

Full Length Research Paper

Awareness and control practice of farmers about rodents as crop pests in Southern Ethiopia

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Accepted 18 July, 2016

A community based cross-sectional survey was conducted to assess knowledge, attitude and practice of farmers about rodent pest control in two districts: Sekoru (Jimma Zone) and Gechi (Illubabor Zone) of Oromia National Regional State, southwest Ethiopia. Structured questionnaire was used to collect information and 480 randomly selected farmers (240 farmers from each district) were involved in the study. Farmers in the two districts rated rodents as very important pests followed by nematodes. A significant number of farmers reported the regular occurrence of rodent pest outbreak. Among crops grown in the two districts, farmers listed maize (*Zea mays*) the crop most susceptible to rodent depredation followed by barley (*Hordeum vulgare*) and wheat (*Triticum* species). Sorghum (*Sorghum bicolor*) was the crop least susceptible to the rodent attack. Farmers in the two districts perform rodent control activities during ripening stage and after harvest and most of them use only one kind of rodent pest control method. Most farmers believe that rodent pests can be controlled and rodent pest control is important. Majority of the farmers reported that rodent pests can significantly reduce crop yield and rodent pests can be effectively controlled if farmers work together with other farmers. Most of them also believe that rodent pest should be controlled at all stages of crop growth and after harvest. Rodent pest control all growth stages of crops, use of more than one control method, cooperative work in rodent control and further ecological study on the rodent pests were recommended.

Key words: Sokoru, Gechi, Southwest Ethiopia, rodent pest control, knowledge, perception.

INTRODUCTION

Amongst the world population, more than half is estimated to actively engage in agriculture and many advances have been made in agricultural technology to increase the amount and quality of the yield of different food crops. Despite the advancements and efforts made

to produce sufficient and quality food, millions of peoples around the world suffer from hunger, malnutrition, and starvation especially in developing countries where more than 80% of the populations are farmers. The reasons for these problems are several and complex, one important

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reason being food loss due to crop pests. Vertebrate pests, especially rodents are responsible for much of the loss and farmers often list rodents as one of the most significant pests to their crops (Singleton et al., 1999; Makundi et al., 2005; Sudarmaji et al., 2003; Tuan et al., 2003; Sang et al., 2003). Many researchers also regard rodents as the number one group of mammals in terms of the problems they create in agriculture, horticulture, forestry, and public health (Makundi et al., 1999; Brown et al., 1999). In Ethiopia, among 84 recognized rodent species, about a dozen of the species are significant agricultural pests (Bekele et al., 2003). Recently, Gadisa and Hundera (2015) reported the presence of four rodent pest species, namely *Rattus rattus*, *Mastomys natalensis*, *Arvicanthis dembeensis* and *Lemniscomys barbarus* in Sekoru district (One of the districts in the present study), Southwest, Ethiopia.

Rodent pests cause a considerable pre-harvest damages and losses of crops in many East African countries. For example, Taylor (1968) reported 20% damage to maize plantation, 34 to 100% loss of young wheat in some fields and 34% loss of barley after outbreak of rodents in Western Kenya. Rodent pests cause an estimated pre-harvest loss of 15% maize in Tanzania (Mulungu et al., 2003). During rodent outbreaks, the damage to maize exceeds 80% in certain cropping seasons and locations (Mwanjabe and Leirs, 1997; Mulungu et al., 2003). Preliminary results in Central Ethiopia showed 26.4% loss of yield in maize (Bekele et al., 2003) which is very high compared to 5 to 15% loss of rice in Asia (Singleton, 2003).

Appropriate rodent control strategy, such as Integrated Pest Management (IPM) can help to reduce the loss of yield caused by rodent pests and produce more food to feed the population of a country. For instance, researches conducted in Southeast Asia indicated that effective control measures can help farmers to produce extra rice enough to feed 200 million people for one year (Aplin et al., 2003; Singleton, 2003). The outcome of control measure might be even more profitable in African countries including Ethiopia as the damage caused is more severe in Africa than in Asia.

The success of pest control activity is affected by several factors. One factor is the technology and its availability to manage the problem in a given area. The other very important factor is the socioeconomic conditions and culture of farmers in a particular area (Sudarmaji et al., 2003; Makundi et al., 2005; Mulungu et al., 2003; Tuan et al., 2003; Sang et al., 2003). This underlines the need of collecting the necessary information about farmers' knowledge regarding pest species, their perception about the pests and their current control practices in their locality before designing a certain pest management strategy even if the technology is available. In Southwest Ethiopia, including Jimma and Illubabor zones such information is lacking despite the presence of serious rodent pest problems. To this effect,

this study was conducted to collect baseline data about Knowledge, perception and control practice of farmers in the region about pest rodents.

STUDY AREA AND METHODS

The present study was conducted in two districts: Sekoru (Jimma Zone) and Gechi (Illubabor Zone) of Oromia National Regional State, Southwest Ethiopia. The two districts were selected because information from plant protection clinic of the region tells frequent outbreaks of rodent pests and rodent pest problems in the two districts (personal communication). Four 'Kebeles' (the smallest administrative body in Ethiopia) from each district were selected for this study. The selection of the 'Kebeles' was based on the information of the district agricultural offices regarding rodent pest problems. The chosen areas suffer rodent plague.

Community based cross-sectional survey was conducted to assess farmers' perceptions regarding rodents as crop pests. From each of the four 'Kebeles', 60 respondents were randomly selected to fill the prepared questionnaire. The questionnaire consisted of three sections. The first section was prepared to summarize demographic and farming information. The second section began with a general question on the main pests of the particular village. Farmers were asked what methods they use to control rodent pests, how often, and when they apply. The third section considered beliefs associated with rodent pests and their control. Statements each with five alternatives from which the farmers chose that best describe their belief were provided. If the respondents were literate, the questionnaire was self-administered and if not interview is administered. Information collected from the informants was summarized using percentages and presented in the form of tables and figures. Chi-square test was used to test statistical significance among the different respondents and their responses at 0.05 level of significance.

RESULTS

Profile of the respondents

Among the 480 farmers that participated in the study, 446 (92.92%) were males and 178 (37.08%) of them were within the age range of 31 to 40 years. More than half (55%) of the farmers have not completed the first cycle of primary education (Grade 1 to 4) and none of them were college graduates. The participants have a minimum farming experience of five years with 68.96% of the respondents having farming experience of 11 to 35 years. None of the farmers involved in the study possess farmland less than 1 ha and 216 (45%) and 168 (35%) of them possess 1 to 1.5 and 1.6 to 2.5 hectares of farmland, respectively. Only 96 (20%) of farmers had farmland more than 2.5 hectares (Table 1).

Knowledge and rodent pest control practices

Rodents and nematodes were listed as very important pests by 422 (87.92%) and 412 (85.83%) of the study participants. Birds and insects were listed as very important pests by 237 (49.38%) and 79 (16.46%),

Table 1. The socio-demographic characteristics of the study participants.

Character	Number	%
Sex		
Male	446	92.92
Female	34	7.08
Age		
20-30 years	62	12.92
31-40 years	178	37.08
41-50 years	86	17.92
Above 50 years	154	32.08
Education		
Illiterate	58	12.08
Grade 1-4	264	55.00
5-8	110	22.92
9-10	38	7.92
11-12	10	2.08
College graduate	0	0.00
Farming experience		
5-10 years	87	18.13
11-25 years	197	41.04
26-35 years	134	27.92
Above 35 years	63	13.13
Size of farm land		
Less than 1 ha	0	0
1-1.5 ha	216	45.00
1.6- 2.5 hectare	168	35.00
More than 2.5 ha	96	20.00

respectively. There was no significant difference between the respondents of the two districts in listing rodents and nematodes as very important pests at 0.05 level of significance ($P=0.38>0.05$ for rodents; $P=0.49>0.05$ for nematodes). But, there was significant variation in their responses while listing insects and birds as very important pests in their area ($P=0<0.005$). Some respondents, 131 (27.29%) have also reported the presence of other important pests in their area (Table 2).

Among the major crop types: maize (*Zea mays*), teff (*Eragostis tef*), barley (*Hordeum vulgare*), wheat (*Triticum species*) and sorghum (*Sorghum bicolor*) were grown in the two districts, 394 (82.08%) of the farmers ranked maize as the first crop susceptible to rodent depredation and barley was ranked second by 299 (62.29%) of the study participants. Most (76.46%) farmers listed sorghum as the crop least attacked by rodent pests. There was no significant difference between the respondents of the two districts while ranking the crops based on degree of damage by rodent pests at 0.05 level of significance

[maize ($P=0.88669$) >0.05 , teff ($P=0.55292$) >0.05 , barley ($P=0.524681$) >0.05 , wheat ($P=0.238593$) >0.05 , and sorghum ($P=0.565836$) >0.05] (Table 3).

The occurrence of rodent outbreaks on a regular basis was reported by 278 (57.91%) of the farmers, while 161 (33.54%) of them reported the occurrence of rodent outbreak in their area to happen rarely. None of the respondents in Sekoru and only 3 respondents from Gechi responded by saying rodent outbreak does not occur in our locality. All the farmers in the two districts agreed that they perform rodent pest control activities. Control measures during the maturing stage of the crops and after harvest were carried out by 144 (30%) and 247 (51.46%) of the farmers, respectively. Some farmers, 17 (3.54%) and 43 (8.96%) perform rodent control practices during the time of land preparation and tillering stage, respectively (Figure 1). Most farmers, 360 (75%) perform rodent control activities alone and only 58 (12.08%) respondents reported that they perform rodent pest control activities in group.

Table 2. Farmers ranking of organisms based on their importance as pests.

Organisms	District	Rank					
		Very important		Important		Less important	
		No.	%	NO.	%	No.	%
Rodents	Sekoru	202	84.17	14	5.83	24	10.00
	Gechi	220	91.67	3	1.25	17	7.08
	Total	422	87.92	17	3.54	41	8.54
Insects	Sekoru	58	24.17	79	32.92	103	42.92
	Gechi	21	8.75	103	42.92	116	48.33
	Total	79	16.46	182	37.02	219	45.63
Birds	Sekoru	134	55.83	82	34.17	24	10.00
	Gechi	103	42.92	110	45.83	27	11.43
	Total	237	49.38	192	40.00	51	10.63
Nematodes	Sekoru	199	82.92	24	10.00	17	7.08
	Gechi	213	88.75	17	7.08	10	4.17
	Total	412	85.83	41	8.41	27	5.63
Others	Sekoru	60	25.00	-	-	-	-
	Gechi	71	29.58	-	-	-	-
	Total	131	27.29	-	-	-	-

Table 3. Farmers' ranking of crops based on severity of damage by rodent pests.

Crop	District	Ranking									
		1		2		3		4		5	
		No	%	No	%	No	%	No	%	No	%
Maize	Sekoru	199	82.91	41	17.08	0	0.00	0	0.00	0	0.00
	Gechi	195	81.25	35	12.50	7	2.92	3	1.25	0	0.00
	Total	394	82.08	76	14.91	7	1.46	3	0.63	0	0.00
Teff	Sekoru	7	2.92	21	8.75	24	10.00	137	57.08	51	21.25
	Gechi	17	7.08	14	5.83	21	8.75	147	61.25	41	17.08
	Total	24	5.00	35	7.29	45	9.38	284	59.17	92	19.17
Wheat	Sekoru	14	5.83	36	15.00	134	55.83	39	16.25	17	7.08
	Gechi	10	4.17	27	11.25	154	64.17	30	12.50	19	7.92
	Total	24	5.00	63	13.13	288	60.00	69	14.38	36	7.50
Barely	Sekoru	17	7.08	155	64.58	45	18.75	20	8.33	3	1.25
	Gechi	21	8.75	144	60.00	55	22.92	20	8.33	0	0.00
	Total	38	9.92	299	62.29	100	20.83	40	8.33	3	0.63
Sorghum	Sekoru	0	0.00	0	0.00	13	5.42	38	15.83	189	78.75
	Gechi	0	0.00	7	2.92	7	2.92	48	20.00	178	74.17
	Total	0	0.00	7	1.46	20	4.17	86	17.92	367	76.46

1: Most susceptible for rodent attack, 2: the next susceptible and so on; and 5= the least susceptible for rodent pest depredation).

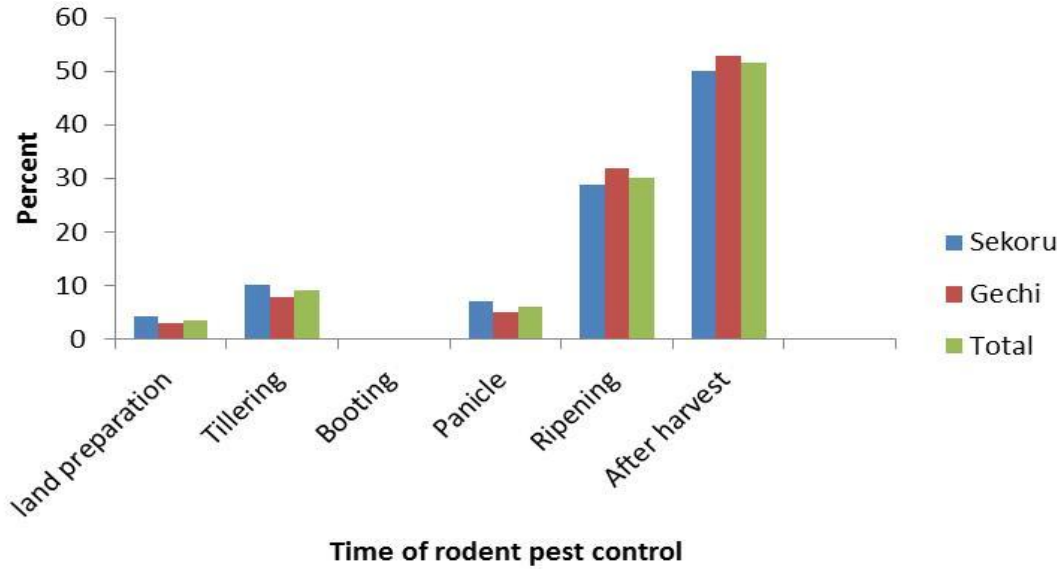


Figure 1. Response of study participants about the time of rodent pest control.

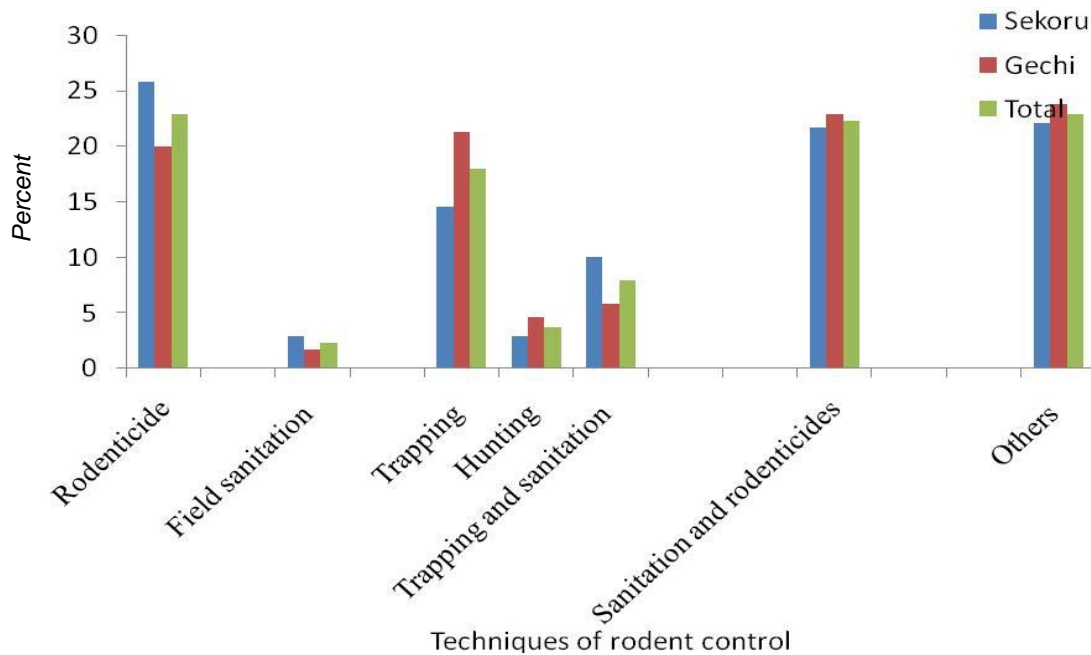


Figure 2. Response of the farmers regarding the type of rodent pest control they use.

Among the study participant farmers, 227 (47.29%) use one type of rodent pest control technique and only 145 (30.21%) of the study participants use two kinds control techniques. None of the farmers utilized more than two kinds of control techniques. Some farmers, 110 (22.92%) responded that they use other techniques not listed in the questionnaire. Among the methods, 110 (22.92%) of the farmers preferred rodenticides followed by trapping which

is practiced by 86 (17.92%) of the respondents (Figure 2).

Farmers’ perceptions

The present study indicated that 349 (72.71%) of the farmers believe that rodent pests can be controlled

and 453 (94.38) of them agreed that rodent control is important. Among the farmers, 398 (82.92%) of them believed that rodent pests can significantly reduce crop yield and 374 (77.92%) farmers agreed that rodent pest control must be carried out. Most farmers, 419 (87.29%), responded that they must work together for effective control of rodent pest and 413 (86.04%) believe that rodent pest control should be carried out at all growing stages of the crops. Among the study participants, 409 (85.21%) of them also underlined the importance of rodent pest control after harvest and 452 (94.17%) respondents agreed that farmers can increase their crop yield by carrying out rodent pest control activities (Table 4).

DISCUSSION

Farmers in the two districts listed rodents and nematodes as the most important agricultural pests. This is in line with many other findings. A study conducted in central Ethiopia and Tanzania revealed rodents as the most important agricultural pests (Makundi et al., 2005). In Australia and Vietnam, rodents are also reported as the most important agricultural pests that are difficult to control (Singleton et al., 1999; Tuan et al., 2003; Sang et al., 2003). Similarly, farmers in west Java (Indonesia) regarded rats, golden apple snails, brown plant hoppers, stem borers, worms and rugged stunt as common pests in their agriculture (Sudarmaji et al., 2003).

The response of 278 (57.91%) farmers indicated that rodent outbreaks occur regularly in the two districts. This implies the crop damage by pest rodent in the two districts could be drastically reduced if appropriate rodent control activity is practiced. Previous reports showed that even in the absence of outbreaks, rodent pests can damage and destroy up to 15% of the crop in a particular area (Mulungu et al., 2003) and under outbreak conditions the damage could reach up to 80% (Mwanjabe and Leirs, 1997; Mulungu et al., 2003). This underlines the need for farmers in the two districts to carefully monitor their crop fields regularly and undertake a timely and appropriate action before outbreaks happen.

Among the major crops cultivated by farmers of the two districts, maize was considered a crop most susceptible for rodent depredation followed by barely by most of the respondents of the present study. Research works done in different East African countries also reported maize as one of the crops seriously damaged by rodent pests (Mwanjabe and Leirs, 1997; Mulungu et al., 2003). Bekele et al. (2003) reported that rodent pests damage 26.4% of maize in Central Ethiopia indicating rodent pests are also serious pests to maize in other parts of Ethiopia.

Though all farmers in the two districts carry out rodent control activities, what they practice to control rodent pests might not end up with success, because their

control activities are not continuous and are restricted to only certain stages of crops or after harvest. This is probably because they may not be able to notice the presence of rodent pests in their crop fields as most rodents are highly secretive and nocturnal (Williams, 1993; Witmer, 2007). Most of the time farmers rely on symptoms of damage before they begin rodent control activities. However, at this time rodents might have reached to a very high density so that application of a certain method may not significantly reduce the damage and loss that can be caused by these pests. In addition, most of the farmers in the two districts apply only one kind of rodent pest control technique and very few apply two kinds of control methods. This is not in agreement with Integrated Pest Management (IPM) that suggests the application of several techniques systematically to get the required outcome from a certain management activity (Tubin and Fall, 2004). Thus, it is very essential to sensitize farmers about the importance of the application of different control methods in all growth stage of crops to get the desired result.

The present study revealed that most of the farmers in the two districts carry out rodent control activities alone. This might also be another reason that might lead to failure in getting the desired result from a certain rodent pest control program. If farmers do not apply rodent control activities in a similar time and intensity, rodents can move from an area where rodent control practice is carried out to an area where no rodent control activity is performed as rodents are highly mobile and adaptive. In addition, they can also return back to the previous area when farmers stop applying rodent control methods after using the area as shelter.

Majority of the farmers in the two districts believe that rodents can be controlled and their control is very important to increase crop yield. This perception is different from the perceptions of farmers in Tanzania and Central Ethiopia that listed rodents as the most important pests that are difficult to control (Makundi et al., 2005). Regarding rodent pest control activities, the response of the farmers contradicts with how they perform control activities. Majority of the farmers perform rodent control activities alone, but they believe that cooperative work can help farmers to carry out effective control practices. Similarly their beliefs in time of rodent control and the kind of rodent control methods are also contradictory. Majority of the respondents agree with the importance of rodent pest control in all the stages of crop growth and after harvest, but most of them carry out rodent control activities mostly in a certain stage for example during ripening of crops or after harvest. No respondent indicated the importance of rodent control at all stages and performed it. At the same time, farmers agree with the application of several control methods for effective rodent control. But, from the response of the study participants, very few use two types of control methods and none of them use more than two methods. Most

Table 4. Farmers' perceptions on rodent pest control.

Perception	District	Response									
		SA		A		DA		SDA		DK	
		No	%	No	%	No	%	No	%	No	%
Rodents can be controlled	Sekoru	151	62.92	27	11.25	24	10.0	4	1.67	34	14.17
	Gechi	137	57.08	34	14.17	20	8.33	7	2.92	42	17.50
	Total	288	60.00	61	12.71	44	9.17	11	2.29	79	16.46
Rodent control is important	Sekoru	189	78.75	34	14.17	0	0.00	0	0.00	17	7.08
	Gechi	213	88.75	17	7.08	0	0.00	0	0.00	10	4.17
	Total	402	83.75	51	10.63	0	0.00	0	0.00	27	5.63
Rodent damage can significantly decrease crop yield	Sekoru	171	71.25	27	11.25	17	7.08	12	5.00	13	5.42
	Gechi	175	72.92	25	10.42	15	6.25	14	5.83	11	4.58
	Total	346	72.08	52	10.83	32	6.67	26	5.42	24	5.00
Rodent control must be carried out	Sekoru	127	52.92	67	27.92	11	4.58	24	10.0	11	4.58
	Gechi	120	50.00	60	25.00	18	7.50	34	14.17	8	1.67
	Total	247	51.46	127	26.46	29	6.04	58	12.08	19	3.96
Rodents can be controlled if farmers work together with other farmers	Sekoru	120	50.00	93	38.75	17	7.08	0	0.00	10	4.17
	Gechi	127	52.92	79	32.92	14	5.83	3	1.25	17	7.08
	Total	247	51.46	172	35.83	31	6.46	3	0.63	27	5.63
Rodents should be controlled at all stages of the growing season	Sekoru	138	57.50	65	27.08	3	1.25	0	0.00	34	14.17
	Gechi	143	59.58	67	27.92	5	2.08	0	0.00	25	10.42
	Total	281	58.54	132	27.50	8	1.67	0	0.00	59	12.29
Rodent control after harvest is important	Sekoru	127	52.92	83	34.58	17	7.08	10	4.17	3	1.25
	Gechi	144	60.00	55	22.92	27	11.25	13	5.42	1	0.42
	Total	271	56.43	138	28.75	44	9.17	23	4.79	4	0.83
By controlling rodents, a farmer can increase his crop yield	Sekoru	171	71.25	51	21.25	1	0.42	0	0.00	17	7.08
	Gechi	168	70.00	62	25.83	0	0.00	0	0.00	10	4.17
	Total	339	70.63	113	21.54	1	0.20	0	0.00	27	5.63
Rodent control must be done once crops start growing	Sekoru	147	61.25	59	24.58	17	7.08	10	4.17	7	2.92
	Gechi	161	67.08	65	27.08	10	4.17	4	1.67	0	0.00
	Total	308	64.17	124	25.83	27	5.63	14	2.92	7	1.46
Rodent control should begin after rodents start damaging the crops	Sekoru	10	4.17	24	10.00	141	58.75	41	17.08	24	10.00
	Gechi	21	8.75	17	7.08	133	55.4	38	15.83	31	12.92
	Total	31	6.46	41	8.54	274	57.1	79	16.46	55	11.46

SA: Strongly agree, A: agree, DA: disagree, SDA: strongly disagree, DK: do not know.

farmers use only one kind of control method.

Extension workers should closely work with the farmers so that farmers practice what they know and believe so that outbreaks of rodent pests could be minimized by undertaking rodent control activities. Farmers should also be advised to use more than one control method in all

growth stage of crops and the technologies should be provided by the concerned body if they are not available. The importance of cooperative work should be emphasized and farmers should be made cooperate in performing rodent control activities. In addition, research work is recommended on the identification and ecology of

the rodent pests of the study area.

Conflict of Interests

The author(s) have not declared any conflict of interests.

ACKNOWLEDGEMENT

The authors acknowledge the Research and Postgraduate Coordinating Office of College of Natural Sciences, Jimma University, for the financial support.

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