HOGGONE®

meSN®

Feral Pig Bait

For reductions in feral pig populations

HOGGONE® meSN® Feral Pig Bait features

HOGGONE® meSN® (microencapsulated Sodium nitrite) **Feral Pig Bait** is a new concept in humane feral pig control.

- HOGGONE® contains sodium nitrite which is an approved food preservative in low doses but which kills pigs quickly
- HOGGONE® is humane and kills by oxygen depletion to the brain and tissues (*metabolic anoxaemia*)
- Pigs are highly susceptible to sodium nitrite because they have low levels of a protective enzyme that is present in most other animals
- HOGGONE® acts quickly and pigs die within 1-3 hours after eating a small quantity of bait
- Pig carcasses are usually found within 200m of the bait site
- Most non-target animals are unlikely to eat HOGGONE®, the bait is used in target-specific bait boxes that prevent access by other animals
- HOGGONE® degrades in the environment leaving no residues
- HOGGONE® is available without special permits

This booklet summarises how HOGGONE® works and the best way to get efficient pig control using HOGGONE®.

Acknowledgements

The HOGGONE® project arose out of the former Invasive Animals Cooperative Research Centre (IA-CRC) and Animal Control Technologies (Australia) Pty Ltd (ACTA) with contributions from Connovation in NZ, U.S. Department of Agriculture (USDA) Wildlife Services program and Texas Parks & Wildlife Department (TPWD) in the USA. Many field experts in Australia and the USA, contract toxicological labs, regulatory consultants, formulation technologists at GEA Pharma systems in Europe and Australia, analytical groups, tooling designers and manufacturers in several countries also contributed. The generous efforts of field staff and landholders who have assisted with extensive testing was crucial. This booklet has been reviewed by an expert panel.

Contributors over the 12 year R&D and testing program are too numerous to mention individually but ACTA acknowledges these inputs and the selfless contributions of many to solve difficult technical problems and complete the testing in demanding field conditions.

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acta

Australian Government Department of Industry, Innovation and Science

Invasive Animals CRC

mla

MURRAY–DARLING BASIN AUTHORITY

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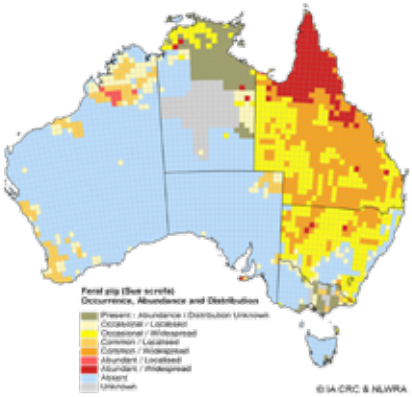
Cover image by Jason Wishart

Feral pigs in Australia

Feral pigs (*Sus scrofa*) have been in Australia since European settlement. Most early populations were found near settlement areas, but they have since spread across 45% of the mainland. They occur on several offshore islands and in all States and Territories. Densities are greatest in Queensland and New South Wales. Pig numbers increase during good seasons and decrease in droughts. It has been estimated that there could be more than 13 million feral pigs across Australia. Populations continue to increase and spread by natural dispersal and deliberate release. Climatic matching suggests there are more suitable areas in Australia that feral pigs could colonise, so the problem could get worse. Pigs can live in arid areas if they have adequate food, water and shelter.



Pig behaviour

Feral pigs can flourish in many habitats because they are highly adaptive. Being opportunistic omnivores, they can eat meat or vegetable matter depending on what is available. In cooler conditions pigs can be seen foraging during the day but most foraging occurs between sunset and sunrise. Feral pigs have relatively large home ranges (average 11km^2) and can travel considerable distances (>7km per night) from shelter to food and water. They often use regular travel pads when they move, though travel distances can be much shorter if local food and shelter is available. Signs such as wallows, rooting in the soil, tracks, dung, fence crossings and tree rubs can be useful for determining recent pig activity.

Web sourced image

Reproduction

Feral pigs tend not to have a defined breeding season. Instead, breeding events are triggered by food availability. When high quality food is plentiful, sows can breed throughout the year. They are pregnant for just under four months, followed by a short non-breeding period while lactating. This means they can produce up to two weaned litters within 15 months under ideal conditions. However in rangelands, where good quality food is often scarce, breeding is typically triggered by rain events and the subsequent flush of green vegetation.

In harsh years or times of drought, sows may not breed at all and piglet mortality can be high, so pig numbers can fluctuate with seasons.

Sows reach sexual maturity when they reach a body weight of approximately 25kg. The litter number and birth weight are determined by the sow's diet. If protein levels are under 14% the litter has a low chance of survival. Protein levels in the sow's diet are a key factor in reproduction and subsequent population levels.

Piglet litters are weaned after about 3 months.

Image by Jason Wishart

Image by Jason Wishart

Feral pig damage

Environmental impacts

Feral pigs cause considerable damage to both animal and plant biodiversity. They are known to consume small mammals, lizards, snakes, turtles, frogs, birds, crustaceans, insects and earth worms.

They also compete for resources needed by native species and destroy native habitat.

Perhaps the most obvious damage caused by feral pigs is when they turn over soil, logs and rocks with their snout during ground rooting while searching for roots of edible plants and invertebrates. Rooting typically occurs in moist areas such gullies, creeks and drainage lines.

Disturbance caused by rooting can promote weed establishment, alter vegetation structure and contributes to soil erosion and contamination of waterways. It may also help spread the soil-born root-rot fungus *Phytophthora cinnamomi* (that produces a lethal root infection in native plants) and Panama disease in banana plantations.

Photo courtesy Shaun Seymore

Photo courtesy Jim Mitchell

Native animals in the contents removed from a single pig belly

Turtle hatchlings in a single pig stomach

Agricultural impacts

Feral pigs cause agricultural damage by:

- eating and flattening crops and pasture
- killing and eating lambs and goat kids
- competing with stock for water and food
- contaminating water sources
- destroying infrastructure such as fences, dams, levies and irrigation lines

Feral pigs cause at least $100 million in lost production every year. Feral pigs have been reported to kill up to 30% of lambs born and with high values for lambs, this loss could cost an individual farm tens of thousands of dollars each year.

Pig damage to grazing land
Photo courtesy Jim Mitchell

People can be at risk of attack by feral pigs

Feral pigs and disease

Feral pigs in Australia already carry many serious diseases including:

- Leptospirosis
- Hepatitis E
- Brucellosis (*suis*) that can infect livestock and humans
- Salmonella, Campylobacter, Rickettsia & Chlamydia

Of potentially greater importance is the risk of feral pigs spreading exotic diseases such as:

- Foot and Mouth Disease (FMD)
- Classical swine fever
- Pseudorabies (Aujesky's disease)
- Japanese Encephalitis
- Nepah virus
- African Swine Fever (ASF) and

possibly even Ebola or Zika viruses.

Pig inflicted bites on dog walker's legs in Canberra

As pigs encroach on the urban fringe interactions with humans increase

Pigs raid rubbish facilities even in major cities including Barcelona (this photo), Berlin and Hong Kong
Photo courtesy SEF a S/Ajutament de Barcelona Via Guardain Newspaper

The risk of disease transfer from pigs to livestock is high. Photo courtesy Jason Wishart

These exotic diseases could cause enormous economic losses and threaten animal health and meat exports if they were to enter and spread across the country. A recent example of an exotic disease outbreak, made worse by feral pigs, occurred in Eastern Europe in 2014 when dead wild boars tested positive to African Swine Fever (ASF). Virulant ASF kills almost 100% of infected animals. Any pig living with infected animals must be culled to prevent the spread of this highly contagious and very stable virus.

There is no vaccine or treatment for ASF.

Since its discovery in Eastern Europe, ASF has spread westward into in Poland, Hungary, the Czech Republic, Belgium and China has reported outbreaks in most provinces. From China, ASF progressed rapidly into many countries in the Asia Pacific. Prior to the ASF outbreak, China produced some 50% of the world's farmed pigs, but more than 200 million have died or been slaughtered in that country due to ASF.

Feral pig control techniques

In Australia, poison baiting, aerial shooting, hunting, trapping and exclusion fencing are techniques used in attempts to manage feral pig populations.

Some of these techniques are more suited to certain areas than others, and some are more successful at different times of the year. For example, aerial shooting is only effective in areas where there is reduced scrub and tree coverage.

Best practice feral pig programs should use several techniques in strategic succession to maximise population reductions and to slow population recovery.

No technique is 100% effective.

Helicopter shooting
Photo courtesy Mike Bodenchuck

Large corale traps
Photo courtesy Jason Wishart

Ground shootoing and hunting
Photo courtesy Jason Wishart

Exclusion fencing is expensive but works.
Photo courtesy John Scriven

Baiting pigs with 1080

Poison baiting is the most common and cost-effective method to manage feral pigs.

A variety of toxins have been used in Australia including sodium fluoroacetate (1080), Yellow Phosphorous and Warfarin (experimental only). Warfarin was never approved because of animal welfare concerns and Yellow Phosphorous is now banned in all states, except Queensland as it is neither humane nor safe for non-target species.

1080 poison is a useful and effective toxin, but even 1080 is not ideal for feral pigs because they require a high dose which can pose a risk to non-target species. This led to research on sodium nitrite in HOGGONE® bait as a new effective tool to combat the feral pig threat and address non-target concerns with other toxins.

PIGOUT® Bait and PIGOUT® Econobait® manufactured 1080 baits are designed to provide greater target specificity than the use of the toxin on grain or in meat.
See www.animalcontrol.com.au for more information.

IA-CRC designed HOGHOPPER® can be used with several bait types

The PIGOUT® bait contains 72mg of 1080 isolated within the bait core

The smaller PIGOUT® Econobait® contains 24mg of 1080 spread throughout the bait matrix.

Image by Jason Wishart

Baiting pigs with HOGGONE®

HOGGONE® is a new type of bait that uses sodium nitrite to kill pigs quickly and humanely.

What is Sodium Nitrite?

Sodium nitrite (SN) is a simple chemical that is used and approved globally, at very low concentrations, as a preservative for processed meats. It occurs naturally in fruits and some vegetables such as spinach. Doses used for food preservation are low and pose no risk to humans.

How does it work?

Oxygen is attached to haemoglobin in red blood cells and is transported to all tissues and cells in the body. Sodium nitrite works by converting haemoglobin to methaemoglobin (metH), that is unable to transport oxygen. Most animals can tolerate low to moderate amounts of SN but pigs have a high susceptibility to this compound because they have low levels of the protective enzyme (*methaemoglobin reductase*) that is present in most other animals and converts metH back to haemoglobin.

If metH concentration reaches about 70 – 80%, it quickly causes death via a phenomenon known as “metabolic anoxaemia” which is a lack of oxygen to the brain and other vital organs. The effects are similar to those from carbon monoxide intoxication and both are humane and very fast acting.

Images by Jason Wishart

Features of HOGGONE® meSN®

- Unlike other poisons, the residues of sodium nitrite in the meat of dead pigs pose no risk to scavengers because SN degrades quickly in the feral pig carcass so levels in edible tissues are low.
- Scavengers are unable to eat enough contaminated muscle fast enough to obtain a lethal dose. This has been confirmed in the USA where scavengers, including coyotes and turkey vultures, were exclusively fed freshly poisoned pigs and showed no adverse effects.
- SN degrades quickly when in contact with moisture, so it will not persist in the environment. In nature, nitrites are converted to nitrates which are utilised directly by plants for growth.


Photo courtesy Justin Foster

How is HOGGONE® supplied?

HOGGONE® is a dense solid paste bait and is supplied in trays of 625g. The SN is in microencapsulated form and spread throughout the paste.

It is a regulatory requirement that HOGGONE® bait is delivered in bait boxes.

Placebo bait is also supplied in 625g trays or in bulk 5kg pails as any quantity can be used in the bait boxes.

5kg pail

625gm tray

Features of HOGGONE® Bait Box

The patent pending **ACTA HOGGONE® meSN® Feral Pig Bait Boxes** and the existing **HOGHOPPER®** product have been carefully designed to allow pigs to smell and easily access bait after limited pre-training, while keeping other animals, rain and extreme heat away from the toxic bait.

The boxes include pre-set lid opening training configurations and an optional magnetic closure to achieve even higher non-target resistance. They are light, yet strong and have positions for ground stakes and carry handles so two boxes can be carried easily by a single person. The Bait boxes incorporate a patent pending bait retention system that limits the risk of aggressive pigs removing trays of baits. They are reusable but we strongly recommend cleaning out old bait before re-use.

Hoggone® meSN® is supplied in 6 or 12 x 625g trays per shipper

Only 100-200gs of bait material is required to kill even large individual pigs. The bait acts quickly so pigs do not eat large quantities of toxic bait.

Baiting pigs effectively

Step 1: Site Selection

Baiting points ('stations') should be positioned by either of two methods:

Baiting at known "hotspots":

Locate bait stations at feral pig 'hotspots' in the landscape, to cluster pigs to a feeding point. Lowest cost option but some sounders may be missed.

Baiting large areas in a grid:

Locate stations throughout landscape at a 500 - 1000m grid spacing. More suited to large areas and where pig hotspot locations are unknown.

Feral pig 'hotspots' are areas where pigs are already active, such as preferred feeding grounds, water points or travel pads between these areas. Once hotspots have been identified, it is important to check them for fresh signs of feral pig activity including tracks, dung, tree rubs, ground rooting and wallows. If feral pigs are present, they will generally feed as extended family groups (sounders) and it is these that you need to attract to feed on bait at your chosen site.

Background image courtesy Jason Wishart

Tracks of feral pigs to a feed source are sometimes obvious.
Baiting near to watering points is often successful.

Step 2: Increase attractiveness of selected site – free-feed

If you think you have identified a suitable site or at each grid position, put out on the ground approximately 20kg of some locally sourced grain, corn or other common local food, and repeat for at least 2 days, replacing what is eaten each day. Spread the free-feed food out in a short trail (e.g. 2m long) so that all pigs in the sounder have an opportunity to feed and become conditioned to feed at the site. Fermented grain, which has been soaked in water for 2-3 days, is particularly attractive and palatable to feral pigs. Adding Carasweet or molasses can further encourage pigs to feed. Clustering the pigs to a feeding point is essential for success.

If no feed is consumed after 5 days try again at another site where there is evidence of pig activity. Bait stations should be far enough apart to prevent animals feeding at multiple sites. Distances between stations depend on a number of factors including resource abundance, topography, climatic conditions, pig density and home range size. A good starting point is about 0.5 to 1.5 km apart. As a general guide, it is better to have two bait stations, each attracting a 20-pig sounder, than to wait longer in the hope of attracting 40 pigs from two sounders to a single bait station.

Example of pre-feeding with grain to cluster pigs to a baiting point.
Photo courtesy Jason Wishart

Step 3: Introduce HOGGONE® Bait Box

HOGGONE® must be deployed in bait boxes to limit access by non-target animals, even though many other animals are either not interested in, or not affected by, HOGGONE®. Birds can be affected. Once grain is readily taken off the ground, deploy your bait box and secure it to the ground using pegs or star pickets. Use one or more boxes at the same site. Place additional bait boxes a few metres apart so that all visiting pigs can feed from them.

Prop the lids open for one night, and fill bait boxes with the same feed as on previous days. If this feed is consumed well, close the lids and keep feeding the pigs with the same feed for another day or two to ensure the pigs are now using the boxes. Pigs readily learn to open the lid if food is inside but other animals find it very difficult. Top up the feed each day to hold pigs at the site.

Temporary barbed or ring lock fence denies cattle access while allowing pigs to move underneath

Step 4: Introduce placebo HOGGONE® Bait

Introduce placebo (non-toxic) HOGGONE® bait after a couple of nights of successful consumption of free-feed grain from the closed bait boxes. Remove old feed in the boxes and replace with trays of Placebo HOGGONE®. If placebo material is consumed, it is more likely that the feral pigs will readily take the toxic bait. If consumption of placebo bait is low after the first night, try another night. If consumption of placebo bait is high (80-100%), switch to the toxic HOGGONE® meSN® bait immediately.

Step 5: Introduce toxic HOGGONE® bait

Note: Do not prematurely transition to the toxic phase of baiting. Be sure that the placebo bait is being readily consumed because this maximises the effectiveness of your baiting program to kill nearly all members of the sounder.

The amount of feed and placebo bait consumed will indicate how much toxic HOGGONE® meSN® bait to put into the bait boxes.

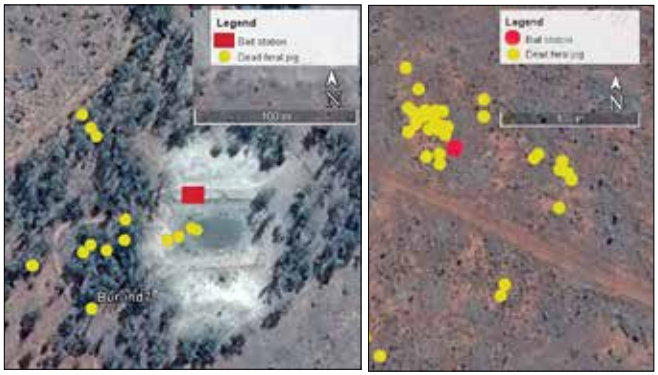
Pigs that are used to eating the placebo bait will readily take poison bait on the first night.

Step 6: Continue baiting

Studies have shown 80-100% knockdown of feral pigs after one night of toxic baiting. Baiting for an additional night (2 nights in total) could be useful to target those pigs that did not access bait on night one. This is optional.

Step 7: Clean up

When poisoning is complete, make sure all leftover toxic bait is removed from the bait boxes and disposed of according to label directions.



Most dead pigs are found within 50-200 metres of the bait station.

For best results

Cluster Phase

Use about 20kgs of grain (can be fermented) at sites of pig activity to cluster pigs to the site

Do not place hoppers unless pigs are visiting

Grain Only

Pigs quickly learn to eat from the hopper.

Cluster Phase

If pigs are present they will feed repeatedly at night.

Try to estimate pig numbers based on consumption of grain

Placebo Phase

Close lids and fill hopper with grain.

Then if grain is taken fill with Placebo (unposioned) HOGGONE® bait

Grain Only

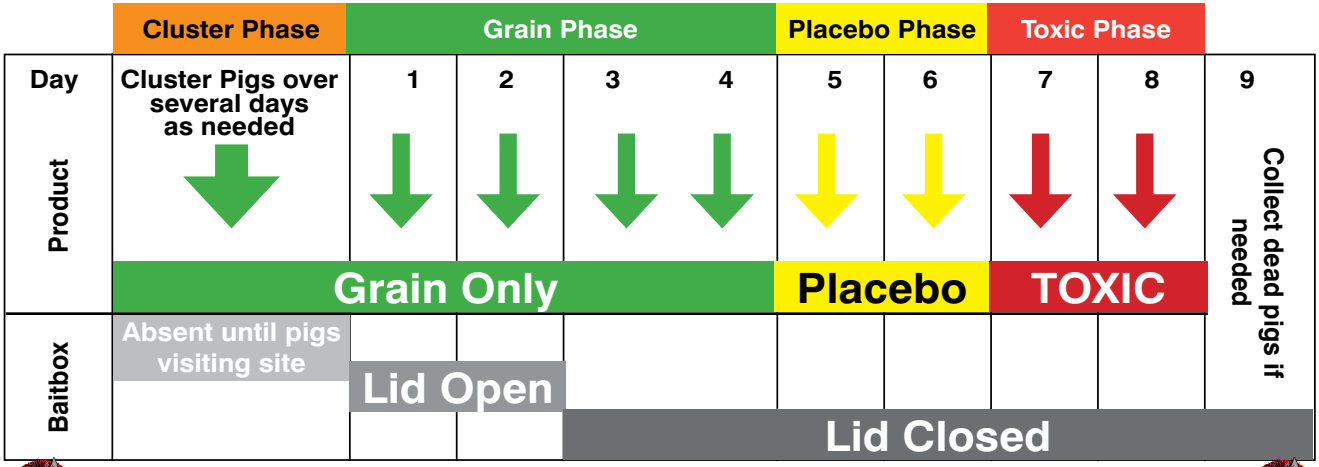
Secure hoppers to the ground.

Fill with grain with lids propped open

Toxic Phase

Pigs that are used to eating the placebo bait will readily take poison bait on the first night

Pick up dead pigs next morning, if required



Key Considerations

Timing

The best time to bait feral pigs is when food and/or water are scarce. During these times feral pigs are more likely to eat baits and their daily activities are likely to be limited to particular areas in the landscape, especially near to where water is available.

Working Together

As with any vertebrate pest control program, results are greatly improved when conducted over broad areas in coordinated campaigns involving neighbours. This approach maximises long-term control and minimises reinfestation. Neighbour notification is not compulsory for HOGGONE® however, it is a courtesy and may improve the effectiveness of programs. The success of long-term population suppression will be reduced without follow up monitoring and integrated control efforts.

WARNING:
HOGGONE® bait contains peanuts and should not be used or handled by people with nut allergies

USA and Australian collborators working on a field trial.

Signage is compulsory

A regulatory requirement is that notification signs must be placed at all entry points to a baited area or property. A free Aquatex gate sign is supplied with each shipper of toxic bait. ACTA HOGGONE® meSN® Feral Big Bait Boxes and additional A3 Corflute and A4 Aquatex signs can be purchased from ACTA if required.

Keep bait dry

Sodium nitrite is a very unstable compound that actively absorbs moisture (hygroscopic). Once wet, it can readily breakdown via a range of reactions that generate aversive gases and other derivatives before oxidising to fertiliser. While this means that degradation in the environment is total, any partially degraded bait will be unpalatable to many animals, especially pigs. The bait can be stored in original unopened packaging and if kept cool and away from moisture, for up to two years. Old residual bait cannot be reused and it is recommended that bait is purchased as fresh as possible for each program. It is better to dispose of uneaten bait than to risk pigs learning to avoid it. Placebo bait can be stored safely for long periods and will not readily absorb moisture.

images courtesy Jessica Marsh

Frequently Asked Questions about Feral Pigs

Q: What breed of feral pig is in Australia?

Most feral pigs in Australia descend from breeds of the domestic pig *Sus scrofa*. The main contributors were most likely the European Berkshire and Tamworth breeds, which had already been heavily modified by cross-breeding with Asian bloodlines. In other countries Eurasian wild boar predominate.

Q: How far do they move?

Individuals can move up to 55 kilometres between watercourses in search of food or in response to major prolonged disturbance due to control programs. However most feral pigs retain a strong attachment to their home range so do not move more than about 7km, even when subject to disturbances such as low-level hunting. Intense hunting activity can lead to increased dispersal.

Q: What is the social structure of feral pigs?

Feral pigs are social animals and form a variety of groups. The most common group is one or more sows and their piglets, but groups may also consist of young sows, bachelor males, and other combinations. Bachelor males generally stay together until they are 18 months old but then tend to be solitary and only join groups for mating or to feed on localised sources of food. The size of feral pig groups varies considerably across Australia. In the open country of western NSW, the group size is roughly 10, but may increase to 50 or more especially if the range of the pigs is restricted to limited water points during drought.

Q: Do they need water and cover?

The distribution of feral pigs in Australia is constrained by the availability of adequate water. They can withstand high temperatures but only if they have supplies of water and shelter from the heat. They avoid the extremes of the day by being active between dusk and dawn. Water is less important in the cooler forests where pigs can be active for longer parts of the day. Pigs can survive in snow, tropical areas and arid zones but do not do well in true desert.

Frequently Asked Questions about HOGGONE®

Q: Is there an environmental risk to be concerned about?

There is extremely low environmental residue from HOGGONE® meSN® or dead pigs as nitrite is unstable and fully degrades. HOGGONE® meSN® bait satisfies all environmental requirements and has been approved by Environmental Reviewers during the thorough registration process. Sodium nitrite is formed by some plants and occurs naturally in the environment.

Q: Where and when do the pigs die?

Metabolic anoxaemia (lack of oxygen to the brain and organs) causes animals to lay down, become unconscious and expire with limited outward symptoms. In field trials, pig carcasses are mostly found within 200 metres of a baiting point and most pigs are killed on the first night of bait deployment. The effects of the bait are fast, so an affected pig will die within 1-3 hours of ingesting the bait.

Q: Can other animals eat a pig that has been poisoned by HOGGONE®?

Levels of residual nitrite in edible parts of carcasses are not higher than found in preserved meats and are proven to be harmless to avian and mammalian scavengers even in worst case forced feeding trials.

Image by Jason Wishart

HOGGONE® trials utilised satellite tracked radio collared feral pigs

ACTA products for large-scale pest animal management available through agencies and/or leading rural merchant stores:

FOXOFF®
Fox Bait
For the control of foxes

SLUGGOFF®
Slug & Snail Bait
For the control of snails & slugs in the home garden

MOUSEOFF®
Zinc Phosphide Bait
For the control of mice in crops

DEN-CO-FUME®
Fumigation Cartridges
For the control of foxes in natal dens

DOGGONE®
Wild Dog Bait
For the control of wild dogs

RABBAIT®
1080 Oat Bait
For the control of rabbits

RABBAIT®
Pindone Oat Bait
For the control of rabbits

FOXSHIELD®
Fox Bait
Fish based bait for fox control

MOUSEOFF®
Bromadiolone Grain Bait
For the control of rats and mice

RATTOFF®
Zinc Phosphide Bait Sachets
Reducing rat populations in sugarcane crops

MOUSEOFF®
Bromadiolone Rodent Block
For the control of mice and rats in domestic, commercial & industrial buildings

PIGOUT®
Feral Pig Bait
For reductions in feral pig populations

FOXECUTE®
PAPP Fox Bait
For the control of foxes

TOADINATOR®
& ACTA ATTRACTA®
For the control of cane toads

DOGABAIT
PAPP Wild Dog Bait
For the control of wild dogs

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