to replace missing seedlings. As the rain season progresses, it becomes impossible to replace cut seedlings and therefore, any further seedling cut by rodents affects the potential yield of the crop (MULUNGU, 2003). Most farmers applied control measures before rather than after planting, which reduces the rodent infestation in the fields. From a management point of view, this is the most appropriate time particularly for a maize crop because the necessity to replant, which is costly in terms of labour and the cost of replacing the seeds, will no longer be there.

Farmers practise a range of techniques to control rodents in both countries but control is based on economic reasons. The reliance on rodenticides appears to be related to effectiveness of this technique, particularly when rodent population densities are high (MAKUNDI et al., 1999). However, the costs involved may be prohibitive for farmers to use this technique. In Tanzania, however, government intervention in the form of free supplies of rodenticides, distribution and supervision of bait application is done only during outbreaks of rodents but not for routine rodent control. A comparison of the rodent control measures shows that there is more integration of approaches in Ethiopia than in Tanzania, partially attributed to lack of free supplies of rodenticides in Ethiopia. Farmers also apply control measures more intensively before planting than after planting. In the study localities in Tanzania, a good proportion of the farmers also continued to apply rodent control measures after planting indicating that rodents were considered a threat to the maize crop in the early stages of growth. This indicates farmer's awareness and knowledge on when reduction of damage by rodent control is most effective and is consistent with earlier reports that more severe damage of the crop occurs at planting and seedling stage (MAKUNDI et al., 1999). In the study sites in Tanzania and Ethiopia, different rodent species were responsible for the reported damage to crops. In both countries farmers have local names to differentiate between species. In Central Tanzania, *Mastomys natalensis* was the dominant and most abundant pest species, whereas in Southwest Tanzania, two species, namely *M. natalensis* and *Tatera leucogaster* were responsible for the reported damage. In Central Ethiopia, BEKELE et al. (2003) reported that *Arvicanthis dembeensis* and *M. erythroleucus* were the major pest species whereas *Mus mohamet* and *Tatera robusta* were minor pest species. In Tanzania, 46.5% of farmers considered maize cob damage to be serious, compared to only 1.6% in Ethiopia. This is possibly due to differences in the species found in the study localities. In Tanzania, *M. natalensis* is a good climber and has been reported to damage cobs on standing maize stems (MULUNGU, 2003). Similar findings have not been reported for the species found in Ethiopia.

CONCLUSIONS

The study shows that farmers in Tanzania and Ethiopia experience severe crop damage due to rodents and that rodent control is undertaken for economic reasons. Rodents are considered the number one pest species in both countries. Further, farmers are aware of the most vulnerable stages when severe attack of crops occurs.

Measures taken to control rodents are much more integrated in Ethiopia than in Tanzania, but generally they rely on rodenticides to a greater extent than on the other control measures. The study also shows that *M. natalensis* and *Tatera leucogaster* are the major pest species in the study localities in Tanzania, whereas *Arvicanthis dembeensis* and *M. erythroleucus* are the major pests in Ethiopia.

ACKNOWLEDGEMENT

This study was financed by the European Union through the STAPLERAT Project (ICA4-CT-2000-30029). We wish to thank the various parties who were involved in the field studies in localities in Ethiopia and Tanzania. Sokoine University of Agriculture (Pest Management Center) (Tanzania) and University of Addis Ababa (Department of Biology) (Ethiopia) provided the logistics that enabled perfection of the work. The authors also wish to thank all the farmers who provided the information on which the publication is based.

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