

Increasing Scottish venison production: a proposal for pilot husbandry projects

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1. Introduction

Against a background of well-documented rising demand for venison especially from supermarkets, and stable or declining forecasts of venison production both within the UK and in New Zealand, together with a growing appreciation of the healthy nutritional properties of venison, it was decided to explore ways in which Scottish venison production might be increased.

The Scottish Venison Partnership considers that the apparent reluctance of Scottish farmers and landowners to diversify into deer might be best addressed by the creation of pilot husbandry projects that could be subjected to stringent economic appraisal and required to hold regular open days for interested potential entrants.

2. The history of Scottish deer farming – previous studies and data

In 1968, a Foot and Mouth Disease outbreak prevented the game dealers from selling to their export markets and the Highlands and Islands Development Board (HIDB) began to look at alternative domestic markets. It noted the high export prices that wild venison was making and the high, and they believed unsustainable, level of subsidy being paid to hill sheep and concluded that the venison market could be expanded. They therefore proposed the establishment of a pilot deer farm.

Kenneth Blaxter, director of the Rowett Research Institute (RRI) in Aberdeen, was simultaneously thinking along the same lines and he called a meeting at the Rowett with other interested parties to discuss this proposal (Bannerman and Blaxter, 1969).

At that meeting Blaxter pointed out: *‘Much of the Highland area of Scotland is of only marginal value agriculturally. Most people think in terms of but two alternatives when considering the contribution such land resources can make, namely hill sheep farming or forestry. There is, however, a third possibility which involves exploiting the red deer.’*

The recommendations from that meeting were:

- Deer husbandry might become necessary to meet the more stringent hygiene requirements of a modern meat market
- Experimentation and research would be required before a commercial venture was launched, therefore it might at this early stage be more appropriate for the RRI than the HIDB.
- Deer stalking and tourism should not be neglected.

Accordingly in 1970 funding was put in place for a joint experimental deer farm to be managed jointly by the Hill Farming Research Organisation (HFRO) and the RRI at Glensaugh, Kincardineshire. An intensive period of research took place both at Glensaugh, and in laboratories in Aberdeen and elsewhere. All aspects of red deer were investigated, and by 1988 127 scientific papers had been published placing Scotland at the forefront of world deer research both in theoretical and practical skills for many decades to come.

Two reports summarised the findings (Blaxter et al 1974; Blaxter et al 1988).

In Chapter 1 of Blaxter 1974 it stated of the hill sheep industry that:

'In the late 1960s there was very considerable concern about the very survival of the industry....Surveys of the profitability of hill sheep farming showed that any meagre profit was entirely due to the amount of subsidy support. Indeed, it was estimated, on the basis of careful costing, that 130 to 190 per cent of the net profit of these farms was accounted for by the subsidy payments they received....'

It went on: *'The monetary return from a red deer carcass had...become almost double that from a hill ewe'* and *'the production of carcass meat from sheep was only 2 to 3 kg/ha'* while *'the production of venison was probably in excess of 1kg/ha.... It seemed possible that meat production from this poor land might well be similar under some type of deer husbandry system to what it was under a subsistence hill farming economy'*.

Necessarily, as unfinished work in progress, the conclusions from this first report are hedged with reservations. However the conclusions at the end of the final report are very pertinent to this present study and are worth including here in some detail.

At the outset of the trial it had been determined that the meat must be produced to very high standards of hygiene and welfare so as to be completely acceptable to the general public and the consumer. *'These prerequisites inevitably entailed the development of an agricultural enterprise rather than one analogous to the game ranching of wild species'*. Initial doubts as to the possibilities of handling a wild species and committing it to an abattoir, the advisability of keeping deer at stocking densities higher than in the wild with concomitant disease risks, the likely breeding success etc were all present at the outset but were all satisfactorily answered. Behavioural problems were easily overcome and the need to hand raise the breeding stock was soon found to be unnecessary and deer were entered into abattoirs without any problem. Much effort was spent in examining disease status and again no insuperable problems were identified. Reproductive success was higher than expected so that whereas wild deer in Scotland often do not produce calves until they are four, 95 per cent of well-nourished yearling hinds produced live calves on the farm and 85 per cent reared them to weaning. In comparison with sheep, deer compared favourably (see table 1 (15.1) below) and due to their long breeding life, the output of potential carcasses per year of total life was 0.51 lambs per ewe per year as against 0.66 calves per hind per year.

Table 1 (15.1): The annual production from 100 hill ewes and 100 hinds

	Age at first parturition (yrs)	Herd life (yrs)	Annual Mortality (%)	Young weaned /100	Replacements of breeding herd	Effective* production	Ratio breeding life: total life
Ewes	2	4	7.0	105	27.8	77	0.66
Hinds	2	12	1.5	86	9.0	77	0.86

* Effective production is the number of young weaned/100 females less those required to replace breeding flock or herd.

Meateat output and quality were assessed. *'It was a surprise to all those working on the project that the killing out percentage of red deer was so high, and so much higher than that of sheep. It was even more surprising that the yield of first quality meat as a percentage of the live weight was higher than that obtained from cattle and about 50 per cent greater than that obtained from sheep.'*

The central purpose of the Glensaugh trial had been to assess *'whether a farming system could be devised based on the husbanding of red deer'*. However *'...what might constitute a farming system changed during the course of the studies'*. Thus, from an enterprise finishing deer direct from the hill, the system evolved to one in which breeding hinds on the hill ground yielded calves for finishing on low ground:

'The results are fairly clear. Meat production from hill resources alone, if it involves in-wintering the calves on purchased feed is hardly viable, but for a system in which unimproved hill produces weaned calves for finishing elsewhere, a profit remains even if the selling price of weaned calves were no more than that of meat animals per kg. ... No data are yet available on which to judge whether the extension of deer farming to good land in lowland situations is sufficiently attractive in financial terms to compete with conventional livestock.'

3. Costings - historical

By 1988 costings making direct comparisons with hill sheep could be made. *'They show that at the same stocking rate the gross margin from sheep was £34.60 per ewe or £346/ha of upland and for deer it was £51.90 per hind or £519/ha. No depreciation of the capital cost of fencing or handling facilities has been included in this calculation.'*

The comparison was even more striking if the subsidy was taken into account, thus *'the gross margin of £34.60/ewe includes £10.25 of subsidy from the state. If this is deducted, the gross margin from sheep becomes £24.35/ewe, a figure less than half that from a similar venture based on red deer and costed in a similar manner.'*

In addition detailed analyses of the physical output and the financial performance of the deer farm were provided both with a hill outrun (System H) and without (System O). See tables 2 (14.9), 3 (14.10) and 4 (14.11) over.

Table 2 (14.9): Resources, herd structure, animal performance, of two systems of upland deer farming, one with a hill outrun (System H), and the other without (System O)

Resources and Herd Structure	System H	System O
Area of sown pasture (ha)	75	75
Area of hill (ha)	500	0
Number of breeding hinds	750	670
breeding stags	45	40
replacement hinds	68	60
Stocking rate - sown pasture (hinds/ha)	10	10
- hill (hinds/ha) winter only	1.5	-
Fertiliser (sown pasture) kg N/ha	120	120
Area of sown pasture conserved (ha)	16	16
Feed requirements (kg/head)		
Hinds		
Hay	100	300
Concentrates	6	25
Young hinds		
Hay	150	375
Concentrates	25	30
Stags		
Hay	150	300
Concentrates	50	60
Replacements		
Hay	175	175
Concentrates	125	125

Animal performance		
Herd life of breeding – hind (years)		15
stag (years)		8
Annual replacements – hinds/100 hinds		8
stags/100 hinds		1
Stag to hind ratio		1.25
Calving date		15 May
Weaning date		21 Sept
Calves – born per 100 hinds		95
weaned per 100 hinds		90
Calf weaning weights (kg LW) – hinds		39
stags		42

Table 3 (14.10: Gross margin analysis of System H and System O

	£ per 100 hinds		
Output	System H		System O
44 stag calves at 42 kg, £2/kg		3696	
37 hind calves at 39 kg, £2.50/kg		3607	
6.5 culled hinds at 42.5 kg DCW*, £2.20/kg		608	
0.5 culled stags at 70 kg DCW, £2.20/kg		77	
		7988	
Variable costs			
Winter feed	1400		3400
Veterinary costs	350		350
Fence repairs and maintenance	500		300
Fertiliser costs	550		600
Transport	125		125
Casual labour	300		300
Sundries	300		300
	3525		5375
Output			
Gross margin (all feed bought-in) per hind	£46.39		£26.13
Plus contribution from conserved area ie value of hay per hind fed	9.38		10.86
Gross Margin per hind	54.01		36.99
Gross Margin per ha sown pasture	540.00		330.00
With:			
(a) 10 per cent reduction in output from calves	£46.72/hind		£29.70/hind
(b) 10 per cent increase in output from calves	£61.30/hind		£44.28/hind

* DCW – dressed carcass weight

Table 4 (14.11): Financial inputs and outputs for System H and System O

Capital costs (£)	System H		System O
Total fencing costs	49000.00		21025.00
Cost handling pens	6000.00		6000.00
Cost of feeders etc for hinds			2000.00
Total capital cost	55000.00		29025.00
Total capital cost per breeding hind	73.00		43.00
Annual servicing charge, 15 years amortised at 15 per cent	12.50		7.50
Variable costs (£) per hind			
Feed cost: hay at £80/t; concentrate at £160/t	14.00		34.00
Fence costs (maintenance)	5.00		3.00
Veterinary costs	3.50		3.50
Fertiliser	5.50		6.00
Haulage	1.25		1.25
Casual	3.00		3.00
Sundries	3.00		3.00

Income		
Value of: weaned stag calves £/kg LW	2.00	
Hind calves £/kg LW	2.50	
Culled hinds and stags £/kg DCW	2.20	

The final report was then able to conclude as follows:

‘With the completion of the joint investigations made by the Rowett Research Institute and the Hill Farming Research Organisation, it can be stated that there is now sufficient knowledge to enable intending deer farmers to embark on a deer farming enterprise with some confidence’. The authors emphasize the remaining need to build marketing, processing and slaughtering infrastructure.

4. Further development

Encouraged by the optimism of the two HFRO/RRI reports on the performance of the Glensaugh deer herd, the HIDB decided to proceed with a second deer farm. In the late 1970s the west coast property of Rahoy in Morvern was chosen as a means of comparison with the heather hill of Glensaugh in the drier East Grampians.

Rahoy rose from sea level to around 1500ft with an average of 2400mm rain per annum. It was a well-balanced property with some 23 Ha of arable grassland and a balance of rough hill and birch woodland with a central access road. By 1980 some 800 Ha had been deer fenced, handling facilities had been built and the deer numbers were around 400 mixed age hinds and 112 stags.

The first sales of breeding stock and venison occurred in 1981. Over the next few years a development programme saw around 45 Ha of the lower hill re-seeded and some of the hill paddocks subdivided.

The management of Rahoy was contracted out to the HFRO in 1985 and over a period of 6 years the stock numbers rose to 800 breeding hinds. Regular blood sampling showed that the breeding hinds were deficient in copper and cobalt and this was addressed by means of cobalt injection and copper bolus administration alongside regular monitoring by blood sampling. This could be done quite easily with minimum restraint with the animals quickly getting used to the process.

Production levels rose with an average weaning percentage of 95 per cent being achieved overall and weaning weights of around 40kg. Calves were weaned indoors in late September and within a few days were settled and eating around 1kg/head of beef nuts plus ad lib hay. UA Perth held store calf sales in late October and November and the Rahoy calves sold well as buyers were prepared to pay premium prices for calves that had a high health status, were well settled and could be bought in reasonably large batches. Most calves were sold to finishers south of the border with female calves attracting keen bidding as replacements.

The HIDB also encouraged new entrants into deer farming (some of whom are still deer farming today) and offered first class breeding stock from Rahoy as well as hands-on training and on-going management advice.

In 1988/89 it was decided to set up a red deer research facility at ADAS Rosemaund in Herefordshire. This was to complement the good basic research work already carried out at Glenshagh, and focus on developing viable systems of deer production for lowland UK conditions. The Research Centre already had highly productive and profitable finishing beef cattle and sheep enterprises. This research was funded by The Ministry of Agriculture, Fisheries and Food (MAFF) with foundation stock donated by the British Deer Farmers Association (BDFA).

5. The rise and fall of commercial deer farming in the UK

Buoyed up by publicity, private commercial deer farming began to develop in Britain. A British Deer Farmers' Association was established in 1978 producing a newsletter and holding open days. Private deer farms multiplied and these early farms thrived on a shortage of breeding females. Prices for red deer hinds reached £500/head and significant numbers were captured by feeding hinds into enclosures and moving them on to deer farms. Exports of breeding deer to new deer farms worldwide, but especially in Europe, grew and continued for twenty five years with one Scottish farm winning the Queen's Award for Export in 1990. Auctions were established and regular autumn sales of calves from vendors on breeding hill farms to purchasers in the lowlands and in England developed and continued for some twenty years.

As the price of breeding hinds inevitably declined attention shifted to the marketing of venison. The British Deer Producers Society Limited (BDPS) was founded in 1983 and for many years attempted to co-ordinate co-operative marketing from venison producers. The Glenshagh deer were marketed through Waitrose in 1981 and this supermarket has continued to sell British farmed venison ever since.

With the emphasis moving from the lucrative sale of breeding hinds it became less easy to generate revenue and many deer farmers became disaffected and abandoned the project. This disaffection was accelerated when a number of farmed deer contracted bovine tuberculosis from stud stags imported from Europe.

There was no legislation to compensate farmers or to enable the veterinary authorities to compulsorily slaughter deer and it took several years before measures were put in place. For a period this had a paralysing influence on the development of deer farming.

With the eventual closure of BDPS largely due to its members selling their venison locally, in Scotland, a producers' group, Scottish Farmed Venison Ltd, was established procuring deer from Scottish farms and marketing the venison into a number of outlets including Tesco. The deer were killed at conventional red meat abattoirs in Dundee, Strathavon, and Galashiels. However, the only dedicated deer abattoir remained that at Round Green Farm, Barnsley, South Yorkshire.

In Scotland, deer farms dwindled more quickly in the absence of killing facilities north of the border and as those who started farming deer in the 1980s retired. There was also a sense of betrayal amongst those long-established deer farmers when Single Farm Payments were introduced on a historical basis. Politicians had encouraged farmers to diversify into deer farming during the 1980s and 1990s reassuring them that subsidies would soon be phased out. Indeed a number of deer farmers had been given 'start up packages' in Scotland, with grants for deer fencing and the provision of hinds, from the Scottish Department of Agriculture. As it became clear that deer farmers were not to be included in the agricultural support mechanism, many became dispirited and abandoned the project that inevitably discouraged others from entering the industry.

6. Sustainability of farmed venison production.

Red deer are astonishingly adaptable and, whilst New Zealand production is almost entirely grass based, experiments at the ADAS experimental farm at Rosemaund have demonstrated that they can be grown quickly housed under extended light regimes on cereal based rations. However, a move in this direction would risk damaging the image of venison. The strength of deer farming would appear to lie in the ability of deer to make good use of grassland. Under those conditions venison production is highly sustainable in comparison with beef, which normally demands high use of cereals.

7. Farmed red deer production

The research carried out at Glensaugh provided valuable information with regards to husbandry, stocking densities and grazing management for optimal venison production. Yearling red deer stags require a pasture height of between 6cm and 8cm to achieve maximum venison production per Ha under set stocking (Hamilton *et al* 1995). It has also been determined that pasture quality (especially poor quality late vegetative summer pasture) has a considerable influence on growth rates.

Work has been done recently in New Zealand (Ag Research, Invermay, Massey University) with alternative pasture species such as chicory and red clover that have the potential to almost double spring/summer growth rates. Chicory contains compounds such as condensed tannins and sesquiterpene lactones, and there is some evidence that these compounds may assist deer health by reducing burdens of internal parasites (Barry *et al* 2001).

Forage crops such as swedes, turnips, rape and Italian ryegrass have proved very successful for over-wintering deer in New Zealand, and this is now normal practice with all classes of stock with virtually no livestock being in-wintered.

It is worth noting that the lower South Island of New Zealand is climatically similar to Scotland (these wintering systems could work well here providing a cheaper and less labour intensive alternative to the current tendency to in-winter calves, and are currently being investigated in Scotland for upland sheep systems).

The voluntary feed intake of young red deer is very seasonal with lowest intakes (and growth rates) in winter and highest in late spring. Work done at ADAS Rosemaund has shown that light manipulation (constant 16 hour light: 8 dark throughout winter) with in-wintered stag calves has the potential, alongside adequate nutrition, to achieve high winter growth rates (Davies *et al* 1994).

Growth rates and hence slaughter dates can however be manipulated without the need for artificial light regimes by strategic feeding during periods of potential high growth rates (late autumn- early spring) using a silage based ration followed by grazing of high quality pasture over the late spring/summer period. This would obviously involve additional feed costs but could spread the slaughter date and thus increase the availability of finished carcasses for processors during a period when venison has to be imported to meet demand from retailers. An example is outlined below.

- **Forage based wintering rations for achieving different slaughter dates for in-wintered stag calves**
 1. For 16 -17 month slaughter (Oct - Nov)
 - winter on good quality silage alone (ME = 10.5-11.0) – allow 600kg per stag
 - good summer pasture
 - 45kg (weaning), 58kg (turnout), 100kg (slaughter)
 2. For 14 - 15 month slaughter (Aug - Sept)
 - Winter on good quality silage + 100 - 250g concentrates per day (allow 500kg silage per stag)
 - good quality summer pasture
 - 45kg (weaning), 65kg (turnout), 100 kg (slaughter)
 3. For 10 - 13 month slaughter (April - July)
 - Winter on good quality silage + 1kg concentrates per day – allow 350kg silage per stag
 - 50kg (weaning), 90kg = 50kg carcass (April), 100kg = 55kg carcass (July)

(Only the top stag calves 50kg + will achieve these early slaughter system target weights)

(Source: ADAS Deer Nutrition and Management 1990/91)

These systems are based on high quality (10.5 - 11 ME) silage (concentrate ration would have to be altered accordingly for poorer quality, therefore analysis of silage sample is crucial). Initially a proprietary 18 per cent crude protein cattle nut was fed as the concentrate element of the diet. Subsequently this was replaced with a home-mix ration with crude protein content of 16 per cent (40 per cent rolled barley, 40 per cent sugar beet pulp, 7.5 per cent soya bean meal, 7.5 per cent fishmeal and 5 per cent molasses meal) with the silage ration. This proved to be very palatable to newly weaned calves. The compound supplement was simplified further to consist of 80 per cent whole barley and 20 per cent soya bean meal plus added minerals. This ration has proved satisfactory and cost effective.

To make early finishing under this system economic, a seasonal price incentive would need to be obtained to adequately reward out-of-season (early) production. This has been the case in New Zealand for many years where the price schedule rewards producers who have animals at optimal slaughter weights (45 - 65kg dead carcass weight) in the early spring for export to Europe pre-Christmas

8. Costings for store calf and stag finishing at current prices

Breeding hinds (productive life 12-15 yrs. 90 per cent calving) good quality **£350**

Breeding stags (herd life 6 – 8 yrs. Ratio 1 stag to 35 hinds) 2 year old good quality **£1500 - £2000**

Fencing costs **£8 – 10** per metre supplied and erected deer net and posts at 5 - 6 m spacing (existing sheep fences can be topped up relatively cheaply and electric fences can be used for internal sub-divisions significantly reducing costs, gates **£150** wooden, **£250** steel

Handling Crush **£1000 - £8000** (vary between manual drop floor – complex hydraulic)

Handling systems can be simple adaptations of existing buildings or purpose built sheds

8.1 Gross margins for store calf production and stag calf finishing

Store calf production (LFA marginal /hill land) per 100 hinds:

Sales	£
45 stag calves @ 45kg live weight @ £2.20 per kg	4455
35 hind calves @ 40kg live weight @ £2.00 per kg	2800
8 cull hinds @ 53kg carcass weight @ £2.00 per kg (sold in skin to game dealer)	848
Average annual value of cull stags	120
Less average annual cost of replacement stags	250

Output	8473
Variable Costs:	
Feed (100 hinds plus 3 stags for 150 days)	2439
Feed (80 weaned calves 21 days pre-sale)	420
Feed (10 replacement hind calves for 150 days)	299
Veterinary and Med	300
Miscellaneous	300

Total Variable Costs	3758
Gross margin per 100 hinds	4715
Assumed feed intakes:	
Stags: 6kg silage + 1.5kg concentrate per day	
Hinds: 6kg silage per day	
Sale calves: 2kg silage + 1kg concentrate per day	
Replacement hind calves: 2kg silage + 0.75kg concentrate per day.	
Costs: Silage £15.00 per 600kg bale. Concentrates £200 per tonne.	

8.2 Finishing store calves – stags – per 100 stags

	£
Sales: 97 Stags (15 -18 months) @ 55 kg dead wt @ £3.80 per kg	20273
Less Purchases: 100 stag calves @ 45kg live wt. @ £2.20/kg	9900

Output	10373
Variable costs	
Feed	2688
Veterinary and Med	300
Miscellaneous (includes bedding straw)	1000

Total variable costs	3988
Gross margin per 100 stag calves	6385

Assumed feed intakes:

2.5kg silage + 0.75 kg concentrate per day. 130 day winter.

Costs: Silage £15.00 per 600 kg bale. Concentrates £200 per tonne.

A breeding and finishing unit could achieve a gross margin per 100 hinds of more than double that of a store calf producing unit but would require a larger area of better quality grazing to be efficient.

8.3 Comparison with sheep gross margins

LFA Hill Breeding Flocks (Blackface/Cheviot Ewes) show an average gross margin of £17.00 per ewe. Store lamb finishing shows an average gross margin £14.00 per lamb (Source: QMS Cattle and Sheep Enterprise Profitability in Scotland 2009)

If we assume a stocking density of 0.5 hinds per ewe (on LFA hill/marginal land) then the gross margin per hind compared with Blackface/Cheviot sheep would be £23.50

9. Deer parks and enclosures

The creation of deer parks or deer enclosures is an alternative to deer farming and requires further investigation.

During the expansion of deer farming in the 1980s, several thousand deer were captured live throughout Scotland by feeding into fenced areas or darting with a tranquillizing drug. These were then mainly transported to deer farms and generally found to settle well in their new environment.

Some estates fenced off larger areas and enclosed whole herds of deer which subsequently became deer farms. Ideally these areas were familiar to the deer and provided natural shelter such as woodland and, in some cases, areas of improved grazing enabling higher stocking densities and levels of production to be maintained when compared to the 'wild' herd outside the enclosure. The availability of winter feed and cost is a major consideration and is crucial to the production and welfare of any enclosed herd.

The deer enclosure could be managed on a very simple basis with deer selectively shot at close range providing high quality carcasses. Most sporting estates have access to game larders and chill facilities where carcasses can be processed for sale to game dealers in the same manner as wild deer.

Such large enclosures might not be incompatible with the traditional sporting interests of the estate.

For this to be profitable, carcasses must attract a significant premium from the game dealer to justify the cost of winter feed and extra labour (currently many deer parks in England are being paid a 30 per cent premium over wild deer for clean shot in skin carcasses).

10. Grants and Subsidies

Through the Scottish Rural Development Priorities (SRDP) scheme support is available to new entrants to deer farming through the Rural Priorities option *Diversification of Rural Enterprises* which specifically lists deer as an enterprise considered as alternative agriculture and therefore eligible for support. Additional support is available in the form of a *Young Farmer Premium* for those who qualify (see extract from SRDP website below).

Rural Development Contracts - Rural Priorities (RDC - RP) is an integrated funding mechanism that will deliver targeted environmental, social and economic benefits.

It will contribute to the delivery of the Scottish Government's strategic objectives through regional priorities, agreed with stakeholders for each of the 11 regions.

Rural Priorities is a competitive mechanism to ensure that contracts are awarded for the proposals that are best able to deliver the agreed regional priorities.

Rate of support:

This Option is about changing the scale or nature of the agricultural business as a whole, or partly, and/or significant changes to existing business practices. By sharing the cost of investment targeted at restructuring, including expansion, it is hoped to support farm businesses to improve their income stream from their agricultural activities and also encourage wider benefits, such as improvements in animal health and welfare, environmental management and health and safety for those involved with the business. Restructuring is taken to mean changes to the scale or nature of the agricultural business as a whole, or of specified elements of the overall business and/or significant changes to existing business practices.

For non-LFA, up to 40 per cent of eligible costs plus 10 per cent Young Farmer Premium if eligible.*

For less favoured areas (LFA) up to 50 per cent of eligible costs plus 10 per cent Young Farmer Premium if eligible.*

*To be eligible for the Young Farmer Premium, the applicant must be a farmer or crofter who, at the time of committing a Proposal is:

- 16 years of age or over, but under 40 years of age
- the head of an agricultural business (either as sole proprietor; or as the majority partner; or as the equal partner with another farmer or farmers under 40 years of age).

Companies are ineligible for the 10 per cent Young Farmer Premium. (Source: SRDP website – Rural Priorities)

New entrants are also able to retain their Single Farm Payment, and farmed deer may qualify for LFA subsidy if this has been historically awarded to other classes of livestock on the area to be grazed by deer (deer are listed as qualifying animals).

11. Genetics and Deer farming

Most of the research done at Glensaugh and ADAS Rosemaund used Scottish red deer (*Cervus elaphus scoticus*). Experiments were conducted at Glensaugh using elk (wapiti - *Cervus elaphus canadensis*) to produce elk x red hybrids. These hybrid animals were consistently heavier from birth and achieved slaughter weights earlier. Gestation periods of red hinds carrying hybrid calves were found to be around 10 days longer and, with increased birth weights, calving problems were more common.

Research in New Zealand with 7 month male elk x red and red deer has demonstrated that, under similar conditions, the hybrid deer achieve higher growth rates but this is thought to be related to the size of the hybrids at a similar age to the red deer rather than a major difference in their feed conversion efficiency (Stevens et al, Invermay). Further studies in New Zealand have shown that fertility of the elk x red is lower than red deer and consequently elk or 75 per cent elk x red sire stags are commonly used as terminal sires only with all progeny slaughtered for venison. The elk x red deer hybrids require a higher pasture allowance than red deer to achieve potential high growth rates.

More recently in New Zealand huge production gains have been made using red deer by performance testing sire stags and establishing a system which allocates breeding values (BVs) which rank individual animals in a population on their genetic superiority for specific traits (eg. growth rate to weaning, temperament, carcass conformation). The 'best' animal to produce venison is fast growing, fertile and easy to manage. These traits are heritable to a varying degree, are economically important, and can be measured.

Artificial insemination (AI) using high BV semen from superior stags is now common practice among commercial farmers in New Zealand and pregnancy rates of around 75 per cent are regularly achieved. AI is carried out vaginally by trained technicians in a similar manner to cattle using a handling crush to hold the hinds steady. Hinds are synchronised prior to insemination and back-up stags introduced 10 - 14 days after AI to cover any non-pregnant hinds. Pregnancy testing with an intra-rectal ultrasound device around 40 – 60 days after removal of the back-up stags is used to determine pregnancy to either AI or stag. Typically hinds pregnant to AI calve over a relatively short period (3 - 5 days) allowing accurate evaluation of growth rates birth to weaning and easier selection of superior animals to be retained for breeding.

12. Transport of Deer

Deer are not subject to the record keeping requirements laid down for most farm species in the Movement of Animals (Records) Order 1960. It is illegal to transport deer in velvet.

Farmed deer travel extremely well and can travel long distances without showing any signs of stress providing that a suitable vehicle is used. Trailers and horseboxes can be used for small batches of deer.

Loading from a handling system into a truck or trailer is relatively straightforward. Breeding stags are required to be segregated during transport and young stags must be de-antlered when travelling in groups. This presents an issue for finishers as stags cannot legally be de-antlered in velvet and may reach slaughter weight before being able to be transported to an abattoir.

In New Zealand, deer velvet removal is permitted under strict veterinary supervision and has considerable value but this remains a secondary product to venison on most farms. It is common however for in-wintered stag calves on a high nutritional plane to be more advanced in antler growth than stag calves wintered on a low nutritional plane and therefore they come into hard antler and can be de-antlered earlier. On long journeys deer must have enough room to lie down and provision made for feeding and water. On shorter journeys deer should be given enough room to stand comfortably.

13. Slaughter of farmed deer

In New Zealand there are many dedicated abattoirs for deer and they have the combined capacity to put through several thousands of deer per day at peak periods. To date there have been no significant welfare issues arising from this process. Venison is the primary product of New Zealand farmed deer production and a network of efficient abattoirs is essential to the industry. Deer are generally transported to the abattoir in double decked trucks which can carry around 110 x 95kg stags, by experienced transport operators and are then allowed to stand quietly in pens for several hours before slaughter. Slaughter is by captive bolt in a purpose built crate, processing takes place on a dedicated deer line by a team of expert slaughter men.

Scotland at present has no abattoir facility for deer. Historically several Scottish abattoirs have successfully handled deer but this was done at a time when many smaller abattoirs (which were the keenest to kill deer) were closing and the low volume of animals being presented made it uneconomic for larger abattoirs to convert lairage facilities and adapt slaughter lines for deer. Currently the nearest abattoir facility for Scottish deer producers is near Barnsley, Yorkshire. PGI status being sought for Scottish venison however would require deer to be slaughtered in Scotland.

A substantial number of farmed deer in Scotland are field shot using a suitable (legal) rifle and ammunition and then processed through an approved facility having undergone the required ante and post mortem veterinary inspections required by legislation governing red meat hygiene. It is however, the authors' opinion that abattoir facilities in Scotland would be required to cope with an increased volume of production if a substantial expansion of deer farming was to take place.

14. Marketing

Work done at Glensaugh had demonstrated the very good nutritional composition of venison in comparison with other red meats in terms of high killing out percentages, high proportion of quality cuts within the carcass and the very low fat content, and the favourable fatty acid profile of the fat. Subsequent research carried out in 2008/2009 as part of a LINK project sponsored by the British Deer Farmers' Association confirmed and amplified this work demonstrating that farmed red deer have an exceptionally good conformation and composition from the human nutritional viewpoint.

These features are so remarkable that many bodies such as the World Cancer Research Fund and American Institute for Cancer Research stated as long ago as 1997 that: *'if eaten at all, red meat should provide less than 10 per cent of total energy... consumption of meat from non-domesticated animals is preferable.'*

This data provided a springboard for venison promotion and chefs gradually came to value the predictability of farmed venison from consistently young deer. Venison became one of the most popular ingredients on the television and magazine journalists' menu. Mintel (2010) indicated that venison demand is rising quickly and that sales of venison rose from £32M in 2006 to £43M in 2009, an increase of over 34 per cent, and was the only red meat experiencing a growth in demand within the UK during that period.

15. Current market

Wild venison continues to supply the bulk of the market, but the retail sector is increasingly dominated by farmed venison imported from New Zealand. Existing suppliers of this imported product are keen to substitute this with UK farmed venison and are concerned about the possibility of declining volumes from New Zealand (*pers. comm: Holme Farmed Venison and Highland Game*). There is now a reliable market for farmed venison.

16. Supply

During the last 30 years most wild Scottish venison was exported to Europe, principally to Germany and Benelux. Most roe deer continue to be exported and there are still a number of game dealers who export red deer. However during the last decade, UK demand has grown so that almost all Scottish wild red deer and all farmed venison is consumed within the UK.

An indeterminate quantity of farmed red deer venison is imported from New Zealand. According to Deer Industry New Zealand statistics, approximately 400,000 carcasses weighing about 15,000 tonnes, of which the UK takes about 5 per cent, seem to suggest that only some 750 tonnes enters the UK but there is some suggestion that this is a substantial underestimate. Frustratingly Intrastat statistics seem unable to distinguish venison imports and the picture is further complicated by the indirect importation of New Zealand venison into the UK via Rotterdam and Hamburg.

Although imports from New Zealand are significant, the chief source of venison on the UK market remains wild red deer. These are almost entirely from Scotland where around 60,000, representing almost 3000 tonnes, are thought to be entering the UK market annually. Cull returns to the Deer Commission for Scotland, and now to Scottish Natural Heritage, allow a figure of approximately 3,400 tonnes (fig 9, McKellar Report 2010) of which about 380 tonnes are from roe deer.

17. Future supply

The predictions are that the supply of Scottish wild venison is unlikely to increase significantly and may even fall (SNH 2010). In addition production of farmed venison from New Zealand is estimated to remain at around 400,000 carcasses for the next few years due to sales of deer farms to dairying and also to some extent to the retention of females. (from DINZ website). Thereafter production may increase. In the peak year of 2005 over 750,000 farmed red deer were killed in New Zealand. Prices of New Zealand venison reflect international demand and currency exchange rates.

18. Conclusions.

If demand continues to grow as many predict, and given the static or falling supply, there will be an increase in the shortfall of domestically produced venison.

The only possibility for dynamically increasing venison supplies lies with deer farming for which Scotland is very well suited. Since it is accepted that venison is healthier than alternative red meats and can be produced sustainably from grass without significant cereal inputs **then it would be in Scotland's national interest to encourage the development of new deer farms.**

New deer farmers benefit from Single Farm Payments since they can carry their existing entitlements with them so that it is only the long established deer farmers that are discriminated against by the agricultural support mechanism. However, new entrants are supported and are thus in a favourable position. There remains however a credibility gap.

The conclusions of the work completed at Glensauigh and Rahoy as well as that carried out at Rosemaund for ADAS and the LINK project, of which one of the sponsors was the Scottish Government, clearly indicate the economic viability of deer farming.

19. Recommendations.

The question then arises how best deer farming in Scotland might be encouraged.

Recent publicity about the growing demand for venison and its static supply stimulated a well-attended day organised by Scottish Land and Estates with continuing bona fide enquiries being received. To help turn this interest into new entrants to the sector the authors of this report recommend that several new deer farms be encouraged to submit to being 'demonstration units' to provide accurate economic analyses for publication.

These demonstration units should be of different scope and scale, and on varying terrain.

Recent research into grazing systems on specialist forages and in particular the wintering of deer on crop could be investigated under commercial conditions alongside the influence of high genetic merit sire stags on production. These farms could also be required to hold occasional open days that would provide ongoing encouragement and credibility.

- We conclude that the objective of increasing Scottish venison production would be best achieved (1) by the creation of several demonstration farms and/or the establishment of a small group of recorded monitor farms to provide hard evidence for others to enter the sector.
- In addition (2) a sector-led 'task force' should be set up under the auspices of the Scottish Venison Partnership, able to draw on additional expertise, to produce a 'Road Map for Growth' for Scottish venison plus additional funding to drive this forward.
- And (3) to identify potential growth of the UK domestic venison market with accurate forecasting for predicted sales volumes over the next 10 years.

On this basis, and with continuing sectoral promotion, we believe that an industry target of 400 new venison farms in Scotland is not unrealistic as a target by 2020 or sooner.

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