NATIONAL FERAL PIG ACTION PLAN

**Australian Feral Pig Report – July 2020**

## 1. Introduction

Feral pigs (*Sus scrofa*) are regarded as one of the most destructive invasive species in Australia. While they are quite prolific in Queensland, Northern Territory and New South Wales they inhabit nearly half of the continent. Due to their low tolerance of hot/dry conditions, they are most abundant near wetlands, flood plains and associated watercourses. Although feral pigs have been noted in seasonally semi-arid regions, their reliance on water and suitable vegetation for food and shelter has limited their expansion into the arid interior of Australia.

Feral pigs have a wide range of impacts on economic, environmental and social value across Australia. The Australian agricultural sector bears a direct economic cost due to the predation of newborn livestock, reduced cropping and horticultural yields, degradation of pasture, waterways and soil, the spread of diseases and invasive weeds, and damage to infrastructure. Furthermore, the native environment is impacted by predation, competition for resources and habitat degradation leading to a variety of native flora and fauna being listed as threatened due to the activity of feral pigs.

Due to their biological similarity to the European boar, commercial harvesting of the Australian feral pig has enabled the export of swine product offshore, although in recent years this opportunity has diminished. Within regional communities the recreational hunting of feral pigs can be a source of income and the presence of a feral pig population also provides social, cultural and food resource value to some indigenous communities.

The illegal hunting of feral pigs has the potential to undermine the credibility and effectiveness of feral pig management programs. It brings with it the risk of damage to private property, destruction of baits and the destruction of or tampering with traps/monitoring equipment. There is also the risk of injury or death to hunters, hunting dogs and other recreational users nearby. Additonally, it can contribute to behavioural modification of pigs, which interferes with the effectiveness of other control efforts being undertaken in a region. The movement and release of pigs to facilitate continued hunting opportunities is also a significant concern.

Intelligent, mobile and social creatures, with a wide-ranging omnivorous diet and a high fertility capacity, has made the management of feral pigs a complex, costly and exhaustive process across federal, state and local government regions.

### 1.1 Population & Distribution

The feral pig population in Australia was estimated at 13.5 million (Hone 1990[1]) with a potential population range of 3.5 million to 23.5 million, based on a 95% confidence interval. Analysis is currently being undertaken by the Australian Bureau of Agricultural Resource Economics and Sciences (ABARES) in order to determine an updated estimate of the feral pig population distribution and densities.

In 2008, West (2008)[2] estimated that feral pigs were distributed across 45% of the country, accounting for approximately 3.43 million square kilometres. Feral pigs were noted to occur in all states and territories, including on some of the larger coastal islands.
Considered most abundant in Queensland (particularly widespread in the far north) and very common in New South Wales, with localised populations occurring across the remaining states and territories – Figure 1.

[1] *How many feral pigs in Australia, Hone (1990)*
[2] *Assessing invasive animals in Australia, West (2008)*

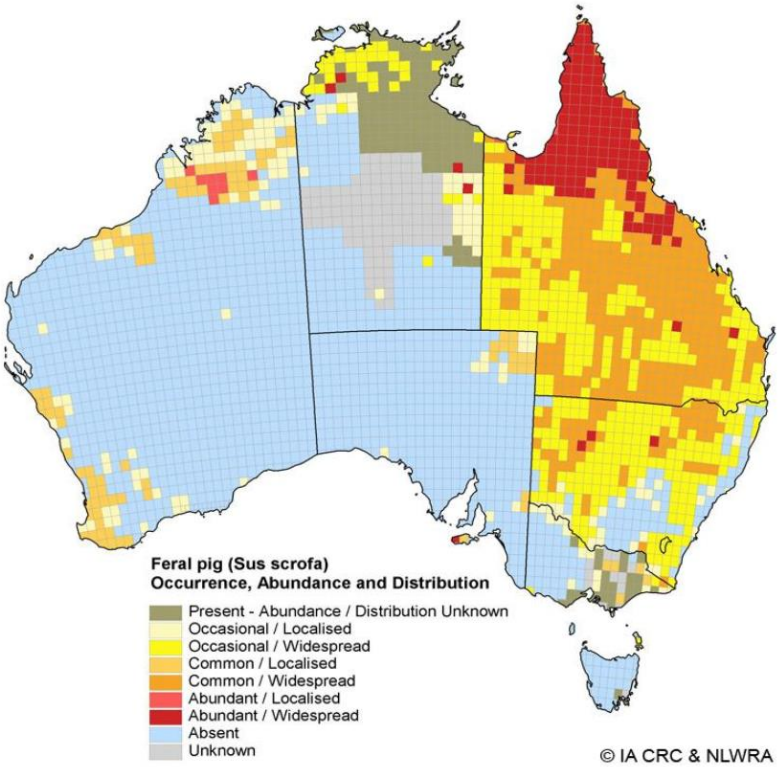


**Figure 1: Map showing the occurrence, abundance and distribution of feral pigs (*Sus scrofa*) in Australia in 2006/2007 (from West, 2008).** Information available for this distribution map varies in quality. A number of areas have high-quality data that are supported by expert opinion, while other areas have moderate levels of supporting information. See West (2008) for details on data quality

## 1.2 Biology, Habitat & Diet

Genetic analysis of feral pigs demonstrates that populations in southeastern states and Western Australia are dominated by European domestic pig ancestry. However, within the northern regions, an Asian domestic pig-based gene sequence is more common. Despite their domestic pig origins, the Australian feral pig closely resembles the Eurasian wild boar in that they are generally smaller, leaner and more muscular than the domestic pig breeds and tend to have larger tusks, snouts and more muscular shoulders. Boars are generally longer, taller and heavier than sows often weighing up to 115kg when mature, while mature females tend toward 75kg, on average.

Feral pigs generally live less than five years and mortality of piglets in their first year is relatively high, particularly during drought. Despite the high youth mortality rates, feral pigs are very fertile with litter sizes of up to six piglets (weaned after three months) and sows being able to breed before they reach one year of age. If conditions are suitable, feral pigs are able to breed throughout the season. Indeed, in a good year feral pigs can increase their population by more than 85%, displaying a reproductive potential that is closer to rabbits than other pest species of a similar size (Choquenot et al., 1996[3]). Reproductive capacity estimates suggest that 55% - 70% of feral pigs need to be culled annually to keep the population size from expanding (Bengsen et al., 2014[4]).

[3] *Managing Vertebrate Pests: Feral Pigs, Choquenot D, McIlroy J and Korn K (1996)*
[4] *Impacts and management of wild pigs Sus scrofa in Australia, Bengsen AJ, Gentle MN, Mitchell JL, Pearson HE and Saunders GR (2014)*

Feral pigs are adept at surviving in a wide range of habitats, provided suitable water, food and shelter are available. Feral pigs can be found in dense tropical rainforests where they are abundant and widespread, particularly in far north Queensland. They can also be found in high mountainous forests, swamps and reed bed marshes, open floodplains, semi-arid floodplains, dry woodlands, open shrubby heathlands and grasslands.

Studies have shown that the larger the pig, the greater the home range, therefore boars tend to have more expansive home ranges than sows. However, home range is also influenced by resource availability, and social conditions with home ranges varying from more than 40km$^2$ for mature boars in semi-arid regions to as little as 0.16 km$^2$ for furrowing sows (Saunders, 1988; Giles, 1980). The mean home-range estimation for all habitat areas and both genders combined was 8.0 km$^2$ (Dexter, 1998).

The diet of feral pigs consists of a wide range of vegetation, fruit, grain and animal material. As rather opportunistic omnivores, their diet can vary according to seasonal availabilities. However, they do show a preference for succulent green vegetation. Feral pigs are monogastric and therefore have a poor ability to digest cellulose, so they are unable to feed solely on grasses and herbaceous broadleafed plants as ruminants do. Studies have shown that the consumption of animal matter varies between seasons and regions but rarely exceeds 20% of their diet (Giles, 1980; Pavlov, 1980). Feral pigs are very adept at using their sense of smell to search for food and can dig to depths of more than one metre in search of food, where soil conditions permit.

Items eaten by feral pigs can include:

- Fruits and seeds – figs, bush peanuts, sweet briar, wattles, geebungs, bananas, mangoes, orchard fruit, pumpkins, watermelons, potatoes, taro, maize, wheat, oats, sorghum and other cereals
- Foliage and stems – palms, pandanus, coconut and banana seedlings, sugarcane, pigweed, semi-aquatic ferns, legumes, clover, lucerne, native grasses, young cereal crops
- Rhizomes, bulbs and tubers – lilies, sedges, rushes, water reeds, bracken, orchids, native geranium, cycads, yams and other tropical rootstocks
- Fungi – above and below ground
- Animal material – insect larvae, earthworms, snails, arthropods (particularly beetles), crustaceans, shellfish, frogs, fish, reptiles and their eggs, eggs of ground nesting birds, birds, mice, young rabbits, lambs, various small mammals and carrion

## 2. Impacts

Feral pigs are a serious agricultural and environmental pest in Australia. They cause losses in productivity to sheep and wool producers through predation on lambs, compete with livestock for feed, cause erosion through digging up soil and vegetation, foul fresh water sources, damage farm infrastructure (such as fences and irrigation), reduce cropping and horticultural yields, spread invasive weeds and act as a vector for various diseases impacting livestock and plants. Soil-borne plant pathogens can be carried by feral pigs causing plant dieback and disease in both native species and across forestry/horticultural assets

Panama Disease TR4 fungus can also be spread by feral pigs – a disease which is not eradicable and causes wilting and eventually death of banana plants. In 2016/17 it was estimated that the

Australian banana industry contributes $1.3 billion to the economy and returns approximately $680 million a year to the farm gate.

In the native environment, feral pigs prey on a variety of small mammals, birds, reptiles, insects, multiple amphibious/aquatic species and the eggs from a host of native animals. Furthermore, feral pigs compete with larger native animals for resources and degrade the native habitat crucial for the survival of such species.

In some communities, the control of feral pigs through recreational hunting practices can have some social and economic value. Additionally, within some indigenous communities, the value of feral pigs as an alternative food source is recognised. The hunting of feral pigs is often used by indigenous elders to teach traditional bush skills and maintain the kinship system.

Similarly, commercial harvesting and feral pig control measures in many remote and indigenous communities serve to provide employment opportunities and additional cash flow. The management of feral pigs that are responsible for significant environmental and economic costs, but are also a resource for indigenous communities, creates a complex challenge and indigenous attitudes to feral pig control vary considerably across the country and can change through time.

## 2.1 Economic

It has been estimated that feral pigs cause approximately $106.5 million in direct economic costs to the agricultural sector in Australia each year, but this may be a conservative figure (McLeod 2004). As highlighted in Figure 2, the economic impact of feral pigs as an invasive species is only exceeded by rabbits.

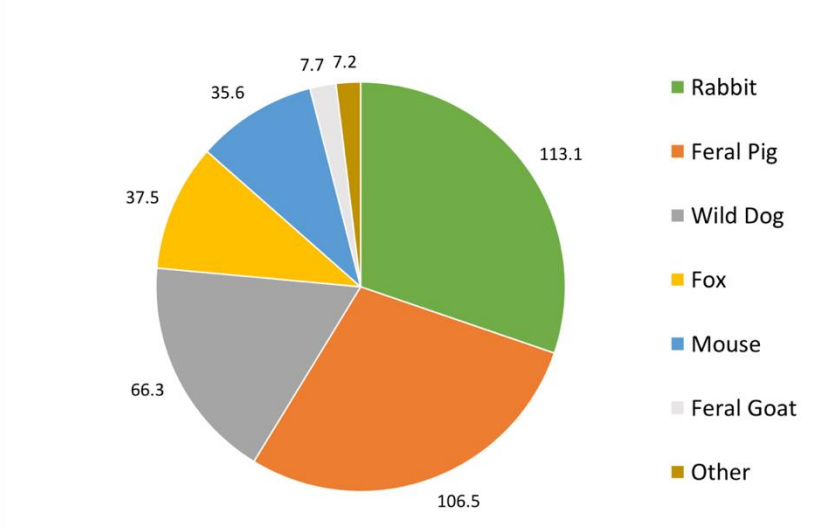


**Figure 2. Economic cost of invasive animals ($ million per annum) - McLeod 2004.**

The key economic costs impacting the agricultural sector as part of the $106.5 million estimate include:

- Predation on newborn lambs. Lamb predation by feral pigs is estimated to range from 18.7% to 32% lamb losses for the semi-arid rangelands (Pavlov et al 1981; Plant et al 1978). Choquenot et al (1996) plotted predation as a function of pig density, with rates of 5% loss at 1 pig per square km, up to 20% at 6 pigs per square km. Gong et al. (2009) estimated production losses in the wool/sheep meat sector through lamb predation to be 4% at low pig densities, 7% at medium pig densities

and 9% at high pig densities. Annual estimates for costs totalled $ 1.0 million for the sheep meat sector and $2.3 million for the wool industry (Gong et al., 2009).

- Reduction in yields of grain, fruit and vegetable crops by feral pigs consuming or trampling plants and up-rooting vegetation. Stomach contents of pigs were examined by Gentle et al (2015) in the Queensland Murray–Darling Basin. Crop residues were found 9% more frequently than non-crop plants. Tisdell (1982) estimated production losses of 3% in wheat, 5% sorghum, 1% barley and 3% in maize when calculating economic impacts of feral pigs. For crops such as wheat and barley, the damage in NSW and Queensland was estimated to be 1% in medium impact areas and 3% in high impact areas. Gong et al. (2009) estimated production losses in the grain industry to be 1% at low pig densities, 2% at medium pig densities and 3% at high pig densities which came to an annual total estimate of $5.7 million. Losses in sorghum and maize crops in the Northern Territory ranged between 7% and 50% (Caley, 1993), sugarcane yields were reduced by 6% and bananas by 1% in north Queensland (Mitchell and Dorney 2002). Losses in 1982 were estimated to be around 0.1% to 0.15% percent of total Queensland production (Tisdell, 1982).

- Physical damage to farm fences, water infrastructure and fouling of dams through wallowing and defecation (Tisdell 1982; Mitchell and Balogh 2007).

- Competition with livestock for pasture by feral pigs was modelled by Bengsen et al. (2014) and it showed they had impact on pastures at densities of up to 7 pigs per square km (Choquenot 1996).

The potential economic cost to the Australian livestock industry and human health through the feral pig population being a carrier and amplifier of many endemic and exotic diseases is substantially more than the $106.5 million estimate and include:

- The spread of infections and diseases to domestic livestock and humans that are endemic to Australia, including Q fever, leptospirosis, brucellosis, melioidosis, tuberculosis, salmonella, porcine parvovirus, Murray Valley encephalitis and sparganosis (Choquenot et al. 1996; Heymann 2008). The involvement of feral pigs in an outbreak could delay detection of the disease and increase the rate or the extent of the spread of the outbreak. Feral pig populations acting as a host could make disease eradication measures expensive, time-consuming and potentially impossible.

- The spread of exotic diseases that are not currently present in Australia, to which feral pigs are susceptible such as; scrapie, rinderpest, Rift Valley fever, rabies, Aujesky's disease, Japanese encephalitis, foot-and-mouth disease and African swine fever. These diseases could be accelerated through the interaction between feral pigs, livestock and native animals.

- The potential for feral pigs to harbour foot-and-mouth disease or African swine fever could result in substantial losses to the Australian livestock sector. It has been estimated that a large multi-state foot-and-mouth outbreak would cost livestock producers more than $52 billion over a ten-year period[5]. An ACIL Allen report in

[5] *Potential socio-economic impacts of an outbreak of foot-and-mouth disease in Australia, ABARES (2013)*

2019[6] on the potential incursion of African swine fever into the Australian pork sector estimated total economic losses between $0.7 to $0.9 billion based on a low spread scenario over three years and between $1.5 to $2.0 billion under a high spread scenario over five years.

## 2.2 Environmental

The National Threat Abatement Plan[7] (TAP) for feral pigs identifies the following key threats to the Australian native environment:

- Predation of native species
- Competition with native species
- Physical modification of habitat
- Disease transmission

In 2013, the Threat Abatement Advice (TAA) identified 161 species of threatened flora and fauna at a national level as being adversely affected by feral pigs. However, the TAA only included species that are federally listed under the Environment Protection and Biodiversity Conservation Act (1999).

There are 442 state listed threatened fauna species impacted by feral pigs, 55 of which are dependent on a specific vegetation structure or lay their eggs in the soil and are at risk of feral pig activity. Similarly, there are 2,319 state listed threatened flora species that are considered likely to be at risk from feral pigs, particularly where they occur in regions frequented by pigs.

Feral pigs are known to spread invasive weeds and plant pathogens, such as *Phytophthora cinnamomi*, which causes plant dieback in a range of native, ornamental, forestry and horticultural plants.

Wetlands are particularly vulnerable to damage by feral pigs, particularly when they begin to dry out as pigs can become concentrated around the water source, thus focussing the damage within a smaller area. Feral pigs have been shown to degrade dams and waterholes through their defecation and wallowing, although few studies have quantified their impact on water quality. A study of feral pig activity on Cape York found the destruction of macrophyte communities and disturbance of wetland sediments impacted water clarity causing acidic/anaerobic conditions. The spread of pig manure and loss of aquatic vegetation resulted in a high level of nutrient enrichment, leading to a reduction in plant biodiversity[8].

The rooting behaviour of feral pigs alters soil structure, although limited studies have investigated the influence on soil properties. It is suggested that rooting behaviour is like tillage within agricultural activities, which causes higher decomposition rates, increased nutrient cycling and nutrient loss through leaching. Furthermore, it is thought that feral pigs can increase runoff through the compaction of soils and trampling of dense vegetation to browse for food or create nests.

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[6] *Economic analysis of African Swine Fever incursion into Australia, ACIL Allen Consulting (2019)*

[7] *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa), Commonwealth of Australia, (2017).*

[8] *A description of freshwater turtle habitat destruction by feral pigs in tropical north-eastern Australia, Doupe, R. G. et al. (2009)*

### 2.3 Social

Feral pigs are prized as a game species by recreational hunters throughout Australia, perhaps due to the relative scarcity or restricted distribution of other large game animals compared to overseas. This is evidenced by the effort and cost that many hunters expend to pursue feral pigs (Tisdell 1982; Meurk 2014). The number of recreational hunters in Australia estimated at between 200,000 to 350,000 (Finch et al. 2014) and it is thought that a large proportion of this figure hunt feral pigs. Recreational hunting has both a social and economic value, with Tisdell (1982) estimating there were around a hundred thousand recreational hunters in the early 1980s spending $45 million per year. The same study suggested amateur hunting was likely reduced the feral pig population by nearly 8% per annum and providing over $3.5 million in savings each season to landowners affected by feral pigs (Tisdell, 1982).

Feral pigs are a valuable cultural and food resource for some Australian indigenous communities and can be important for maintaining social/family structure, as well as connections to traditional lands and lifestyle (Koichi et al. 2012). These connections are useful in encouraging individuals away from patterns of antisocial behaviour and for promoting community cohesion (Homel et al. 1999; Koichi et al. 2012). However, pigs can also damage important cultural and subsistence resources, and are therefore can also be viewed as an invasive pest within some communities or at certain times (Robinson et al. 2005; Fordham et al. 2006; Koichi et al. 2012). It has been suggested that feral pig management programmes conducted within indigenous regions could be used to generate financial reward for the community, under a carbon pollution abatement policy or a biodiversity initiative but establishing an acceptable method for doing so would require considerable assessment and expense (Bengsen & Cox 2014).

## 3. Management

The Threat Abatement Plan[9] (TAP ) for predation, habitat degradation, competition and disease transmission by feral pigs provides a national framework for feral pig management, research and education. Furthermore, it assesses scientific research and associated developments that have occurred since the creation of the TAP in 2005 and investigates changing priorities for feral pig management.

As the feral pig population is widespread and eradication is no longer considered a viable option, the management process is based on asset protection and minimising economic, environmental and social impacts. This approach shifts planning and management away from the elimination of the feral pig problem towards strategies based on reducing the negative impacts created by feral pigs. The tactics used to minimise the impacts of feral pigs are based on feasibility, cost-effectiveness, the type/scale of the impacts, animal welfare considerations and the available methods of control. The Threat Abatement Plan acknowledges the principles for effective pest animal management outlined in the Australian Pest Animal Strategy 2017-2017. As feral pigs are considered to be a nationally significant pest species there is a need for a customised action plan, similar to the National Wild Dog Action Plan[10], that can deliver a coordinated best practice approach to feral pig management that is safe, efficient and humane, and supports continuing economic activity while being socially acceptable and environmentally sustainable.

[9] *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa), Commonwealth of Australia, (2017).*

[10] https://wilddogplan.org.au/wp-content/themes/nwdap/docs/NWDAP2020-2030.pdf

## 3.1 Control Methods

There is a range of control methods available for the management of feral pigs including hunting, trapping, Judas Pig, baiting, and habitat manipulation. However, no single technique will completely remove feral pigs from a given area, so a combination of techniques is required for effective management.

### 3.1.1 Shooting

Commercial harvesting

The commercial harvesting of feral pigs for export has generated income into regional communities since the early 1980s, although there has been considerable variation in the export volume and value. The value of the industry has ranged from $50 million to $10 million annually over several years between 1980 to 2010.

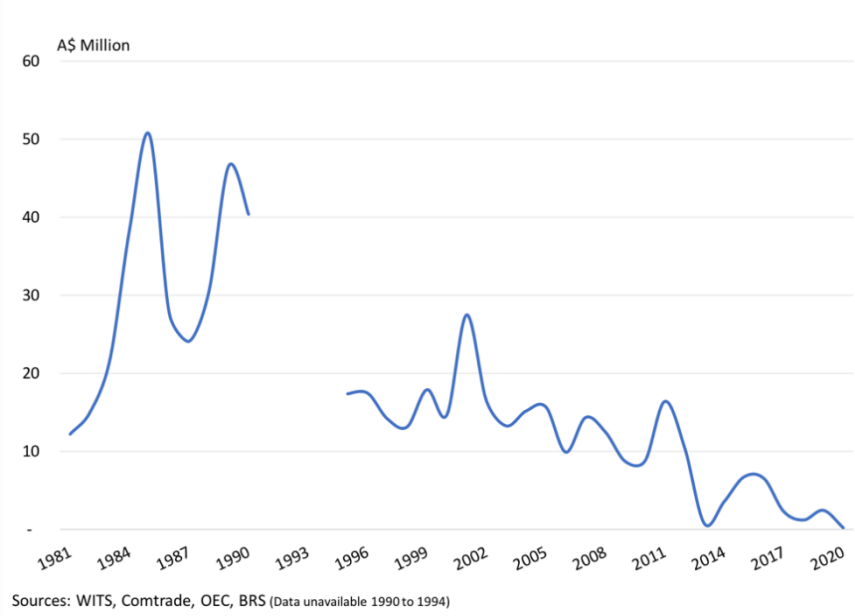


**Figure 3. Feral pig exports to Europe (A$ million 1980-2020)**

In recent years the industry has suffered a significant decline to see trade values slip to under $3 million per annum. This has been exacerbated by:

- An increase in competition from alternative suppliers in overseas markets
- The economic viability of commercial harvesting being limited to a selection of regions due to the logistics and cost of harvesting pigs over large areas
- Limited and sporadic supply of fresh carcasses of acceptable quality to processing facilities
- A reduction in the number of accredited hunters, which has made it difficult to meet offshore demand and maintain market share
- A change in consumer preferences

Professional cull (aerial or ground shooting)

Aerial shooting is a useful control measure for the removal of feral pigs across larger areas without dense cover or inaccessible terrain, particularly when pigs are at high densities. Populations can be diminished by 65% to 90% but can recover quickly once culling ceases, if it is not supported by integrated control strategies to eradicate pigs that were not dispatched during the aerial shooting activities. Ground shooting is much more labour intensive and more suited to smaller, less accessible forested areas with trap/helicopter wary animals present.

Recreational shooting

It is generally considered that recreational shooting of feral pigs has limited impact in the control of the pig population and minimisation of their spread. Furthermore, there are concerns that public hunting of pigs can reduce the effectiveness of organised baiting, trapping and professional hunting programs by creating a warier pig population and by dispersing pigs into wider region or more inaccessible area. Additionally, some landholders have concerns about certain facets of recreational feral pig hunting such as; problems with trespassing and property damage, harassment of livestock and protected native animals, and the deliberate introduction of captured pigs to areas previously unoccupied by feral pigs.

Use of dogs

There is reasonable concern regarding the use of dogs to hunt feral pigs despite the use of well-trained dogs and experienced hunters being quite effective at tracking and locating hard to find feral pig populations or in flushing out residual populations post alternative control measures. There are legitimate animal welfare concerns regarding the use of dogs to hunt feral pigs, both for the dog and the pig. Similarly, there are issues with dogs used during hunting that become lost, exacerbating the wild dog problem and causing problems for livestock producers and native species.

### 3.1.2 Trapping

Trapping is a widely used and effective measure for capturing feral pigs as multiple animals can be trapped at once and animal welfare concerns are lessened where traps are set in areas with adequate shelter and frequently checked. Additional benefits of trapping include the ability to safely release non-target species and the high success of trapping during times where food resources may be scarce. However, the use of traps has a higher cost than alternative control measures, and if used incorrectly or without a suitable pre-feeeding strategy pigs may become trap wary. They are also more difficult to transport across locations and are limited to more accessible areas.

### 3.1.3 Judas Pig

The use of a Judas Pig that has been radio collared and released is used to take advantage of the social nature of pigs whereby tagged animals are tracked in order to reveal the location of feral pig populations. Once identified the pigs can be shot, trapped or baited and the Judas Pig can be released again to locate alternative populations. This method can be useful in identifying key areas to focus upon for a selection of control methods and be helpful in locating wary pig populations.

### 3.1.4 Baiting

Baiting is a relatively cost effective and widely used method of feral pig control and can be deployed more easily in remote habitats, particularly through aerial baiting. However, there are concerns that some toxins used can be harmful to animals not intended to be targeted by the baiting program. Furthermore, baiting has not been shown to remove all pigs from an area as pigs can become bait shy, with residual pigs having access more available resources and leading to a quick expansion in their population again. There are also animal welfare concerns regarding the experience of the feral pig that has consumed a lethal dose prior to their death. The introduction of more species-specific bait toxins, such as Hoggone™ and PigOut™,

has been shown to remove pigs in a humane, target-specific and environmentally safe manner.

### 3.1.5 Exclusion Fencing

Fencing can be useful to protect small areas and can act as a useful non-lethal control measure from damage to high value crops or key environmental resources. However, fences are an expensive form of feral pig control, particularly over the longer term when breaches need repair and ongoing damage to the fence requires regular maintenance. The use of fences also merely re-directs the problem of feral pigs to a different area and does little to manage the spread of feral pigs or control the population in the landscape.

## 3.2 Feral Pig Management

Effective management of the feral pig problem will require a cooperative and well-coordinated approach between all relevant stakeholders. Management procedures will benefit from better public awareness of the impacts associated with feral pigs. Furthermore, the success of a sustained reduction in damage caused by feral pigs will be contingent upon ongoing control, continued monitoring and cohesive control efforts. Figure 4 outlines a selection of the main strengths, weaknesses, threats and opportunities that are relevant to the management of feral pigs.


**Figure 4. Feral Pig Management SWOT Analysis[11]**

[11] *Adapted from Feral pig control strategy south-west Western Australia 2015-2020*

## 4. Further Research & Ongoing Management Activity

An updated estimate on the population and distribution of feral pigs would be advantageous in order to determine key areas for control focus and to understand how the population and density has changed through time. It is understood that the Australian Bureau of Agricultural Resource Economics and Sciences (ABARES) is currently investigating this as part of a broader assessment of national pest and invasive weed distribution.

A more detailed study into the economic cost (current and potential) of feral pigs could help to build a better understanding in the community with regard to the damage that feral pigs do, particularly in the agricultural industry. This could also help build the case for a fully funded feral pig specific management program across federal and state jurisdictions, which ensures ongoing funding all the way down to the community/local council level to help support the sustained control activities of feral pig management groups at the grass roots level.

A feasibility study into the economic, environmental and social benefits within regional, remote and indigenous communities that an ongoing fully funded feral pig management program would bring. This study could include an assessment of:

- employment opportunities provided by this program within remote/indigenous communities
- the value of feral pigs as an ongoing source of food and how it encourages social cohesion (particularly in indigenous communities)
- an exploration into opportunities a revived feral pig export market could provide (This could be undertaken as part of a broader package of support offered to the domestic pig industry to assess the ability to expand export markets for both the feral pig harvesting and domestic pork industry sectors)

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