

## ENVIRONMENTALLY COMPATIBLE INTERGRATED GERBIL (AND OTHER RODENT) MANAGEMENT FOR CULTIVATED CROPS<sup>©</sup>



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### INTRODUCTION

Rodent invasion of cash crop fields occurs from time to time especially in the grassland and savannah biomes of South Africa. Various rodent species may come into play depending on the nature of the crop as well as the biome in which the crop is produced. The crop type will also strongly determine which type of rodent will likely invade the cultivated field as rodents have different dietary preferences and may adjust their behaviour to match the available food source.

The following genera are usually considered to be pest in agriculture and forestry:

### SPECIES OF ECONOMICAL IMPORTANCE

**Species: *Otomys* spp.** (vlei rat) is found mostly in moist grassland areas and around wetlands.

**Diagnostics:** They eat mainly fresh green plant growth. Their presence can be verified by the tunnels that they make in dense grass and also by the way in which they neatly cut off active growing plant stems with their incisors. Their droppings are short and capsule shaped with a pale brown colour. The animals are generally short and stocky with thick hair and short tails. They live in family groups but rarely reach large population sizes and seldom have a noticeable impact on agriculture.

**Impact:** Vlei rats usually have a minor impact on newly planted timber tree seedlings especially those adjacent to wetlands and in nurseries.



**Angoni vlei rat**



**Brown rat**

**Species: *Rattus norvegicus*** (brown rat) or the ship rat is a very common alien invader that is found in the domestic, industrial and agricultural environment.

**Diagnostics:** They are easily detected by the presence of large numbers of animals, elongated, peanut shaped droppings with a pungent odour and gnaw marks on wood, electronic equipment, irrigation pipes and tree bark, and physical crop damage. The brown rat is a large animal with a tail slightly longer than its body and generally grey-brown in colour.

**Impact:** They usually grow into plague proportions and will have an impact on young timber trees and vegetable crops.

**Species:** *Mastomys natalensis* and *M. coucha* (multi-mammate mice) are grassland and savannah biome species that occur in significant numbers where food is available.

**Diagnostics:** They also burrow and may dig up large tracks of land. Multi-mammate mice are medium sized rodents with long tails and grey bodies. Their droppings are elongated and fairly visible in the field. They feed on grass seed, fresh plant material and insects.

**Impact:** When food is available and climatic conditions are favourable, their numbers can explode into plague proportions. They normally have an impact on vegetable crops.



**Multi-mammate mouse**



**Striped mouse**

**Species:** *Rabdomys pumilio* (striped mouse) is a grassland, fynbos, Karoo and savannah dweller. Their main food is insects, seed and fresh plant material.

**Diagnostics:** It is a medium sized rodent with a long tail and very conspicuously striped over the length of the back. The species does not burrow but makes nests out of grass.

**Impact:** It seldom becomes a significant problem as numbers do not explode like other small rodents.

**Species:** *Gerbillurus*, *Desmodillus* and *Tatera spp.* (gerbilles) are found in the grassland, savannah, Karoo and fynbos biomes mostly in the drier areas.

**Diagnostics:** Gerbilles are small to medium sized rodents with shortish tails and long hind legs. Their droppings are small, oblong and spiked, and easily go undetected. They are burrowing animals and frequent clay soils that offer excellent accommodation in the mud cracks that form during the dry seasons. Sandy soils are also heavily infested with gerbilles where they dig their own burrows. Gerbilles often explode in numbers and figures of 40,000 animals per hectare have alleged been recorded.

**Impact:** They cause massive crop damage due to the burrowing, consumption of freshly planted seed, germinating seed, ripening crops and consumption of the vegetative matter of plants.



**Bushveld gerbil**



**Gerbil droppings**

***This integrated management plan focuses mainly on gerbilles.***

## GERBIL MANAGEMENT

### Understanding gerbil population dynamics and reasons for their invasion of crop fields

- ❖ Favourable food supply. Gerbilles cash in on the abundant food supply in cash crop fields. Newly planted crops and crop residues offer a year round food supply. There is basically no mitigation for this.
- ❖ Continuous mono-culture cropping. With the demand for cereals, grain producers make maximum use of their arable land and plant the same crop due to economic and climatic conditions. This creates a very favourable habitat for gerbilles.

- ❖ Climate change. There is strong evidence that the summer season in South Africa is shifting to a later period in the calendar. Later rains and warm summer ends give gerbilles a better chance of survival.
- ❖ Conservation agriculture. Some agronomists believe that the minimum and zero tillage soil cultivation practices contribute significantly to the growing gerbil problems. When crop fields were deeply ploughed after every harvest it not only destroyed crop residues (removing potential food) but also destroyed a significant part of the population and their habitat. With the advent of conservation soil cultivation practices this important management tool is no longer having its devastating impact on gerbilles.
- ❖ Rodents are not different to other pests and should be managed in an integrated pest management (IPM) system. Most agriculturists practice IPM with varied levels of success. IPM uses all possible mitigation measures available to manage pests and steers away from the *pesticide only* principle. Natural control methods, mechanical control methods, chemical control methods, crop rotation, pest exclusion and pheromones are all part of IPM.

## PRINCIPLES OF PRACTICAL GERBIL MANAGEMENT IN CROP FIELDS

- The founding principle of IPM is maintaining a balanced ecology on the farm. Predator-prey balance is very important to keep gerbil numbers in check. Farmers have a number of allies that will by default assist with gerbil management:



**Common buzzard**

- ❖ Diurnal raptors such as kites, buzzards, small eagles, harriers, secretary birds and certain kestrels will prey on gerbilles. Gerbilles are active from late afternoon until after sunrise and hence will offer diurnal birds of prey a hunting opportunity.

- ❖ Owls are excellent gerbil managers as they are actively hunting when gerbilles are most active during the night. Owl species to attract to the farm include barn owls, grass owls, marsh owls, spotted eagle-owls and Cape eagle-owls.

- ❖ Mammalian predators such as the black-backed jackal, bat-eared and Cape foxes, honey badgers, caracals, servals, African wildcats and mongooses prey on gerbilles.

- ❖ Reptiles including most of the snakes and monitor lizards are gerbil predators.



**Spotted eagle-owl**

These predators are invaluable in rodent management and no activities should be considered that may impact on their well-being. Mammalian predators such as jackals and caracals that predate on livestock must be managed ecologically sensible to avoid secondary impacts on other predators that contribute to gerbil management.

- Another important principle in IPM is to apply rodenticides that will be effective without posing a threat to the predators and their environment. Rodenticides of nature cause may result in the mortality of non-target organisms but if applied correctly the potential risks for non-target species are minimised. Select rodenticides that pose the least possible risk of secondary poisoning to avian predators. The following principles are compulsory when applying rodenticides in field conditions:

- ❖ Use only products that are registered for gerbil management in field situations. Many of the common household rodenticides are not registered for field application as they pose too much risk of secondary poisoning.
  - ❖ Apply rodenticides strictly according to the label instructions. Never overdose or underdose as this may either cause a knock-on effect or render the products ineffective.
  - ❖ Apply rodenticides in such a manner (using bait stations) that other non-target mammals or birds will not be exposed to the products.
  - ❖ Strict monitoring of the effect of the rodenticides is important in order to ensure that no excess product is applied.
  - ❖ Pulsed baiting is important as it is more effective than single applications or continuous applications. Pulsed baiting will be discussed further on in this document.
- The next principle of IPM regarding gerbil management is mechanical control. There are several methods available to the farmer:
- ❖ Water drum traps are effective against gerbilles. It is a very simple and cost-effective method to use but requires day to day management.
  - ❖ Habitat destruction is an option when massive numbers of rodents invade cultivated fields. This is usually done by ripping up the infested areas to a depth of at least 500 mm.
  - ❖ Rodent cage traps may also be used with freshly germinating maize seed as lure but it may not be very effective.
- Another principle of IPM for gerbil is the exclusion of them from cultivated fields. This may be quite difficult to achieve but is still worthwhile to explore especially for small patches of vegetable crops.
- Crop rotation is part of IPM for gerbilles. This breaks the cycle of constant food supply and adds some value to the management of gerbil outbreaks.
- Trap crops are also valuable in gerbil IPM. This provides lush green vegetation at the time when gerbilles will target the crop with their devastating impact. Trap crops create a “barrier” between the gerbilles and the farmer’s valuable crop.
- Lastly is the overarching principle of IPM namely maintaining a continuous monitoring programme of gerbilles. Regular surveys and trapping of gerbilles are essential tools in monitoring their populations. It will give early warnings of potential infestations and thus preventative measures may be deployed to prevent outbreaks. Crop pellets could also be collected around raptor perches and analysed for rodent species.

### Gerbil management protocols

1. Timing of rodent management. It is futile to try and manage a gerbil outbreak when at the time when impact is noticed. Curative management is never successful and will only be a waste of time, effort and money. The following needs to be considered when gerbilles are endemic in an area: Gerbilles take refuge in the hedgerows and around fences where the soil is not utilised for cash crop production during the fallow time. The burrows can be detected easily as they are about 50 to 60 mm in diameter and well defined.



**Hedgerows harbour gerbilles during the non-crop time**

- a. Gerbilles move as far as 50 meters into the planted areas of crop fields directly after seed is planted. They start digging out seed just after planting but cause most damage



**Typical gerbil burrows**

when seeds are germinating. This most probably due to seed being soft and more palatable than when newly planted.

b. Freshly germinated plants are dug out and the plant is neatly severed off from the seed with the animal's incisors. The animal eats the seed and leaves the severed seedling on the soil surface.



**Seedling clipped off by gerbil**

c. The seedlings are located probably by the animal's extremely keen sense of smell and by detecting growth hormones produced by the seeds when germinating. It is therefore evident from damaged fields that all seedlings are dug out in rows as deep as 30 meters into the field.

- d. The gerbil population is expected to explode at the time of germination due to the ample food supply. Very large colonies can develop within a few weeks and may result in as much as 30% crop damage in large crop fields and as much as 100% damage in small plots of cash crops.
- e. The animals appear to collect and store germinated seeds in their burrows as food supply for later in the season.
- f. It is expected that outbreaks may occur more frequently during successive wet seasons and due to climate change that shift rainy seasons and increase ambient temperatures.
- g. Effective management of gerbilles can only be achieved when the animals are at their most vulnerable – that is during the time when crop fields are fallow (winter for summer grain areas and summer for winter grain areas).
  - i. Mechanical trapping (paragraph 6), raptors and owls (paragraph 3), rodenticides (paragraph 5) and nest destruction (paragraph 7) must be done concurrently and successively (as described further on) during the fallow period.
  - ii. Control must be started in the areas of highest density and then moved to areas of lower density.
  - iii. Control efforts must be intensive to be effective.
  - iv. Start off with mechanical trapping and nest destruction, followed by raptors and owls and lastly with rodenticides.

2. Mechanical tilling of soil. Whenever outbreaks of rodent plagues - particularly gerbilles - are expected fields should be tilled after harvesting of the crops and before planting of crops to destroy any gerbil colonies. This may only be required in the first 30 to 50 meters of crop fields as gerbilles seldom invade further than that. Tilling should be done to a deep horizon (700 mm) to ensure that all rodent burrows and nests are destroyed. Follow these management principles when tilling becomes a necessity to destroy colonies:

- a. Before tilling commences, erect raptor perches to allow diurnal birds of prey and owls to capitalise on the rodents' inability to shelter in burrows. (Raptor perches are discussed in paragraph 3a).

- b. If needs be tilling should be repeated after one week to destroy any remaining rodent nests.
  - c. No tilling and minimum tilling are good soil conservation practices, but it does contribute to the increase in numbers of gerbilles in endemic gerbil areas. In order to maintain the required pressure on gerbilles it is important to implement very strict monitoring programmes. Should gerbil populations show any increase it is essential to till crop fields to destroy gerbil breeding areas. Tilling may be repeated as stated in paragraph b to effectively destroy breeding areas.
3. Raptors and owls. Raptors and owls can be lured in to assist with rodent management. The following points are very important:



**Raptor and owl perch**

a. Perches should be erected around the fields and in fields so that birds are able to catch rodents that venture into the crop fields. It is advisable to have a cleared area of at least 2 meters wide around the field with perches erected in this area. Perches should be made of 3 m X 50 mm gum or poplar poles for raptors and be planted to have a length of 2.4 m above the ground surface. Perches for owls can be shorter – 1.6 m X 30 mm gum or poplar poles that are planted to have a height of 1.4 m. For both perches long sisal inflorescence stems may also be used to save on costs. Long and short poles should be planted at the outskirts of the tilled zone at 50 m intervals. No cross arms (as in the picture) should be erected on perches as it appears from previous experience that the birds prefer straight poles.

i. To attract owls and diurnal raptors to the perches, it is advisable to scatter a few handfuls of crushed grain around the perches late in the afternoon. Gerbilles will soon discover the food and lure owls and raptors to the perches.

ii. It is advisable to remove barbed wire from fences where perches are erected in close proximity to fences as owls are often trapped by barbs when they try and perch on fences. This particularly true for marsh owls, barn owls and spotted eagle-owls.

iii. Should crop field fences have smooth wire the fence posts could be modified to suit as owl and raptor perches.

b. No rodenticides should be applied while raptor perches are up. Should rodenticides become necessary, the perches must be taken down.

c. Owl nesting boxes may also be erected for barn owls and spotted eagle-owls around crop fields. Only one owl nesting box should be erected per 20 hectares. Boxes are simple to construct: a base of 400 mm X 600 mm with three walls of 400 mm high is fitted with a roof and one of the short sides is left open as an entrance. Fit a 50 mm high doorstep to the entrance to secure chicks and eggs. Boiled linseed oil or roof paint (three coats) will preserve the wood for at least nine years. The JoJo owl boxes (013-262-3021) are equally suitable as nesting boxes for both owl species. Such nesting boxes may be attached to trees on the perimeter of the crop fields or on long poles. Ideal height is 4 m above ground level. If boxes are going to be out in



**Typical owl nesting box**

the open and not under the cover of trees then the outside surface should be painted white with PVA paint to reflect heat. Nesting box doors should face southeast or east.

4. Trap crops are a means of keeping gerbilles out of planted areas during the time when gerbil damage is expected. Cheap grain crops must be planted on the outskirts of the tilled zone to lure rodents away from the germinating crops. This will also



**Trap crop planted next to maize**

keep many of the bird species that may forage on germinating crops away from planted areas. A one meter wide swath of grain should be planted but timed so that it offers fresh, palatable matter to rodents at the time when the planted crop germinates. Grains such as rye, barley, wheat and soy could be considered as trap crops.

- a. Raptor perches must be erected in the trap crops to allow raptors and owls to predate on rodents.

5. Rodenticides. Rodenticides should be used as a last resort and in a 'big hammer' approach if an outbreak has to be brought under control, or to knock a population out before it starts proliferating. The 'big hammer' approach is to knock out infestations rapidly and effectively. Rodenticides should also be used during the fallow periods to crash the residual populations of gerbilles that find harbour in hedgerows and around fences.

Several rodenticides are registered for gerbil control. **However, the Griffon Poison Information Centre reserves the right to only endorse the use of rodenticides that pose little or no risk of secondary poisoning to owls and raptors.**

- a. **FLOCOUMAFEN. Storm Secure** (registration number L9740, Act No. 36 of 1947, **HARMFUL**, contains 0.05 g/kg flocoumafen, BASF South Africa (Pty) Ltd, P.O. Box 2801, Halfway House 1685) and **Storm** (registration number L5204, Act No. 36 of 1947, **HARMFUL**, contains 0.05 g/kg flocoumafen, BASF South Africa (Pty) Ltd, P.O. Box 2801, Halfway House 1685) are wax block formulation rodenticides that are weather resistant and palatable for gerbilles. Flocoumafen is a second generation, single feed rodenticide. Animals will succumb to the effects of flocoumafen after a single ingestion of Storm Secure or Storm. The avian toxicity of flocoumafen is high ( $LD_{50} = 24$  mg/kg) and there is thus reason to believe that there may be a risk of primary poisoning if birds like seed eaters consume any of the bait blocks. However, if the bait blocks are applied as directed in this document, the chances of primary bird poisoning is very low. Secondary poisoning of owls may be an issue due to the high toxicity but if applied according to these directions, the secondary poisoning risk is minimised. It is a good precautionary principle to collect dead and dying rodent from the third day after the first application of Storm Secure or Storm and to incinerate these animals. Collection is best done in the early morning.

Avoid using Storm Secure or Storm during the peak breeding seasons of grass and marsh owls – mostly from April to the beginning of June. During this time young, inexperienced owls may target dying rodents as prey and it is in their interest to avoid using Storm Secure during this period.

- b. **DIFENACOUM. Ridak Bait Block** (registration number L8641, Act No. 36 of 1937, contains 0.05 g/kg difenacoum, **HARMFUL**, BASF South Africa (Pty) Ltd, P.O. Box 2801, Halfway House 1685) and **Ridak Pasta** (registration number L8642, Act No. 36 of 1937,

**HARMFUL**, contains 0.05 g/kg difenacoum, BASF South Africa (Pty) Ltd, P.O. Box 2801, Halfway House 1685), **Rodex Raptor Rat and Mouse Pellets** (registration number L9567, Act No. 36 of 1947, contains 0.05 g/kg difenacoum, **HARMFUL**, Innovative Pest Management, P.O. Box 3131, Kenmare 1745) and **Rodex Raptor Rat and Mouse Grain Bait** (registration number L9567, Act No. 36 of 1947, contains 0.05 g/kg difenacoum, **HARMFUL**, Innovative Pest Management, P.O. Box 3131, Kenmare 1745) are registered for gerbil control. Difenacoum is a first generation or multiple feed rodenticide. Gerbilles must ingest at least three successive doses of Ridak for the difenacoum to take effect. The avian toxicity of difenacoum is also high at LD<sub>50</sub> > 50 mg/kg but since it is a multiple feed rodenticide it poses a limited risk of secondary poisoning to raptors and owls.

Wax blocks and paste blocks should be applied in home-made or commercially available bait stations. Home-made bait stations are made from 75 mm plastic pipes with a length of 600 mm. Four wax blocks or paste blocks should be strung on a wire loop inside the pipe. The wire loop must be tied on the outside of the pipe. Such bait stations can be placed every 20 meters on the immediate perimeter of the crop field inside the first rows of plants when damaging gerbil populations have to be controlled. During the fallow period the bait stations should be placed on the verges of hedgerows. Bait stations should be checked every four days and replenished if necessary. The grain bait is best applied directly into gerbil burrows during times when gerbilles are starved for food. It may also be applied in bait stations.

- c. **COUMATETRALYL. Mirron Grain Bait** (registration number L9495, Act No. 36 of 1937, contains 0.05 g/kg coumatetralyl, **CAUTION**, Villa Crop Protection, P.O. Box 10413, Aston Manor 1630) and **Rumour Grain Bait** (registration number L9496, Act No. 36 of 1937, contains 0.05 g/kg coumatetralyl, **CAUTION**, Universal Crop Protection, P.O. Box 801, Kempton Park 1620) are available for gerbil management. The coumatetralyl active ingredient is one of the least harmful to birds (LD<sub>50</sub> for birds is >2,000 mg/kg) and can thus be used throughout the year to control gerbilles. It is a first generation, multiple-feed anti-coagulant and animals have to ingest it for at least three days before the coumatetralyl will kill them. It is very effective despite not being an acute toxin. It is, however, very important in terms of efficacy to apply grain-based baits during times when there is a scarcity of other feedstocks for gerbilles as they may not readily take grain baits when natural food or planted seeds are on offer.

Grain baits must be applied in bait stations, preferable those obtainable from suppliers of the rodenticides. These bait stations are also suitable for paste and wax block baits. Practical experience has shown that placing grain baits into gerbil burrows is not effective when there is ample food supply; it is, however, suitable for placement into gerbil burrows when food is very scarce.

- d. **BRODIFACOUM: Recuse Bait Block** (registration number L9447, Act No. 36 of 1937, contains 0.05 g/kg brodifacoum, **HARMFUL**, Villa Crop Protection, P.O. Box 10413, Aston Manor 1630), **Reduce Bait Block** (registration number L9448, Act No. 36 of 1947, contains 0.05 g/kg brodifacoum, **HARMFUL**, Universal Crop Protection, P.O. Box 10413, Aston Manor 1630), **Rodex Rat and Mouse Grain Bait** (registration number L9291, Act No. 36 of 1937, contains 0.05 g/kg brodifacoum, **HARMFUL**, Innovative Pest Management, P.O. Box 3131, Kenmare), **Rodex Bait Blocks** (registration number L9292, contains 0.05 g/kg brodifacoum, **HARMFUL**, Innovative Pest Management, P.O. Box 3131, Kenmare), **Rodex Rat and Mouse Pellets** (registration number L9293, Act No. 36 of 1937, contains 0.05 g/kg brodifacoum, **HARMFUL**, Innovative Pest Management, P.O. Box 3131, Kenmare 1745), **Pulse Pellets** (registration number L6190, Act No. 36 of 1937, contains 0.05 g/kg brodifacoum, **HARMFUL**, Lifeguard Science, Private Bag X3, Lanseria 1748), **Pulse Wax Block** (registration number L6189,

Act No. 36 of 1937, 0.05 g/kg contains brodifacoum, **HARMFUL**, Lifeguard Science, Private Bag X3, Lanseria 1748), **Kombat Rats and Mice Blocks** (registration number L6425, contains 0.05 g/kg brodifacoum, **HARMFUL**, Kombat (Pty) Ltd, 39 Dr. Gordon Drive, Greytown 3250) and **Kombat Rats and Mice Pellets** (registration number L6424, contains 0.05 g/kg brodifacoum, **HARMFUL**, Kombat (Pty) Ltd, 39 Dr. Gordon Drive, Greytown 3250) are registered for gerbil management. Brodifacoum is a second generation single feed anti-coagulant rodenticide. There is a possibility of primary poisoning of birds due its high avian toxicity (LD<sub>50</sub> is 0.31 mg/kg for birds) and thus the product must be used with extreme caution. Due to the offering of a wax block the palatability for birds of very low and hence birds should not really be prone to eating the bait.

Rodents that die off after ingesting brodifacoum pose a secondary poisoning risk to owls and raptors. In order to prevent this all owl and raptor perches must be removed before the application of brodifacoum baits and only be replaced fourteen days after the last application. It is also best to apply these rodenticides when grass and marsh owls are not breeding. It is a good precautionary principle to start collecting dead and dying rodents from the third day after the first application of these brodifacoum containing products and to incinerate these animals. Collection is best done in the early morning.

Use the pulsed baiting principle must be used with anti-coagulant rodenticides. Bait should be supplied for short periods of time (10 to 14 days), removed for 14 days and re-applied for 10 to 14 days after which the campaign must be evaluated for efficacy.

No wax blocks or paste blocks may be placed out in the open without the use of bait stations – it is against registration and may pose an unnecessary risk to non-target animals.

Raptor perches should be taken down when anti-coagulants are applied but re-erected fourteen days after the end of a rodenticide campaign. Dead rodents should be collected and disposed of before the erection of raptor perches.

- e. **ZINC PHOSPHIDE ready-to-use grain baits. Avi-Knaagdood** (registration number L4273, Act No. 36 of 1947, contains 20 g/kg zinc phosphide **CAUTION**, Avima (Pty) Ltd., P.O. Box 3131, Kenmare 1745) and **Hyperrat** (registration number L7351, Act No. 36 of 1947, contains 40 g/kg zinc phosphide, **CAUTION**, Arysta LifeScience (Pty) Ltd., 7 Sunbury Office Park, La Lucia Ridge 4019).
- f. **ZINC PHOSPHIDE concentrate. RotBlitz** (registration number L9481, contains 800 g/kg zinc phosphide, **HARMFUL**, National Fumigants (Pty) Ltd, P.O. Box 935, Kenmare 1752) and Farmag Zinc Phosphide (registration number L10022, Act No. 36 of 1947, contains 800 g/kg zinc phosphide, **TOXIC**, Cedar Falls Properties 130 (Pty) Ltd, 22 Burnside Road, Old mill Industrial Park, Mt Edgecombe 4300) are registered for gerbil control. The standard recipe for preparing gerbil baits is 40 kg maize (preferably broken), 1 kg zinc phosphide concentrate and 1 litre warm sunflower oil.
  - i. A refined procedure that provides a more effective bait is as follows: germinate the maize seed, dry it off and then apply the zinc phosphide and sunflower oil. This bait is then applied in plastic bait stations (see different models). About 30 grams of bait should be placed out per bait station. Bait stations must be spaced at 10 m intervals. Bait must be applied in pulses of five days: apply bait for five days, remove for five days, apply for five days, etc. Bait stations should be checked and replenished at least every second day to ensure that bait remains fresh and palatable.

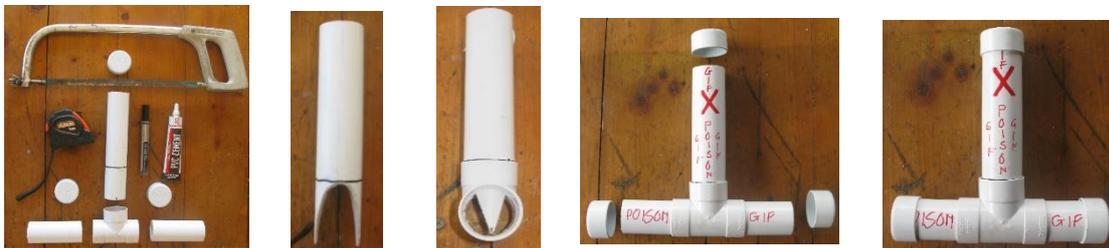
1) It is best to place bait stations out and replenish them late afternoon.

- 2) Bait stations must be placed on the immediate perimeter of the crop field in the first row of plants and in hedgerows where gerbil activity and burrows are noticed.
- 3) Zinc phosphide baits can also be placed directly in gerbil burrows. This should be done as follows: Make a long tube funnel from 25 mm PVC irrigation pipe and the upper end of a 2-litre plastic cold drink bottle. Insert the funnel into the burrow and drop approximately 1 teaspoon of zinc phosphide bait down the funnel into the burrow. Once the bait is dispensed, cover the burrow with the heel of the shoe.
- 4) Raptor perches must be taken down before baiting commences and may only be re-erected two days after baiting has terminated.
- 5) Workers that handle any of the phosphine products **MUST** wear butylene rubber gloves and facial masks.

### HOME-MADE BAIT STATIONS FOR GERBIL RODENTICIDES (ACUTE AND CHRONIC RODENTICIDES)

**T-structure bait station** made from 50 mm PVC drainpipe and fittings. Material required is a length of 50 mm PVC drainpipe, one T-piece and three stoppers plus a tube of PVC glue.

1. Cut the one end of a 30 cm piece PVC pipe into a V-shape (like an arrow):
  - a. Mark a circle 60 mm from the end of the pipe with a black marker.
  - b. Mark the middle of the pipe at the end with a black marker.
  - c. Cut from the middle as marked at the end of the pipe to the circle at 60 mm with a hacksaw. Repeat this cutting on the opposite side of the pipe.
2. Apply a small trickle of PVC cement to the arrow shaped end of the pipe; push this arrow edge of the 30 cm piece into the T-piece connector as shown so that the sharp points are in the outlets of the T-piece connector.
3. Apply a small trickle of PVC cement to the one end of each of the 10 cm inserts and insert these into the side joints of the T-piece connector.



4. Affix the bait station to a steel or wooden dropper with a cable tie in the crop field. Place the rodenticide bait down the vertical tube and seal the tube with the stopper.

**Irrigation pipe bait station** is made from a 500 mm piece of 75 mm irrigation pipe. The baits must be strung through a piece of soft binding wire inside the pipe and pipes must be placed 10 meters apart in the affected area.



- g. **ALUMINIUM PHOSPHIDE.** Aluminium phosphide tablets may be used to fumigate gerbil burrows; it is only successful if the soil in the burrows is moist as water is required to activate the aluminium phosphide and liberate the phosphine gas. Five brands are available namely **Aluminium Phosphide Tablets** (registration number L6279, Act No. 36 of 1947, contains 560 g/kg aluminium phosphide, **VERY TOXIC**, RT Chemicals, 10 Ninth Avenue, Kroonstad 9700), **Aluminium Phosphide Pellets** (registration number L6277, Act No. 36 of 1947, contains 560 g/kg aluminium phosphide, **VERY TOXIC**, RT Chemicals, 44 Kerk Street, Lichtenburg 2749), **Aluminium Phosphide TB** (registration number L8214, Act No. 36 of 1947, contains 570 g/kg aluminium phosphide, **TOXIC**, Volcano AgroScience, 7 Sunbury Office Park, La Lucia Ridge 4019), **QuickPhos Tablets** (registration number L7501, Act No. 36 of 1947, contains 560 g/kg aluminium phosphide, **VERY TOXIC**, Coopers Environmental Science (Pty) Ltd, 91 Maple Road, Pomona 1619) and **Farm-Ag Aluminium Phosphide** (registration number L10024, Act No. 36 of 1947, contains 570 g/kg aluminium phosphide, **TOXIC**, Cedar Falls Properties (Pty) Ltd, 22 Burnside Road, Old Mill Industrial Park, Mt Edgecombe 4300). Make sure that **ONLY** active gerbil burrows are identified and drop one tablet into each after which the burrow must be sealed off.
6. Water drum traps. This practical technique has been applied by some farmers with great success. Steel or plastic containers with open tops are planted level with the soil surface. The drums are half filled with water and sunflower seed is scattered on the water. Rodents attempting to get to the seed drop into the drums and drown.
- Drums can be planted in the tilled zone around the crop fields at 10 to 20 meter intervals. A few seeds should be scattered around the drums on the soil surface to attract the rodents to the drums. Do this at sunset to avoid attracting game birds to the drums.
  - This method needs day to day management and corpses should be collected in the morning and disposed of.
  - Raptor perches should remain erected as this method does not pose any risk to the raptors.
  - It may also be used simultaneously with the rodent baits but in such a case raptor perches must be taken down.
7. Nest destruction. It may be advisable in situations where gerbil numbers are out of control to destroy nesting colonies by tilling hedgerows. Deep tilling to about 700 mm is required to effectively destroy nesting colonies.

8. Exclusion of rodents from crop fields. This technical can only be applied in small crop fields. It consists of a simple method of planting a steel or plastic plate of about 300 mm high around the crop field and thereby preventing rodent invading the field from the surrounding habitat.

## **IMPLEMENTATION SEQUENCE FOR RODENT MANAGEMENT PROTOCOLS TO PREVENT GERBIL OUTBREAKS**

### **During the non-crop season**

1. This is the time when gerbil populations are vulnerable to climate and food scarcity and it is best to knock population back during this time with the use of the recommended and registered rodenticides. It is also more environmentally sensible to apply rodenticides during this time as migrant raptors are absent, and owls have delivered most of their offspring.
2. Use drum traps and rodenticides to crash the population that will be overwintering in hedgerows.
3. Once the rodenticide campaign is completed allow fourteen days before erecting raptor and owls perches as described earlier on in the management plan.
4. Till spots in the planting area that are infested with gerbilles.
5. Monitor the population on a regular basis.

### **Before the planting season – if gerbil activity is noticed**

1. Till a 2 m wide track around the crop field. This track could be wider depending on the cultivation practice.
2. Plant a trap crop on the outskirts of the tilled track. This crop should produce ample, fresh green material at the germination time of the cash crop.
3. Bury water drum traps in the tilled track and manage these devices daily.
4. Apply rodenticide baits for the period recommended.
5. Remove rodenticide baits after successful extermination of the rodent infestation.
6. Allow fourteen days after the last application of rodenticides and then erect raptor perches and owl nesting boxes as recommended.
7. Implement a rodent population monitoring programme.

## **EMERGENCY PROTOCOLS FOR POTENTIAL HUMAN AND WILDLIFE POISONING BY RODENTICIDES**

1. My telephone number must be at every farm and production facility to call for support with any poisoning emergency.
2. A local veterinarian should be contracted to assist with any poisoning emergencies.

3. Vitamin K1 should be on stock at all farms and production facilities for treatment of anti-coagulant poisonings.
4. For phosphine poisonings it is strongly recommended to seek the immediate advice of a poison information centre while taking the patient to a medical facility. Magnesium sulphate has been used to reduce the effects of phosphine poisoning but it is still necessary to get professional medical support.
5. No treatment of mammals or birds should be administered before consulting with me.
6. Human patients may not be treated for poisoning; they have to be treated by a qualified and registered medical practitioner.

## **ENVIRONMENTAL SAFETY PRECAUTIONS WITH RODENTICIDES**

- 1. Apply rodenticides strictly according to label instructions.**
- 2. Never scatter rodenticides on surfaces; only apply in burrows or in commercial or home-made bait stations.**
- 3. Never use insecticides to mix home-made rodenticides; it is illegal and very risky.**
- 4. It is good practice to remove owl perches when rodenticides are applied to prevent primary and secondary poisoning.**
- 5. Use rubber gloves when applying rodenticides.**
- 6. Do not take the dogs along when applying rodenticides as they tend to eat baits.**

**GRIFFON POISON INFORMATION CENTRE (24 HOUR POISONING  
EMERGENCY HELPLINE) 082 446 8946**

**IMPLEMENT THE MANAGEMENT PLAN BY FOLLOWING THE ADVICE**

***IT IS THE RIGHT THING TO DO!***