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Greg S. Pickles

Agriculture Protection Adviser, Agriculture Protection Board of Western Australia, Baron-Hay Court

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Pickles, Greg S., "FERAL GOAT COMMERCIALISATION: THE BEGINNING OF THE END OF ERADICATION?" (1992). *Proceedings of the Fifteenth Vertebrate Pest Conference 1992*. 62.
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FERAL GOAT COMMERCIALISATION: THE BEGINNING OF THE END OF ERADICATION?

GREG S. PICKLES, Agriculture Protection Adviser, Agriculture Protection Board of Western Australia, Baron-Hay Court, South Perth, Western Australia 6151

ABSTRACT: The goat (*Capra hircus*) was first introduced into Western Australia (WA) over 100 years ago and since this time have been liberated and become feral. Feral goats are now found over much of the semi-arid and arid pastoral areas of the State and as uncontrolled grazers cause significant damage to the rangeland. The use of commercialisation as a control strategy to induce landholders to reduce feral goats has been used. This strategy is appealing for several reasons. It requires little government involvement from agencies responsible for pest control, resulting in low public costs. It returns immediate, tangible profits to landholders for the control effort and it utilizes the pest as a resource, making the programme more acceptable to some individuals. However, it is now clear that a commercialisation policy has not been successful in reducing overall feral goat numbers and the consequent damage. Some reasons for this include; commercialisation requires the creation of an infrastructure to handle the product; immediate economic returns from feral goats become long-term cash flows; long-term benefits are not considered; individual control is undertaken rather than co-operative programmes; feral goats are not included as part of the landholders domestic stocking rate entitlement. If such a policy is to continue it will not achieve the long term objective of eradication.

A feral goat eradication programme has recently been instigated in Western Australia by the pastoral industry. Although, commercialisation is to be used to remove the bulk of the population, such a strategy cannot be used on a long-term basis and follow-up control must be undertaken if the objective of the programme is to be achieved. The prolonged use of a commercialisation policy will result in the preservation of a species rather than the elimination of it.

Proc. 15th Vertebrate Pest Conf. (J. E. Borrecco & R. E. Marsh, Editors) Published at University of Calif., Davis. 1992

INTRODUCTION

Goats (*Capra hircus*) have become feral in many areas of the world. They have been especially successful in establishing on islands and in mountainous areas. Large populations do occur in more traditional livestock grazing areas such as continental Australia (McKnight 1976). Feral goat populations can lead to deleterious effects on the environment and where feral goats and domestic stock coexist, many landholders are concerned about potential competition for food and water. Feral goats have been shown to survive better than sheep when rangeland conditions are poor.

To protect the environment, and in some situations to reduce competition between domestic stock and feral goats, organized programmes to control or eliminate them from specific areas or regions have been conducted with varying success. Feral goats are controlled using a variety of methods including mustering, trapping, shooting and poisoning. Selling or 'commercialisation' of feral goats, usually for goat meat, has also been suggested and used as a control strategy.

The purpose of this paper is to:

1. Describe commercialisation as a control strategy for feral goats.
2. Discuss the limitations of commercialisation for feral goat control.
3. Suggest how commercialisation fits into an overall feral goat eradication programme.

FERAL GOAT CONTROL IN WESTERN AUSTRALIA

Goats were first introduced into Western Australia by an Acclimatization Society in the 1870s as domestic stock to provide milk, butter and meat. Through escapes and intentional liberations, they became established in the wild shortly thereafter (Rolls 1969). By 1928, the Western Australian

government declared them a pest in some parts of the State because of their perceived deleterious affect on the environment (Long 1988). The objective of this declaration is to eradicate feral goats from the State. The current feral goat control programme falls under the authority of the Agriculture Protection Board of Western Australia (APB) whose role is to co-ordinate the prevention, eradication and control of vermin and noxious weeds.

In an attempt to induce landholders to reduce feral goat numbers to a low level a 'commercialisation' policy was introduced in 1973 allowing landholders to take advantage of the commercial value of feral goats while they worked toward eradication. Such a policy was seen as a first step in the eradication programme by removing large numbers quickly and cost effectively. This policy however, still continues.

Since 1973 over 2.5 million goats have been removed commercially from the rangeland yet there has been an increase in the feral goat population. In 1987 and 1990 the Australian National Parks and Wildlife Service (ANPWS) and the Western Australian Department of Conservation and Land Management (CALM) undertook an aerial survey of kangaroos numbers in Western Australia. Feral goat numbers were also collected during these surveys. It was noted that goats remained the most widespread and numerous of the large feral animals recorded during the surveys. From the 1990 survey data, the population of feral goats has been estimated at one million. This figure indicates an increase over the three year period of 78 percent even though over 560,000 have been removed commercially during the same period. In many areas included in the survey, feral goat densities have increased significantly.

Mustering and trapping are the main feral goat control strategies used by landholders, with sale of feral goats primarily for meat. The APB requires that all feral goats be destroyed if they are not shipped for slaughter or held under a

keeping permit. This includes free roaming animals and those mustered or trapped which have no commercial value i.e. kids, diseased or injured animals, or small lots where the low numbers make transport uneconomic. As an incentive and to address this issue, a bounty system was introduced in 1978 which paid a \$1.00 bonus on each pair of ears collected. The scheme was discontinued in 1985, having been assessed as ineffective.

In the past, up to 250,000 goats per year have been controlled by sale or destruction (Figure 1). In most years this turn off has still allowed increase in goat numbers. Goats often have more than one kid and more than one kidding per year and so, on the basis of 50 per cent females in the flock, at least 60-70 per cent of numbers must be removed each year in order to reduce numbers. Analysis on the population dynamics indicates that not less than 70% of the animals must be removed if a net reduction in the population is to be achieved. While no accurate population estimates are available, 250,000 goats is probably less than 25 per cent of the population, and while this number can be removed relatively easily, a much more intensive and concerted effort will be required to markedly reduce the population and ultimately achieve eradication.

COMMERCIALISATION AS PART OF FERAL GOAT CONTROL STRATEGY

Feral goat control through commercialisation is appealing for several reasons. It requires minimal involvement from government agencies responsible for feral goat control, resulting in low public costs. The APB incurs relatively few costs for feral goat control compared with control programmes for other feral animals. Costs are primarily administrative and advisory. Costs of the actual feral goat control are met by the landholders. Commercialisation also returns immediate, tangible profits to landholders for the control effort. It utilizes the pest as a resource, making the programme more acceptable to some individuals.

Landholders acceptance of a control programme is influenced by many factors, but costs to implement and anticipated benefits are of major importance. The benefit of feral goat commercialisation to the landholder can be viewed from two levels; 1) the benefit of controlling goat numbers, theoretically leading to reduced grazing pressure and thus increased sheep production, or reduced environmental damage, and 2) the income generated from the sale of goats and

goat products. The benefit of reduced goat numbers is fairly subjective and usually long-term. The sale of goats is easily quantified since it produces immediate and tangible income.

The result of the commercialisation strategy is that goats will be harvested at a level where the difference between the revenue and costs are maximised. This level is known as the maximum economic yield and although it is economically efficient, biologically it will result in the population increasing. The point where harvest is equal to recruitment is known as the maximum sustainable yield and will be the largest harvest that can be continuously sustained without forcing the population into decline (Figure 2). Any effort expended after the maximum sustainable yield will result in a decrease in population growth as numbers destroyed will be greater than the recruitment. Such a decrease is essential if eradication is the objective.

As animals are not equally catchable and control operations progressively cull out those least able to adapt to it, the survivors, at low numbers, are comprised of a large proportion of animals that are either extremely wary or that have home ranges in areas that are difficult to hunt across. Hence a unit of effort expended when numbers are low will reduce the population by a lesser fraction than when numbers are high. Control in this phase will be very costly as the harvest per unit effort will diminish.

LIMITATIONS OF COMMERCIALISATION

Although commercialisation offers a means of recovering a positive return for the feral goat populations on a property, as a long-term strategy it has important limitations that have prevented it from achieving Western Australia's control programme objective; eradication.

The short-term economic incentive of commercialisation has influenced, and likely reduced, the control programmes effectiveness. This is primarily due to;

1) Commercialisation requires the creation of an infrastructure to handle the product.

Commercialisation of feral goats is influenced by individuals and organizations with no direct economic involvement in free-roaming feral goats but who have considerable interest in them after they are captured. Transportation, processing and marketing require a constant or reliable source of product to adequately support the commercialisation process. The market for the product, i.e. the consumer, must be developed and maintained, and this too requires a constant and/or reli-

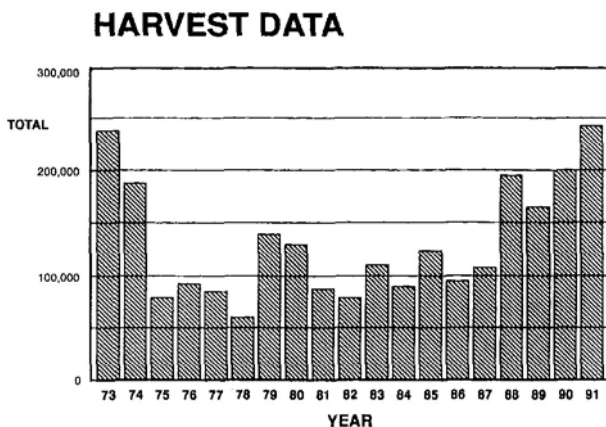


Figure 1. Number of goats harvested annually.

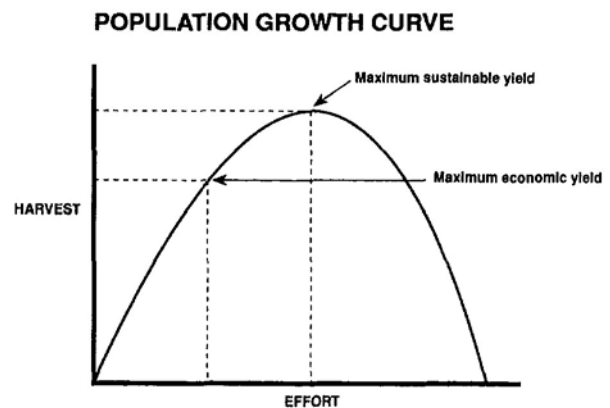


Figure 2. Population growth curve illustrating the points of maximum economic yield and maximum sustainable yield.

able source of goats. Once the processing and marketing infrastructure is developed, pressure will be maintained on the producers of the commodity, i.e. the landholders, to continue supplying the product. Obtaining a constant and reliable source of feral goats is not generally compatible with control objectives and is impossible if eradication is the goal.

2) Immediate economic returns from feral goats become long-term cash flows.

Once landholders receive a financial return from their goats it then becomes part of their cash flow. This return is then integrated into their budgets and future returns. As landholders become reliant on this income they develop strong incentives to harvest feral goats to maximize returns. This has been noted where landholders do not muster small herds of goat because it is uneconomic. They prefer to wait until the herd size grows so mustering efficiency improves and transportation costs are reduced. Releasing unsalable goats, primarily kids, after muster does occur since sale of that animal as an adult will yield more income than many landholders believe the goat will cost them to carry on their property, even though economic assessment suggests this is fallacious.

3) Long-term benefits are not considered.

Due to the commercial return being both immediate and tangible, long-term benefits of control, such as range condition and increased sheep production, are not considered. It has been estimated that as goats compete for feed with sheep they will cost the industry over \$2.5 million annually if the combined effect is a 10 per cent drop in lambing, 2 per cent increase in mortality and a 0.25 kg drop in wool production per head. This cost is very conservative as the combined effect is known to be greater.

As these benefits of control are not included in decision making, less than optimal control is undertaken.

4) Individual control is undertaken rather than co-operative programmes.

As the landholder wants to maximise the return, control is undertaken on an individual basis. Due to the high mobility/migration of the feral goat, control by an individual landholder is less effective and efficient than a co-operative programme. This private self-interest cannot be relied upon to ensure socially optimal control. Benefits from controlling goats cannot be fully appropriated by individual landholders because they move across property boundaries. Landholders argue that there is no point in spending too much money on control, if the area can be reinfested from adjoining properties where no control is done. If landholders co-operate and undertake coordinated control programmes then they reap the full benefit of control by running more sheep (or improving the rangeland).

5) Feral goats are not included as part of the landholders domestic stocking rate entitlement

The land affected by feral goats is held under 'pastoral lease' from the Government. Stocking rates of sheep and cattle is limited in the lease but feral animals are not counted. This results in the landholder viewing the commercial return as a bonus, allowing feral goats to be managed on top of the domestic stocking rate without any accountability. This overgrazing is resulting in serious long-term rangeland degradation.

FERAL GOAT ERADICATION PROGRAMME

The planning of sound feral goat control strategies is dependant on a number of key steps. These include;

1) Definition of the problem.

The actual problem needs to be precisely identified and defined. For instance, feral goats per se, are not the real problem, but rather their presence as uncontrolled grazers on the rangeland and the associated damage caused. Survey data indicates that on the rangeland 46% of grazers are sheep, 34% are kangaroos and 20% are feral goats. The development of a feral goat eradication programme must therefore not preclude a holistic view incorporating other grazers.

2) Definition of the programme objectives.

A clear understanding of the control programmes objectives are necessary before an integrated programme, including commercialisation, can or should be undertaken. Commercialisation can easily lead to losing sight of these. The programmes original intent is forgotten when people begin viewing feral goat control as a commercial operation. This can lead to confusion about the "pest" status of the feral goat.

3) Full participation by all stakeholders.

The development and implementation of any programme requires the involvement of the stakeholders who will be undertaking the control. This involvement results in ownership of the programme and a commitment to success. Such participation encourages individuals to work in teams which has been shown to be more effective and efficient.

Recently, the pastoral industry in Western Australia instigated a feral goat eradication programme in response to concern on the numbers and damage, being done by uncontrolled grazers. The objective of this programme is to eradicate goats from the rangeland over a five year period. This programme is being implemented by utilising collective groups of adjacent landholders undertaking co-operative control and also encouraging more intensive and extensive control work by highlighting the long-term benefits of increased production and decreased rangeland degradation. The governments role in this programme is one of co-ordination and development of alternative control techniques such as poisoning with '1080' (sodium monofluoroacetate) and helicopter shooting.

The main strategy to be used by the industry to remove the bulk of the population is mustering and trapping for commercial gain. After this initial control, the programme must switch to follow-up control using other strategies/methods to continue exerting pressure until the population is eliminated. To succeed, this will require individuals and organisations (landholders, processors and transporters) relying on commercial returns from feral goats to diversify away from utilising feral goats. This will require a change in attitude by these parties and may require feral goats to be included as part of the domestic stocking rate entitlement and/or enforced decommercialisation if eradication is to be achieved. In the absence of a change in attitude and follow-up control, feral goat populations are likely to quickly increase, restricting carrying capacity of sheep and cattle. In Western Australia feral goat populations can exhibit an increase of 70 per cent per year. Depending on the number of goats removed, populations can easily return to pre-existing levels within a year or two if there is no follow-up control.

CONCLUSION

Commercialisation of feral goats for control or eradication can be a useful management tool. Depending on the circumstances, the initial commercialisation effort can reduce goat numbers substantially. In Western Australia it has been shown to have limitations that hamper its ability to achieve the long-term control objectives of an eradication programme.

If such a programme is to be successful landholders will need to realise the long-term damage this uncontrolled grazer is doing, and bodies benefiting from the commercial value of these animals will need to diversify.

Reliance on long-term commercialisation is the beginning of the end of eradication.

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