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Development and Evaluation of a Community-Based Rodent Control Strategy at Regae

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***Abstract* – In rural environments rodents are pests because they damage standing and stored crops and animal feeds and cause distress among livestock, particularly poultry. Rodents also affect rural people more directly in their homes where they cause damage to buildings and furniture and stored food stuffs and they may even bite people. Rodents also present a human health risk because they factor in the transmission of deadly diseases, such as the bubonic plaque which is transmitted through fleas that use the rodents as hosts. For all of these reasons, rodent control is important. In 2002 the Regae community identified the need to control rodents in the village as a development priority. During community meetings it was identified that rodents damaged standing and stored crops, food stores, and furniture and incidences of children being bitten whilst asleep were reported. The current study was undertaken in response to this identified need. Whereas many approaches and techniques to control rodents exist, the development and implementation of a safe, effective, affordable community-based strategy for the control of rodents in rural settlements, such as Regae, has received little attention. Two surveys were conducted in Regae using capture-mark-release (CMR) and structured questionnaire method respectively. Rodent populations inhabiting suitable environments have the potential to increase rapidly up to the size limit imposed by that environment.**

***Keywords* – Rodent, Community, Development.**

I. Introduction

In 1999, the Department of Local Government and Housing of the Limpopo Province in collaboration with the National Community Water and Sanitation Training Institute (NCWSTI) the provincial Departments of health and Welfare, Works, Agriculture, Education, and Department of Water affairs and Forestry, initiated a collaborative programme to increase the capacity of communities to participate in development activities implemented jointly (DAIJ). The initiative was supported by selected non- governmental structures working in the region, namely the Mvula Trust, the Tsogang Water and Sanitation Project and the United Nation Children Fund (UNICEF). The Middle Lepelle TLC was chosen as the pilot site for the programme. Regae was one of the communities where the programme was implemented. The Regae community was resettled to this village from Winterveldt in 1972. The village is 46 kilometers north of Marble Hall. Agriculture at Regae consists of the production of cattle, sheep and goats on communal rangeland and crops on plots along the Olifants River. Through community meetings it was identified that damage to crops was one of the main problems in Regae. The Regae community complained that rodents gnawed at anything that was remotely edible, be it left over food, seeds, stored crops and plastic. They pointed at the mining activity as the cause of the rodent problem. They reported that the Rockfield Mine Company which was active in the area during 1997 and 1998, made use of the explosives to break up rock formations. Residents claimed that the invasion of rodents commenced at about the same time. Consequently they linked the two events. Their interpretation was that the explosions scared the rodents in the veld and caused them to move to the village. The purpose of this study is to collect information needed to develop an appropriate and efficient strategy to control the local rodent problem. First information on the type of damage caused by the rodents, distribution of the damage, and local control practices and their effectiveness were investigated. There after secondary information were consulted to identify potentially suitable solutions to the problem, subsequently in participation with the community a rodent control strategy were formulated and implemented. Finally the impact of this strategy was assessed.

II. Rodent Pests: An Introduction

Rats and mice spread around the globe stowing on board sailing ships. Their spread coincided with the colonization of the world, [1] (Leiers, 1995:5). According to [1] Leiers (1995:5) rodents and man have had a long lasting relationship and since thousands of years rodents have been dreaded enemies of man. The spread of rats and mice is largely determined by climatic conditions and the availability of food, water and harbourage [2] (The Natural Resource Institute 2005:9). People in developing countries are constantly living on the edge of famine and cannot afford to lose much of their harvest to rodents. Each year, rodents cause financial losses of more than a billion dollars in the United States alone [3] (Meehan, 1984:30). According to [3] Meehan (1984:37) rodents causing damage to humans include at least 40 species. Worldwide, the main species appears to be *Rattus rattus*, but indigenous species may be the main cause of local problems. According to Meehan [3] (1984:295) the amount of food rodents contaminate with their hairs,

droppings and urine far exceeds that which they eat. In agriculture rats cause important economic losses when they infest buildings used for animal production. Apart from feeding on the animal foodstuffs they can cause distress among livestock. For example distress caused by rodents has been shown to significantly reduce egg production among layers [3] (Meehan 1984:293). Selected rodent species favour of human settlement. They enter huts and other human abodes, where they breed under floors, in the thatch of roofs or in holes in the walls. According to [4] Degraaff (1981:222) they also shelter holes in the ground or under the foundation of houses. Although domesticated strain of rats and mice have contributed greatly to medical science, the need for rodent control is urgent. Most people, not only in developing countries, expect control action to visibly kill large numbers of rodents. Consequently they are more likely to invest in rodent control when they can see rodents die.

III. Identification of Rodent Infestations

Active rodent infestation may be identified in several ways. These include droppings, damage to goods and structures, smear marks, runways, tracks, harbourages and burrows, smell, dead and live rodents [3] Meehan (1984:294-303). If droppings are shiny and glistening, this indicates an active infestation. The continually growing incisor teeth of this animal live two parallel shallow marks of about 4 mm on the damage goods and structures [3] (Meehan, 1984:296). Black rat usually travel along well-defined paths in houses, seldom deviating from a known route. As they travel, their bodies come into contact with solid objects such as walls, poles and furniture's in the house leaving a dark greasy deposit. According to [3] Meehan (1984: 303) the grease is produced naturally. Indoors in dusty areas and outdoors in mud, the footprints of rodents can be easily seen. [3] Meehan (1984: 301) says that the presence of tracks may also be a clear indication that an infestation is active since old footprints will soon be eradicated by dust or water. Long thin marks in dusty areas usually indicate a tail being dragged or rested [3] (Meehan, 1984:299).

IV. Methodology

The study investigated how people were affected by the rodents, and the existing strategies and practices they used to control rodents. This was followed by a review of existing knowledge on rodent control strategies and practices with a view of identifying potentially suitable and safe ways to control rodents that could be used as part of community-based rodent control strategy. The two strategies and practices have been synthesised and different options presented to the community to identify the one that will be suitable and effective to the area. The participatory action plan has been developed in the community meeting. The study employed two main research methods, namely a survey and an action-research. Two surveys were conducted in Regae using capture-mark-release (CMR) method and structured questionnaire respectively. CMR method not only examines population numbers, but also individual movement patterns, social interactions turnover rates and least possible interference to the rodent structure [5] (WHO 1974:17). The first one was to determine rodent density in order to formulate control strategies. The second one evaluated the effectiveness of the employed strategies. The survey data were analysed using descriptive statistics enabling the reduction of data to measures of centrality and spread. MS Office Excel was used for this purpose [6] (Mackenzie, [6] Ball & [6] Virdee, 1990:87). To be able to identify rodent population species present in Regae, capture-mark-release (CMR) method was used. The basic idea is that the proportion of marked animals in a recaptured sample is equal to the proportion of all marked animals in the whole population. New animals are marked in every sample, each time resulting in an increased number of marked animals in the population [1] (Leiers, 1995:45). In order to effectively assess the impact of the employed strategies, minimum number alive (MNA) method was used. This is because different species have different capture probabilities and all the individuals of a species on a grid may not be captured during the trapping period [7] (Armstrong, & [7] van Hensbergen 1998:12). The work started in 2002 when the Regae community identified the need to control rodents in the village as a development priority, resulting in the formal decision to develop a safe community-based rodent control strategy. This decision provided the justification for the study. The first phase of the study consisted of a detailed description of the rodent problem. This was achieved by conducting two research activities. The first activity investigated the experiences of the community with the rodent problem. This was done by conducting a questionnaire survey involving a probability sample of 120 households in Regae. The first phase of the study was conducted in 2004 and 2005.

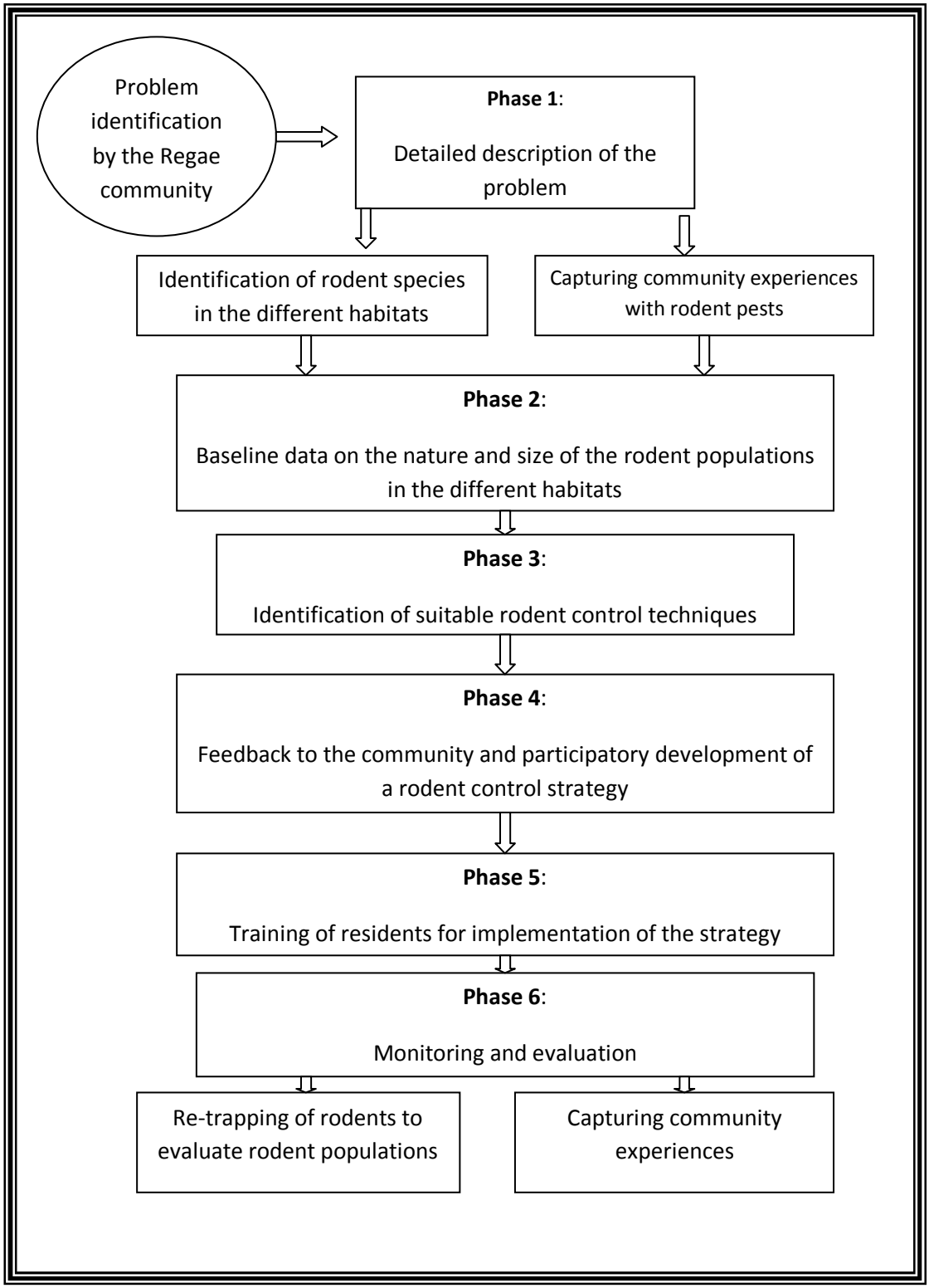

Fig. 1. Framework of the approach used in the community rodent control strategy in Regae village

The results of the trapping guided the review of literature on the rodent species that are of concern in this study. The second phase consisted of the collection of quantitative and qualitative base line data on the density of the rodent populations in the different habitats that were identified. The purpose of collecting this information was to establish a benchmark to quantitatively assess the effectiveness of the rodent control strategy that was developed and implemented. Sherman LFA live traps are used to capture rodents. It is an aluminium rectangular box (7.5×9×23cm) with a door that closes when the animal enters the trap and steps on a baited triggering platform

[1] (Leiers 1995:21). The traps are baited with a mixture of peanut butter, maize scrap and oats [8] (Ferreira & [8] Van Aarde, 1996:116) and [1] (Leiers 1995:21). A trapping grid comprised 100 trapping stations with one trapping grid per stand [8] (Ferreira & [8] Van Aarde, 1996:116). A distance of 10 meters between trapping stations is suitable [9] (Willan, 1992:59). Captured rodents were marked by toe clipping and be released at the site where it was captured [8] (Ferreira & [8] Van Aarde, 1996:115). The third and fourth phases consisted of the development of the community-based rodent control strategy. First a review of literature dealing with rodent control was conducted to identify the available methods. Subsequently, the results of this review were presented to the community. This involved a description of the different methods and their advantages and disadvantages with specific reference to health hazards. Thereafter the community engaged in deciding on the strategy to be used. The fifth phase consisted of training the community in the use of the different rodent control methods contained in the strategy and the implementation of the strategy. The final phase of the study consisted of monitoring and evaluation. This involved trapping of rodents in the different habitats for comparison with the base line data obtained prior to the implementation of the strategy and a survey of the households that were interviewed during phase one of the study. To limit the effect of population dynamics related to season, trapping for baseline data and for impact assessment were done during the same month. In order to effectively assess the impact of the employed strategies, minimum number alive (MNA) method was used. This is because different species have different capture probabilities and all the individuals of a species on a grid may not be captured during the trapping period [7] (Armstrong, & [7] van Hensbergen 1998:12).

V. Results and Discussions

When these rodents invade buildings they chew through wires, gnaw plastic and lead water pipes, makes holes in walls and cause other structural damage. Apart from the damage to infrastructure, furniture and buildings, 51(43%) of the interviewed households reported that these animals is also damaging their clothes. There has been no specific direction about the origin of the rodents at Regae. Initially most of the residents have associated the presents of the rodents with the explosions used to break rock formations from the nearby mountain by Rock Field Mine Company. It is unquestionable that the amount of food contaminated by rodents with hairs, droppings and urine far exceed that which is eaten as witnessed in Regae during household's interviews. Rats biting to Regae residents particularly children while asleep are a general problem. Of the 120 interviewees 58 (48%) reported that their families suffered rodents bite particularly on the feet. According to the residents, it is not easy to be aware on the spot when attacked because for every little bite the rodent blew air to the wound so that it is not hurting. Typically the bites appear as deep slices caused by razor sharp incisor teeth of these rodents. The attack or bite by these rodents to Regae residents is a major concern because they reported that it is likely that these rodents will transmit diseases to the victims (zoonose). Many rodent species carry microorganisms harmful to human health. These include bacteria, rickettsia, viruses, fungi and protozoa. These microorganisms cause many diseases. According to [10] Welden (1990:214-220) transmission can be through an intermediate organism (vector) or directly. Some rodent borne diseases have been known for many hundred of years for causing devastating mortality in human populations. One such disease is the bubonic plaque, which is known to be carried by over two hundred species of rodents. [11] McCormick, [11] Webb, [11] Krebs, [11] Johnson & [11] Smith (1987:437) report that transmission of the bubonic plaque to humans is mainly through fleas who use the rodents as host. The lesson learnt with these animals is that it does not recognise any boundaries, and that they threaten almost every aspect of farming and food production, from spoiling quality to destroying building structures and biting people. To initiate identification of a rodent presenting a pest problem in Regae community, rodents were caught, taken to Tshwane University of Technology and identified by Mr Kobus Kotze of the Department of Nature Conservation. According to him the rodents were classified as follows: **Kingdom,** Animalia, **and Phylum**: Chordata, **Class**: Mammalia; **Order**: Rodentia; **Suborder**: Sciurognathi, **Family**: Muridae, **Subfamily**: Murinae, **Subspecies**: *Rattus rattus, Multimammate mouse, Mus musculus, Mus minutoides* and *Rhabdomys pumilio* respectively. Common name: Black rat, *Mastomys coucha,* House mouse, Pygmy mouse and Field Stripped mouse respectively.

VI. Conclusion

- Rodent control inside the dwellings appeared to be primarily function of the efforts made by the household to prevent and control rodents.
- The rodent survey indicated that implementation of the strategy reduced the prevalence of *Rattus rattus* in and around the village, but this appeared to provide opportunities for the population of other rodent species (particularly *Mus minutoides)* to rise.
- There has been a limited support from the department of agriculture to buy enough rodent traps and cages.
- Lack of continuous support from the department of agriculture also contributed to the less achievements on the employed rodent control strategy.
- The study also revealed that rodents do not recognize any boundaries and that they gnaw at anything that is remotely eatable..

6.1 *Recommendations*

Based on the results of this study it is recommended that community mobilisation be continued and intensified with a view of achieving more effective implementation of the rodent control strategy. Awareness creation should be made on magnitude of the economic losses which result from rodent destruction of crops and consumption of stored food. Dispose of debris and trash as soon as possible. Woodpiles and stacks of lumber or other

materials to be saved for later use should be stored at least 30cm above ground level and as far as away from home as possible. Keep grass short and cut or remove brush and dense shrubbery that may provide rodent protection. Trim the limbs off any trees or shrub that overhang or touch buildings. Seal gaps and holes inside and outside the home that are greater than a ¼ -inch in diameter with one of the following materials: cement, light gage metal mesh, wire screening, hardware cloth, and other patching materials. Keep food and water covered in rodent-proof containers. A rodent proof container of thick plastic, glass, or metal and has a tight-fitting lid will discourage rodents from damaging stored food.

REFERENCES

[1] H. Leirs. (1995). *Population ecology of mastomys natalinsis. Implications for rodent control in Africa*. Belgium: Department of Biology, University of Antwerp.
[2] The Natural Resource Institute. (2005). *Rodent biology and control.* United Kingdom: University of Greenwich.
[3] A.P. Meehan. (1984). *Rats and mice*. Kent: Brown knight and Truscott Ltd.
[4] G. De Graaff. (1981). *The rodents of Southern Africa*. Pretoria: Sigma Press.
[5] World Health Organization (WHO). (1974). *Ecology and control of rodents in public health importance*. Switzerland: Medizinischer, Verlag.
[6] A. Mackenzie, A.S. Ball, & S.R. Virdee. (1990). *Instant notes on ecology*. 2nd ed. London: BIOS.
[7] A.J. Armstrong. & H.J. Van Hensbergen. (1998). Small mammals in afforestable montane grasslands of the northern Eastern Cape Province, South Africa. *South African Journal of Wildlife Research*, 28:11-18. Pretoria: Natal Witness Printers.
[8] S.M. Ferreira, & R.J. Van Aarde. (1996). Changes in community characteristics of small mammals in rehabilitating coastal dune forest in Northern Kwazulu Natal. *African Journal*, 34:113-130.
[9] J.B. McCormick, J.W. Kresbs, K.W. Johnson, & E.S. Smith. (1987). A prospective study of epidemiology and ecology of Lassa fever. *Journal of infectious diseases*, 155:437-444.
[10] O. Welden. (1990). *Encyclopedia of animals' mammals*. London: Toppan Printing.
[11] K. Willan. (1992). *Problem rodents and their control.* Duran*:* University of Natal.

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Born on 04/04/1956 in Groblersdal Town in the Sekhukhune district of Limpopo Province Republic of South Africa. Got Diploma in Agriculture on rural development in Tompi Seleka College of Agriculture situated in Marble Hall Town in 1985. Got B Tech Degree on rural development in 2001 in the Tshwane University of Technology situated in Pretoria the capital of Republic of South Africa in the Gauteng Province. Got Master's Degree in Plant Production on community rodent control in 2011. Got Diploma in Education from University of Limpopo in Limpopo Province next to Polokwane Town which is the capital of Limpopo Province in 2014.

He started working as the Ward Extension assistance in 1982. He then worked as the Agricultural Extension Technician from 1986 until 1992. From 1993 to 2003 he worked as the Agricultural Training Advisor in the Sekhukhune District and managing Five Municipalities namely Fetakgomo, Makhuduthamaga, Ephraim Mogale, Tubatse and Elias Motsoaledi. In 2005 and 2006 he worked as Agricultural Extension Advisor for the Limpopo Province facilitating training in five districts. He then joint Tompi Seleka College of Agriculture in 2007 as the head of Extension and Partnerships. In 2012 he became the Principal of Tompi Seleka College of Agriculture until now. He is presently enrolled as the PhD student with The Da Vinci University in 2014.