



Full Length Research Paper

Farmer's knowledge, attitude and practice on rodent management in lowland irrigated rice in Central-eastern Tanzania

^{*A}Mulungu, L.S., ^BMrosso, F.P., ^AKatakweba A.A.S., ^{B,C}Mdangi, M.E., ^DTesha, P.P.H.,
^DNgowo, V., ^{B,D}Mchomvu, M., ^AKilonzo, B.S.

^APest Management Centre, Sokoine University of Agriculture, P.O. Box 3110, Morogoro, Tanzania,

^BARI-Ilonga, P.O. Box 33, Kilosa, Tanzania;

^CCrop Science and Production, Sokoine University of Agriculture, P.O. Box 3005, Morogoro, Tanzania

^DRodent Control Centre, Ministry of Agriculture, Food Security and Cooperatives. P.O. Box 3047, Morogoro, Tanzania.

*Corresponding author's email: lothmulungu@yahoo.co.uk

Abstract

Rodents are one of the major factors limiting crop production in Central-eastern Tanzania. A quantitative study was conducted at Hembeti village to obtain information on knowledge, attitude and practice of villagers with respect to rodent management. Structured questionnaires were administered to 30 randomly selected farmers and the results obtained were analysed by the SPSS Ver. 12 Computer programme. It was revealed that 80-90% of the farmers cultivate maize and paddy in small fields ranging from 0.5 to 1.5 acres. Rodents were reported to be the leading pests causing 20-60% crop losses both in fields and stores yearly. Methods used to assess presence of rodents in the area included presence of burrows and unearthed seedlings in fields and damaged grains and rodent noises in stores. It was further found out that farmers were responsible for control of rodents and that 53% and 47 % were using rodenticides and physical killing methods respectively. Financial constraints were reported to be the major factors limiting farmers to acquire and apply rodenticides. Need for training farmers on other management methods basing on ecological approaches was recommended.

Keywords: Management, rodents, knowledge, attitude and practice.

INTRODUCTION

Food production is threatened by many factors including pests, particularly rodents at pre and post harvest crop stages (Leirs, 1992; Oguge et al. 1997; Leung et al. 1999; Stenseth et al. 2001; Massawe, 2003; Mulungu, 2003; Mrosso, 2004; Massawe et al. 2008). The extent of rodent damage on maize and other food crops, in Tanzania, vary from negligible amounts to over 80% depending on location and growing season (Mulungu et al. 2003). Makundi et al. (1991) reported that 5 – 15% of maize crop in Tanzania, annually lost due to rodents, and that such losses amount to about 382,673 tonnes per year of the actual yield as reported by FAO (2010). This amount of maize would be enough to feed 2.1 million people for a whole year (at about 0.5 kg/day/person). In Chunya district, South-western Tanzania, for example, rodents

have been shown to consume 40 – 80 % of planted maize seeds (Mwanjabe and Leirs, 1997). Such figures cause substantial threat to food security in the district and other areas dominated by smallholder farmers owning about 0.5 - 2 ha of land per household as it is the case for majority of farmers in Tanzania. In addition, such fields are normally isolated and surrounded by bushes and fallow areas which provide suitable environment for rodent harbourage and breeding (Mwanjabe, 1993; Mrosso, 2004). Several studies have revealed that *Mastomys natalensis* is the most important rodent pest of crops in most parts of Tanzania (Mulungu, 2003; Massawe, 2003). In irrigated rice plots in eastern Tanzania, for example, the pest damages 6.1 – 11.2% of the crop (corresponding to yield loss of 0.19

and 0.48 t/ha) during wet and dry seasons respectively (Sixbert, 2013). According to the author such amounts are enough to feed 2,996 and 7,568 people during the wet and dry seasons respectively.

Sustainable rodent management in rice production and other agricultural or residential areas must be based on what farmers currently try to do in order to control the pests, their financial status, labour expenses, farmers' perceptions on the effectiveness of control strategies, and their perceptions about rodents and the management tools at their disposal. Most small-scale farmers in many places in Tanzania, for example, use acute rodenticides so that dead bodies of the pests are seen shortly after application. Although some rodenticides cause significant bait shyness and do not produce very high mortality rates, farmer's perceptions can lead to wrong choices. It is therefore crucial to understand people's knowledge, attitudes and practice (KAP) on rodent management before proposing any changes and consequent introduction of new approaches. KAP has substantial influence on the management and keeping rodent populations at minimum levels. The objective of the current study therefore was to establish the farmers' knowledge, attitudes and practice on rodent management at Hembeti village Morogoro region where rodent outbreaks occur frequently.

MATERIALS AND METHODS

The study was conducted at Hembeti village in Mvomero district, Morogoro region, central-eastern Tanzania. Six farmers were randomly selected from each of five hamlets of Hembeti village. Information on farmers' knowledge, attitude and practice on rodent management was collected by use of structured questionnaires administered through interviewing of farmers of both sexes. The basic questions asked included time devoted for farming by individual farmers, most crops grown, size of their farm fields, most economically important pests, frequency of occurrence of rodents, methods used for assessing rodent presence, effects caused by rodents, control methods for rodents, effects of rodenticides and future needs. Data obtained from the questionnaires were analyzed using SPSS Ver. 12 computer software. Most of the data were presented as percentages using Microsoft excel software.

RESULTS

Overall observations showed that 50% of the farmers in the study area devoted most of their time for farming and that they are mostly subsistence owning an average of 0.5-2 acres each (Figures 1 & 2). It was also observed that the most commonly grown crops in the area were rice, maize, tomato, cassava, simsim and sunflower

(Figure 3). It was further observed that average harvest per cultivated area for most farmers ranged from 0.5 – 10 bags of 100 kg and 5.1 – 15 bags of similar weight for maize and paddy respectively (Figures 4a & b). Less than 15% of the farmers grow tomatoes, simsim, sunflower and cassava and their harvest ranges from 0.5 – 15 bags of 100 kg per farm (Figure 4c-f).

Rodent, armyworm, birds and weeds were reported by most of farmers to be their devastating pests. Of these rodents were the most prevalent causing noticeable losses ranging from an average of 20 – 80% in both maize and paddy (Figure 5). Most farmers reported that rodent outbreaks were most frequent and severe during pre-harvest (86.7%) and postharvest (90%) periods (Table 1). As regard methods used by farmers for assessing presence of rodents in the fields and stores, seven and five methods respectively were reported by various numbers of farmers (Figure 6). As regards farmers' knowledge on other rodent associated problems, farmers reported wide range of problems caused by the pests, in addition to destroying of crops. These include; damage of personal effects such as clothes (80%), human bite (60%), transmission of diseases (27%), contamination of stored food (30%) and chick eating (21%) (Figure 7). When asked about rodent control practices in the study area 53% farmers reported use of rodenticides as their reliable method for rodent control, while physical trapping (use of locally made traps and buckets of water buried to the soil surface with a floating bite at the middle) were reported by 46.5% of the farmers (Figure 8). The interviewed farmers showed awareness on detrimental effects of synthetic rodenticides in the environment. These included water pollution (32%) and killing of non targeted organisms (60%). However, less than 10% of the farmers were not aware of effects of synthetic rodenticides on the environment (Figure 9). When asked for opinions regarding rodent management 70% of the farmers requested for more rodenticides while 16% requested for training (Figure 10).

DISCUSSION

Impact of rodents in many areas of Tanzania is significant both on crops (Mulungu et al. 2003) and public health aspects (Katakweba et al. 2012). About 50% of the villagers at the study area are full time farmers and hence any damage on crops would threaten their livelihood due to food shortage. Rodents are the most devastating pests in the area followed by armyworms and birds. The former are destructive not only on crops but also personal properties and transmit diseases of public and animal health importance. Several authors have reported similar problems in different parts of Tanzania (Makundi et al. 1991; Mulungu et al. 2003). Despite the multiple roles of rodents in the economy of the country, the animals continue to be highly ranked pests due to prevailing

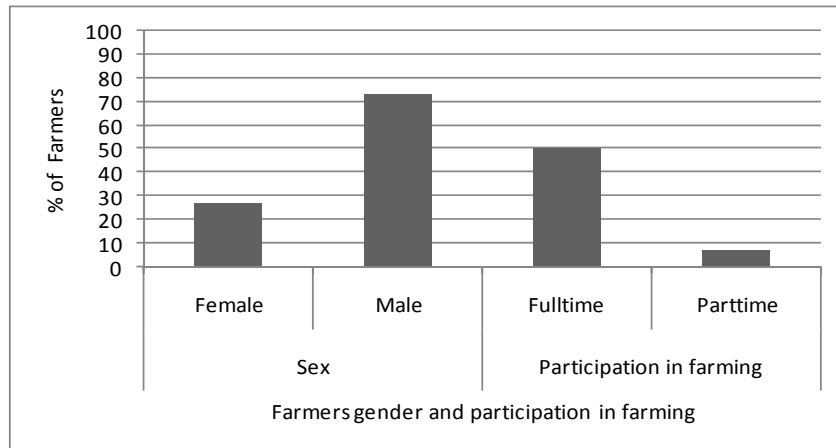


Figure 1. Time of farmers devoted for farming and their gender in Hembeti village, Mvomero district

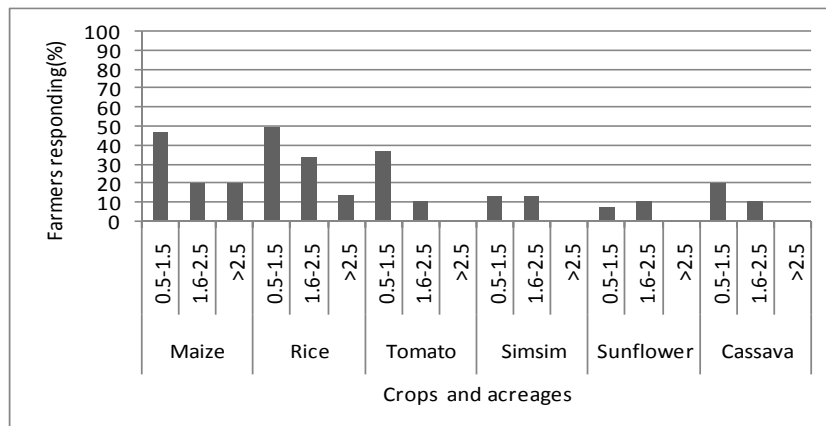


Figure 2. Average acreage (acres) owned by farmers per crop in Hembeti Village, Mvomero district (N = 30)

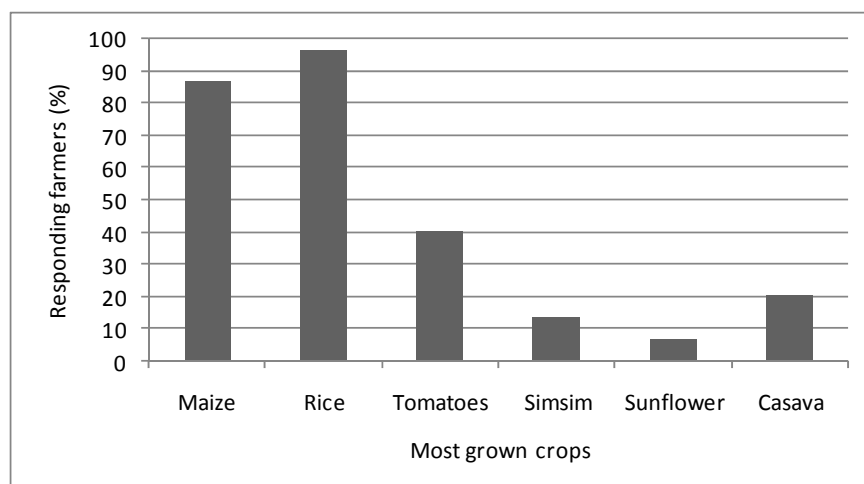


Figure 3. Most grown crops in Hembeti Village, Mvomero district (N = 30)

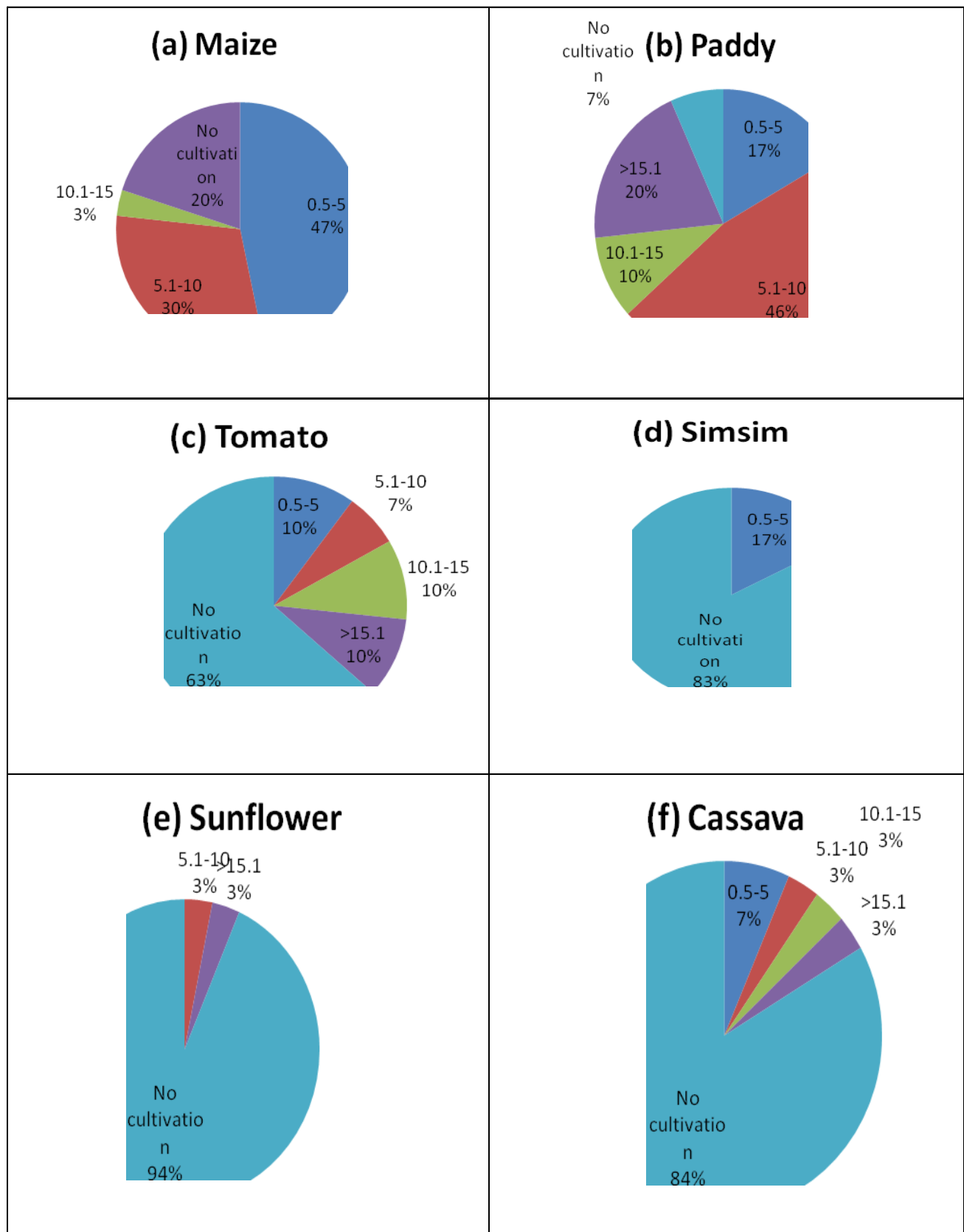


Figure 4. Most grown crops and Yield in 100 kg capacity bags, Hembeti village (N = 30). (The percentages are responded farmers).

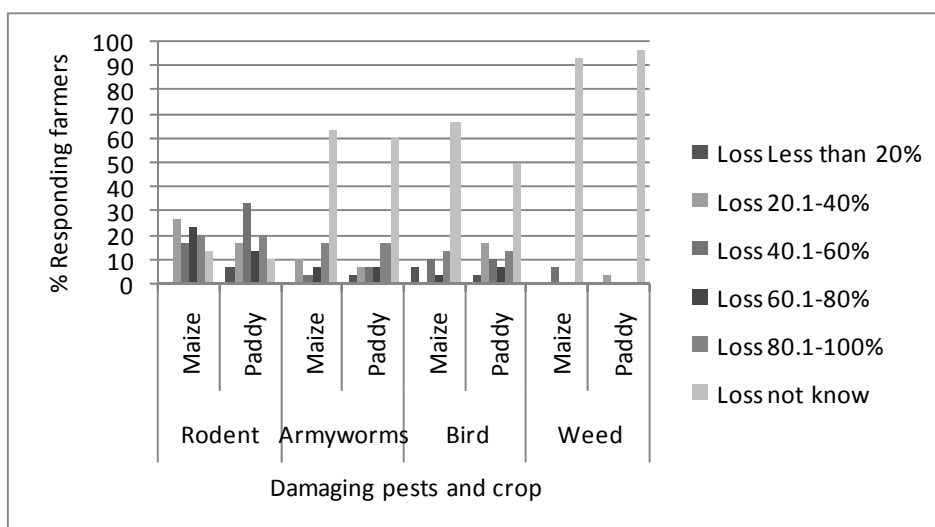


Figure 5. Pest and extent of damage to crop as indicated by farmers in questionnaires in Hembeti village (N = 30)

Table 1. Frequency of occurrence of rodents in Hembeti village (N = 30)

Occurrence/Frequency	Percentage responding farmers (%)	
	During post harvest	During pre harvest
Severe (every year/season)	86.7	90
Often (Every after one-three years)	16.7	10
Occasional (every after 4-6 years)	3.3	0
Rear (occurs once every more than 6 years)	3.3	0

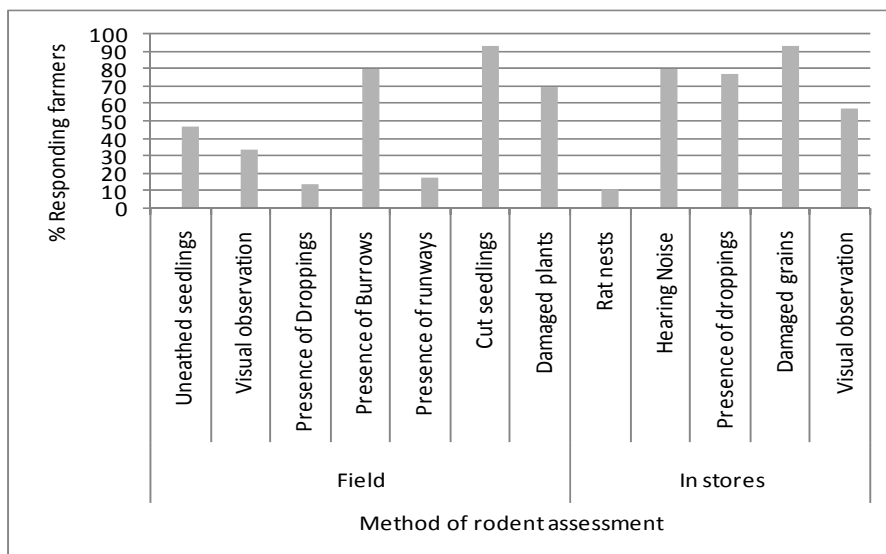


Figure 6. Ranking of most used Methods for assessing presence of rodents during pre and post harvest of crops in Hembeti village (N= 30)

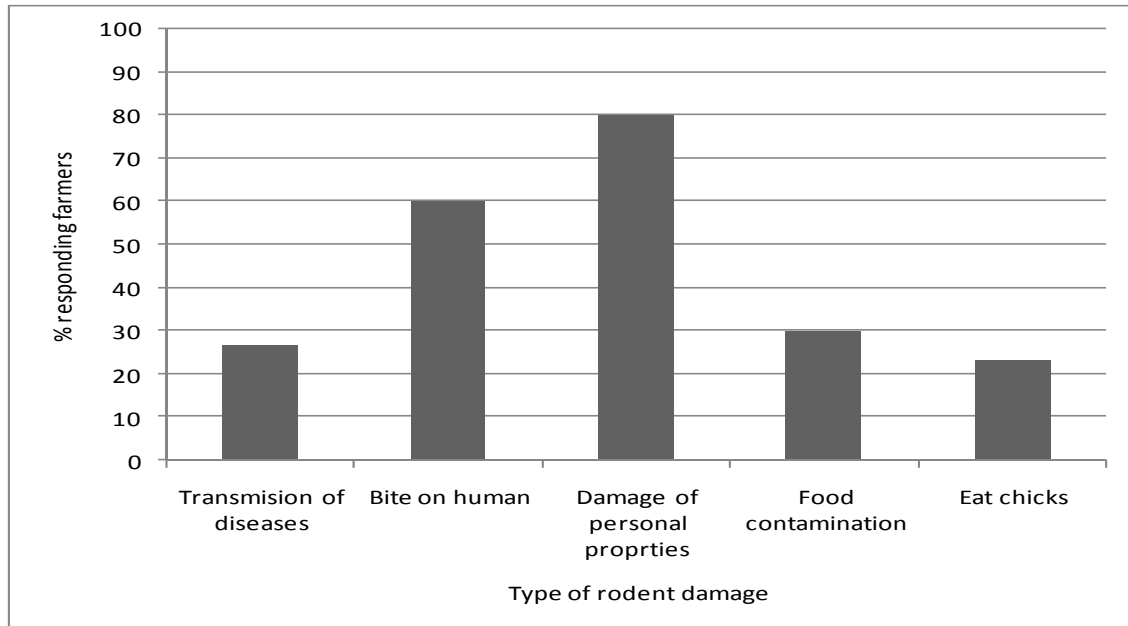


Figure 7. Ranking of adverse effects caused by rodents (N=30) in Hembeti village

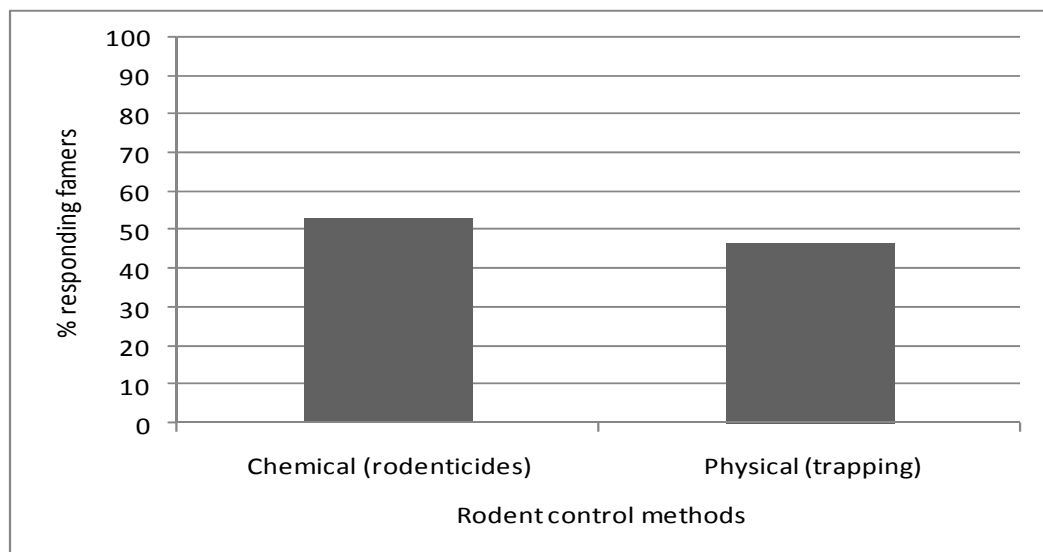


Figure 8. Ranking of rodent control methods by farmers in Hembeti village (N = 30)

Note: Chemicals (rodenticides) used involves Zinc phosphide and Bromadiolone while Physical killing includes trapping, sanitation, hunting, using baskets, and a combination of two or more methods.

difficulties in controlling them by farmers themselves (Makundi et al. 2005), a fact which is probably attributable at least partly to the environmental features of most small-scale farmers (Mwanjabe, 1993).

The reports by farmers that they lose 20 – 80% of their rice produce due to rodent damage, are similar to those

reported by Mulungu et al. (2003) and Mwanjabe and Leirs (1997) for maize production in different areas of Tanzania. Likewise, the severe losses (86.7 and 90%) reported to occur before and after harvest respectively are closely consistent with those reported by Brown et al. (2008) who reported regular rat damages of 84.6%

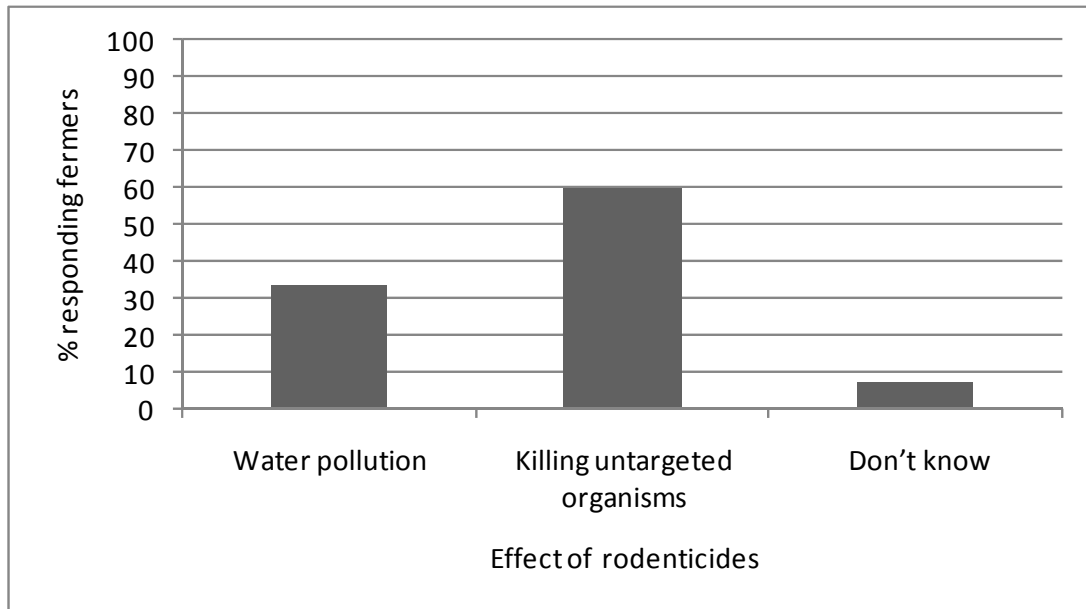


Figure 9. Ranking of effects of rodenticides in farmer, Hembetivillages (N=30)

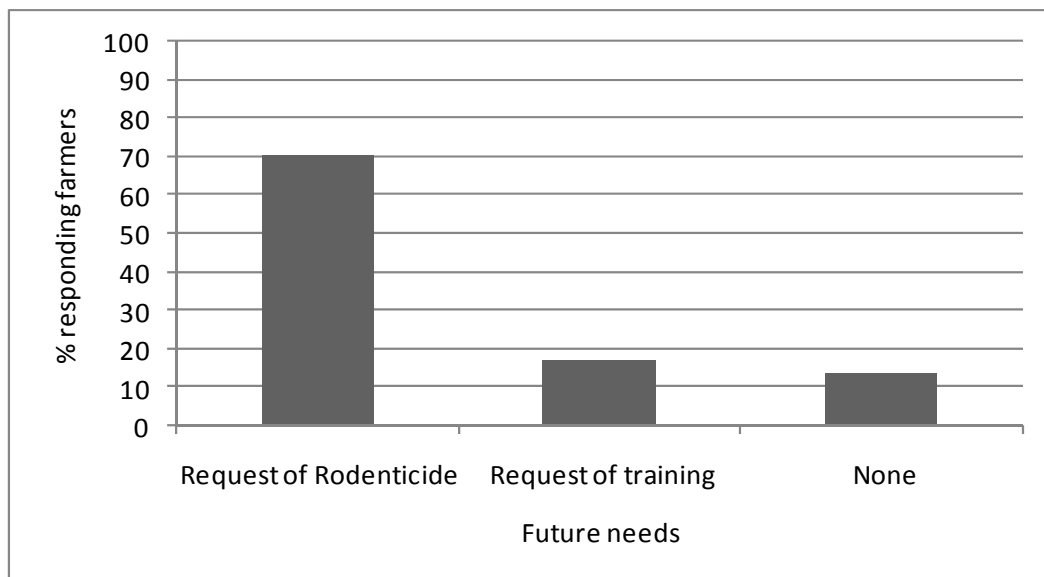


Figure 10. Farmer's opinion on future need for rodent management

(farmer's response) of rice crop in Myanmar, and Makundi et al. (2005) who reported an average loss of 66.6% in maize crop in Tanzania. According to Mulungu et al. (2013), these observations call for extra efforts in controlling rodents in order to keep their populations at minimum levels and consequently avoid losses.

The observation that farmers in the current study area are able to detect rodent infestation by using several traditional methods, especially presence of burrows, damage of seedlings in fields, presence of damaged

grains and hearing of noise in stores suggests that the communities have substantial indigenous knowledge about the rodent pests and that such knowledge can be collaboratively utilized in developing community –based rodent management strategies.

Furthermore, the reported farmers' knowledge on non-agricultural rodent-borne problems including transmission of various human and animal diseases, eating chicks and damage of personal properties can be used as an effective tool for advocating the farmers to organize and

practice community rodent control programmes rather than doing so individually, as it is the case in many parts of Tanzania (Makundi et al. 2005). Indeed community – based strategies can prevent re-invasion of treated fields by rodents from neighbouring un-treated ones (Brown, 2008).

The current observation that 70% of the interviewed farmers prefer use of rodenticides as the method of choice for controlling the pests, and that 53% were economically unable to purchase the chemicals, can be interpreted to suggest need for farmers' training on alternative rodent control approaches including ecologically-based methods.

It can be justifiably concluded from the current observations that Hembeti village experiences huge losses of rice crop both in the fields and after harvest due to rodent damage and that those farmers have substantial knowledge on how to assess presence of pests. It is also conclusive from the current study that the said farmers are knowledgeable on some rodent control methods especially the use of rodenticides and physical trapping killing and on the effects of rodenticides on the environment. On the basis of the current observations, need for training of farmers on ecologically based rodent management strategies is desirable and recommended.

ACKNOWLEDGEMENTS

This work was supported by the Zonal Agricultural Research and Development Funds (ZARDEF) through Eastern Zone; the Zonal Agricultural Research Director for authorizing to conduct the study, the Zonal Research Coordinator for ensuring availability of funds. We also wish to express our sincerely gratitude to the SUA Pest Management Centre Director for provision of various facilities utilized in this study.

REFERENCES

- Brown PR, Yee N, Singleton GR, Kenney AJ, Htwe NM, Myint M, Aye T (2008). Farmers' knowledge, attitudes, and practices for rodent management in Myanmar. *Int. J. Pest Manage.* 54(1):69-76.
- FAO (2010). Rice production in Tanzania. <http://faostat.fao.org/site/567/DesktopDefault>.
- Katakweba AAS, Mulungu LS, Eiseb S, Mahlaba TA, Makundi R, Massawe A, Belmain SR (2012). Prevalence of haemoparasite, leptospires and cocobacilli with potential for human infection in the blood of rodents and shrews from selected localities in Tanzania, Namibia and Swaziland. *African Zoology*, 47(1): 119–127
- Leirs H (1992). Population ecology of *Mastomys natalensis* (Smith 1834) multimammate rats: possible implications for rodent control in Africa. PhD Degree awarded at University of Antwerp, Belgium, pp 2 - 45.
- Leung LKP, Singleton GR, Sudarmaji, Rahmini (1999). Ecologically-based population management of the rice-field rat in Indonesia. In: Ecologically-based Rodent Management. (Edited by Grant Singleton, Lyn Hinds, Herwig Leirs, and Zhibin Zhang) ACIAR Canberra, Australia. pp 305 – 317.
- Makundi RH, Bekele A, Leirs H, Massawe A, Rwamugira W, Mulungu LS (2005). Farmers perceptions of rodents as crop pests. Knowledge, attitude and practices in rodent pest management in Tanzania and Ethiopia. *Belgian J. Zool.* 135(Suppl.): 153 -157
- Makundi RH, Mbise TJ, Kilonzo BS (1991). Observations on the role of rodents in crop losses in Tanzania and control strategies. *Beitrag zur Tropischen Landwirtschaft und Veterinaemedizin* 4: 465 - 474
- Massawe AW (2003). Effect of cropping systems and land management practices on rodent population characteristics. PhD Degree awarded at Sokoine University of Agriculture, Morogoro, Tanzania, 1176pp
- Massawe AW, Mrosso FP, Makundi RH, Mulungu LS (2008). Breeding patterns of *Arvicanthis neumanni* in central Tanzania. *Afr. J. Ecol.* 46, 320-324.
- Mrosso FP (2004). Reproduction and breeding patterns of *Arvicanthis neumanni* in central Tanzania. A dissertation submitted in partial fulfillment of the requirements for the degree of Master of Science (Agriculture) of Sokoine University of Agriculture, Morogoro, Tanzania. 70pp
- Mulungu LS (2003). Assessment of maize (*Zea mays* L.) damage and yield loss due to rodent in the field. PhD Degree awarded at Sokoine University of Agriculture, Morogoro, Tanzania, 178pp
- Mulungu LS, Makundi RH, Leirs H, Massawe A, Vibe-Petersen S, Stenseth NC (2003). The rodent density – damage function in maize fields at early growth stage. In: Rats, mice and people: Rodent biology and management Singleton. (Edited by Singleton GR, Hinds LA, Krebs CJ, Spratt DM) ACIAR, Canberra. pp 301 - 313.
- Mulungu LS, Ngowo V, Mdangi M, Katakweba AS, Tesha P, Mrosso FP, Mchomvu M, Sheyo PM, Kilonzo BS (2013). Population dynamics and breeding patterns of Multi-mammate mouse, *Mastomys natalensis* (Smith 1834) in irrigated rice field in Eastern Tanzania. *Pest Management Science*, 69(3):371-377
- Mwanjabe P, Leirs H (1997). An early warning system for IPM-based rodent control in smallholder farming systems in Tanzania. *Belgian J. Zool.* 127: 49 – 58.
- Mwanjabe PS (1993). The role of weeds on population dynamics of *Mastomys natalensis* in Chunya (Lake Rukwa) valley. In: Workshop proceedings of Economic importance and control of rodents in Tanzania. (Edited by Machang'u R.S.). 6 – 8 July 1992, Sokoine University of Agriculture Morogoro, pp, 34 – 42.
- Oguge N, Ndung'u D, Okemo P (1997). Effect of neem plant (*Azadirachta indica* Juss, Meliaceae) products on maize grain consumption by three common rodents pests in Kenya. *Belgium J. Zool.* 127 (1): 129 – 135.
- Sixbert V (2013). Population dynamics, breeding patterns of rodent pest species and crop loss assessment in irrigated rice in Mvomero district, Morogoro, Tanzania. M.Sc Degree awarded at Sokoine University of Agriculture, Morogoro, Tanzania, 76pp
- Stenseth NC, Leirs H, Mercelis S, Mwanjabe P (2001). Comparing strategies of controlling African pest rodents: An empirically based theoretical study. *Applied Ecology*, 38: 1020–1031.