

WILDLIFE RANCHING AND MEAT PRODUCTION: A GLOBAL OVERVIEW

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"To exchange the wide spectrum of twenty to thirty (species of) hoofed animals living in delicate adjustment to their habitat, for the narrow spectrum of three ungulates - cattle, sheep and goats - is to throw away a bountiful resource and a marvellous ordering of nature" were the words of South African ecologist, Sir Frank Darling in 1960²³. The agricultural based economy of today is based on cereal crops and grain eating animals, rather than the deer-pig based economics on which mankind relied in antiquity¹⁷. This longstanding man-deer relationship was important because it showed a trend towards animal husbandry of a deer population on which there was a high degree of economic dependence¹⁷. Deer are an ancient family, comprising 41 species¹⁸, which emerged some 20 million years ago during the Miocene period in Asia. China records the first attempted farming with deer (Père David's deer) in about 1 000 BC²³, but archeological excavations reveal an even earlier economic dependence on deer populations, with a system for harvesting game which maintained their numbers and safeguarded their breeding potential^{17,23}. This complex and delicately balanced association is revealed in the diggings at Molino Casarotto, where 75 percent of the animals killed consisted of young individuals, a situation which cannot be considered as random culling¹⁷. The apparent deliberate concentration on only certain species, ages and sexes, implies a form of intelligent management of the animal resources²³. In southern Italy and Greece red deer were exploited continuously for 50 000 years up to the Neolithic age. Red deer were found at 95 percent of the archeological sites and probably provided 40 percent of all the meat eaten throughout Europe from the end of the Ice Age until 4 000 BC¹⁷. For over 30 000 years fallow deer and gazelle contributed to approximately 70 percent of all meat eaten as indicated by diggings at the Kebarah cave site on Mount Carmel²³.

Africa has been blessed with a rich heritage of wild fauna, presumably because the Pleistocene age did not result in the extermination of the great majority of mammal species as it did in Europe and North America⁴¹. Of the 194 species comprising the order Artiodactyla, 92 are indigenous to Africa¹⁸. Antelope have been intelligently used in Africa, with planned culling based on folklore, tradition and respect for tribal leadership. On this basis hunting has for centuries been a source of high quality protein to the human population in Africa⁴¹, with between 60 percent and 80 percent of the meat eaten in several countries in southern and west Africa originating from wild animals⁵. Game tend to be resistant to most endemic diseases and are better adapted to their environment¹⁹, with the result that many have advocated the ranching of game in Africa in preference to farming with exotic domestic stock⁹. Careless exploitation during early colonisation caused the disappearance of many animals²³ and game populations reached a precariously low level even prior to the turn of the nineteenth century^{19,20}. In addition, domestication and veterinary disease control measures required fencing, which robbed the natural fauna of the opportunity to roam freely in search of better quality food²³. Game had no economic value at this stage, and wholesale game eradication programmes were instituted to protect domestic stock¹. Many of the surviving wild mammals are essentially those which adapted to modern day farming practices and the densities of the game species are directly influenced by the man-induced environmental changes and by their behavioural response to food and water^{2,22}. In South Africa, nineteen species of wild ungulates are now considered as being important on farmed land which comprises 69 percent of the total area of the country. Springbok, impala and blesbok are the three dominant farm species with the first two easily controlled by fencing². Game animals were never farmed, however, because the profitability of such farming could never compare with conventional livestock production^{19,33}. Farmers have shot and marketed game in South

Africa for decades, albeit in a primitive manner and with a suspect health status of the product. This was in the absence of suitable guidelines or regulations, resulting in a low commercial value in the first half of this century^{32,33}.

The commercial utilisation of wildlife was initiated by the United Nations Development Programme in Zambia in the 1960's with the aim of reducing game populations to meet the carrying capacity of their habitat and their subsequent maintenance at an optimum level²³. This project failed due to a 34 percent wastage from bruising and bullet damage and the cost of the heavy equipment demanded by the authorities to comply with elaborate hygiene and meat inspection regulations²³. Optimism was again raised about the possibilities of game ranching by Raymond Dasmann in 1964 in his book "African Game Ranching"²³. Doubt remained, however, about the economic validity of continuous cropping of natural fauna, and in consideration of the future for game production within the Republic of South Africa, it was concluded that the answer lay in either game farming or game ranching¹⁹. The game farming industry was initially restricted to the sale of game during a predetermined hunting season, which coincides with the South African winter months, with land owners permitted to shoot surplus game on a restricted number basis¹⁹. These carcasses were invariably eviscerated and despatched by train to the nearest urban centre with skin and head intact. This form of commercial utilisation involved over 3 000 properties in the Transvaal with an annual supply of approximately 3 500 tons of fresh meat²⁷. In South Africa, the landowner through the exercise of lawful ownership by tenant, benefits directly from the commercial utilisation of game³³. The last two decades has shown an increase in the numbers of the more common game species³², and today there are close on 10 000 farmers in South Africa who make a substantial financial gain from game on their land²⁵. The number of registered game farms gives no idea of the extent of the commercial utilisation of game. Game farming has been defined as "the economic use of game within the farm confines"⁶, but some do not accept morally the concept of the commercial use of wildlife²⁵. A term "farm game" has been coined to describe wildlife on private land where any operation recognised as "game farming" does not take place²⁵. The development of the game farming industry has not always been viewed with optimism especially with regard to the problems associated with ownership, management, disease and hygiene of slaughter. Cropping truly wild, unowned and uncontrolled animals is a "transient phase interrupting a trend terminating in domestication or extinction"⁹. Ecologists in Africa do not necessarily share this view and many propose economic arguments in favour of farming antelope as a component of effective game conservation²³. Reasons for keeping game are the prestige of owning game animals, hunting for sport and recreation, conservation of endangered species and the aesthetic pleasure of viewing wild animals^{19,23,34}. Income can be generated from keeping game and four main areas in this respect have been identified²⁵, namely, game harvesting and the sale of game meat, live game sales, game viewing and hunting, including safari hunting, trophy hunting and hunting for table use. Although an expanding industry, "game farming" is a loose term covering game exploitation of varying intensities which lies somewhere between uncontrolled hunting of wild populations and intensive domestication, these being the two extremes of the spectrum of commercial exploitation^{23,26}. In 1986 it was estimated that 82 percent of farmers with game on their farms derived an income from "game farming"²⁰, contributing up to R74 million of the gross of agricultural production. The production potential of the South African game meat industry is approximately 10 000 tons per annum¹².

Game farming has had an influence on many of the extensive farming areas in South Africa³². Some authors are of the opinion that wild ungulates reproduce more efficiently, grow out well

and dress out at a higher percentage carcass yield with a high percentage of red meat³². To make this higher biomass commercially attractive, some harvesting of the animals to control population numbers is essential annually^{24,41}. For almost two decades this has been practiced to satisfy the overseas gourmet market and to stimulate foreign exchange. Impetus was also given to game farming by the belief that the ever expanding local demand for conventional red meat could be supplemented with game meat³². A challenge has arisen on how to utilise wildlife commercially on a sustained yield basis whilst remaining economically competitive with countries who have advanced game ranching to almost complete domestication for farming purposes⁵. Harvesting is the most widespread commercial use of game, with between 50 000 and 60 000 blesbok and springbok being harvested each season²⁵, and is an essential component of any well organised conservation programme. Problems have been encountered in the cropping of game with the access to cropping sites being difficult and carcass chilling unreliable³⁴. Harvesting large numbers of game economically under extensive conditions in South Africa has a number of pitfalls. The main losses when shooting game in the wild are attributed to wounded animals that are never recovered, meat unfit to eat because of bullet damage and the poor meat quality resulting from the stress of the hunt⁴⁰.

The springbok (*Antidorcas marsupialis*) is one of the most common antelope found in southern Africa³⁴ and constitutes upward of 80 percent of the antelope harvested in South Africa each year with the majority of venison exported also being derived from this species. It has a core distribution area coinciding with the area of maximum temperature variations, where it occurs in appreciably higher densities than elsewhere²⁴. This core area is almost identical to the region where the rainfall occurs most often during the equinoxes spring and autumn and which appears to favour the antelope's reproductive cycle²⁴. The reproductive rate of the springbok lends itself to improvement through management³⁴ and it has been concluded³³ that an increased breeding rate could result from the pressures of game harvesting procedures. Although the springbok is no longer strictly feral and can be herded in camps or paddocks, they are not truly domesticated, where domestication implies improvement through breeding¹⁹ or adaptation genetically by behavioural selection¹⁵. However, if domestication is more than simply being tame²³ and if it presumes the propagation of animals that man keeps in "captivity"³, then the springbok can be regarded as being domesticated and scientific farming practices will guarantee its survival²³. The springbok will probably never be as fully domesticated as the farmed deer of Europe and Australasia, but could be considered "rather as an opportunistic feeder, roaming freely over a sheep farm or cattle ranch, to be cropped from time to time as a cash bonus"². Generally, deer and antelope meat is well known for its lean character²¹. In the springbok the mean carcass fat content of the different age groups never exceeds 4 percent³⁴. In domestic food animals the percentage meat decreases from birth to maturity, whereas in wild ungulates it increases, peaking at 84 percent in adult males and 82 percent in adult females^{34,41}. In one study mature springbok and impala rams dressed out at an average of 58 percent, compared with the 51 percent for ewes, which is higher than that of sheep but similar to cattle³⁷. In another study little difference was found between the sexes in impala and wild ungulates were found to have a higher dressing percentage than domestic ruminant species⁴¹. Wild ungulates have certain muscle characteristics which differ from domestic food animal species. The meat obtained from the flank and brisket in the springbok comprises only 10-12 percent of the carcass weight compared with 24 percent in sheep carcasses¹⁶. The high quality hind quarter musculature comprises 29 percent in the springbok as against 24 percent in sheep⁴⁰. The longissimus dorsi muscle is also very well developed in springbok compared with sheep of the same age⁴¹. It

has been shown that the *M. longissimus dorsi* of seven South African wild ungulates, including the springbok, had a lower fat content than cattle or sheep³⁹. Springbok meat has the lowest moisture content when compared with other antelope meat and its fine grain and softer texture due to the smaller fibre thickness resulted in the highest tenderness rating in comparative tests. This is one of the reasons for the high demand for springbok venison and biltong (jerky)³⁹. Young red deer carcasses shot in the wild were found to be lean and well flavoured and produced 32 percent of top quality boned-out meat from haunch (hindquarter), saddle and forequarter²¹. Fallow deer meat has been found to be undeniably dry and fibrous in texture and has a taste which will never be popular²³. Venison in general has a consumer barrier to overcome and although the high lean content is attractive, the strong "gamey" taste is often objected to¹⁹. There are two distinct and separate markets for game meat: the local subsistence diet and the exotic luxury trade, into which South Africa's springbok falls²³.

Health authorities insist that the same conditions and facilities for carcase dressing and meat inspection should apply to game animals shot in the bush, as for domestic animals slaughtered in abattoirs²³. In 1975, The Federal Republic of Germany imposed stringent restrictions in the field of hygiene on importing countries⁹, with the restrictions being more difficult to meet on the open ranges of Africa²³ than when working with "slaughter deer" in conventional abattoirs³⁵. Hunting game by stalking as a method for obtaining venison on a commercial basis is not economically viable⁸. Wild or feral game formed the basis of New Zealand exports and the United Kingdom venison industry until the farming of deer was officially recognised. This seemed a logical development in man's attempts to extract greater production from his environment without further endangering the resources upon which his future depended⁵. In supporting this concept the Viscount of Arbuthnott said: "there may be good reason to doubt the desirability of promoting an 'unnatural' use of yet another 'natural' resource for the needs of man, but such a proposition overlooks the tenable viewpoint that many natural resources in a hard commercial world will only be given their true value and status once it has been demonstrated that they have an intrinsic commercial usability!"⁸. Game harvesting is the method employed to utilise the high productivity potential of indigenous wild animals¹⁸.

In Australia a deer farming industry has developed in New South Wales with a legal requirement from the outset that deer must be slaughtered in abattoirs³¹. In 1978 deer farming was started in Queensland and by 1985, when all deer farms had to be licensed under the provision of the Deer Farming Act, there were 70 deer farms. These were mainly in the red deer feral area with a population of 4 000 red deer (*Cervus elephus*), 1 000 rusa deer (*Cervus timorensis*) and 500 fallow deer (*Dama dama*).

In Denmark, by the time legislation was adopted in 1987, 350 deer farms were registered with a fallow deer population of some 12 000 does and 2 000 hinds. Two hundred and fifty deer farmers have formed a limited company in a system where meat is the major commodity³⁸. Deer farmers receive almost twice the price per kilogram carcase weight for deer meat as compared to beef and mutton³⁸. In Denmark fallow deer are slaughtered on the farm where they are either shot in the field or stunned with a captive bolt in the mustering yards³⁸. The deer are then eviscerated in a specially designed and approved vehicle prior to being inspected by a veterinarian.

In the Federal Republic of Germany, the licenced sportsman may not retain the meat of the animals he shoots, even on his own land. There are 2 000 deer farms in the Federal Republic of Germany with more than 40 000 does, which are controlled on a provincial basis by an association of deer farmers. In West Germany the economy of fallow deer farming is regarded as being better than that of lamb or beef production²⁸. From the many attributes sought in a wild ungulate for successful game farming, perhaps the following have attributed to the success of the fallow deer in West Germany: high productivity, easy calving, good feed conversion, good meat formation with a high yield of saleable meat which is of an excellent quality²⁸. There are only a few farms that have red deer²⁸.

In New Zealand farming of deer was officially recognised in 1970, and the New Zealand Deer Farmers' Association was formed in 1975⁹. By 1984 a deer population in excess of 300 000 was recorded with red deer accounting for 85 percent of the population on more than 2 000 farms^{23,30}. The Ministry of Agriculture and Fisheries has prepared a game farm production guideline, the aim of which is to ensure that game animals are handled correctly and hygienically from killing to delivery at a meat processing plant. Carcasses must be delivered to a game depot or game packing house within sixteen hours of killing, having first been eviscerated and cooled by hanging in the shade¹⁰. The carcass should be kept as dry as possible and the aitchbone should be split between the hind legs to assist in the cooling process. Originally slaughter of deer was carried out on farms, until a mobile slaughter facility was introduced and where the carcasses were taken by a refrigerated vehicle to the game packing houses³⁰. This was found to be economically impractical and now abattoirs are compulsory with the stress of slaughter being found to be no greater than for other livestock. The building and running of an abattoir and chilling facilities are, however, expensive and time consuming³⁰. Today there is vast capital investment in helicopters, vehicles, buildings and equipment necessary for processing deer carcasses in accordance with the very exacting hygiene restrictions imposed by Germany on importing countries⁹. A small number of deer farms produce a limited amount of venison to satisfy the demands of a very specialised market and there seems to be little prospect of meaningful further development. New Zealand has, however, joined Sweden in looking at the huge potential market in the United States, where the lean content of venison should be very attractive to the health conscious American consumer⁷.

The three types of slaughter facilities for reindeer in Sweden can be summarised as a permanent plant where reindeer are slaughtered and various products are processed, a semi-permanent field slaughter facility where reindeer are killed and the head, legs and viscera removed and a mobile slaughter operation which travels from corral to corral and then prepares carcasses in a similar manner to semi-permanent field facilities. This latter method was found to be practical and a useful alternative to slaughter using permanent facilities if done in a proper manner. Inspection requirements for cattle and reindeer are identical in Sweden⁷.

The British Deer Farmers' Association was formed in 1978¹³ and by 1983 members were farming about 10 000 fallow deer commercially^{4,22,29}. In Scotland studies commenced in 1970 to devise farming systems to utilise the red deer. This probably represents the first attempt for many thousands of years in the United Kingdom to domesticate a wild ruminant⁸. In 1967 the yield in deer meat from wild populations was about 25 000 carcasses, with approximately 1 500 tons per annum being exported. In 1970 the Red Deer Commission stated that "the

farming of deer specifically for venison production, if carried out under present circumstances, is unlikely to be economic" (reference being to on-farm casual slaughter)⁸. In Scotland a sizable commercial unit for the production of venison was established in 1973. An experimental herd of red deer was started in England in 1978. From Scotland it was reported in 1979 that the price of venison from estate larders had escalated from a few pence to 20 per pound as a result of the demand for deer meat in Europe and the development of an export trade⁸. In 1982 the British Deer Producers' Society Ltd, a government supported farmers' co-operative was formed to market venison produced by members¹³. The first slaughter of deer in a commercial abattoir was performed in Scotland in 1982 and subsequently in England in 1984¹³. This slaughter was exempted from the restrictions of the out-of-season hunting bans. Research and the development of systems has shown that the farming of red deer can provide an economically viable alternative to both sheep and cattle and has now become firmly established in the United Kingdom and other European countries. On the local market in the United Kingdom deer meat is sold in the luxury range directly to hotels, thus obtaining a much higher price than would be possible through conventional game marketing avenues^{31,36}. At present this is on a larger scale than in New Zealand, with stocks in Scotland alone being estimated at more than 250 000 animals¹⁴. In Britain the trend is to shoot the animals in the field with a rifle at close range as they graze^{11,31}, in some cases using a 0,270 calibre high velocity deer stalking rifle²¹. This method has been condemned as primitive, but it is effective, humane and does not disturb surrounding animals. Apart from the humane aspect, the keeping quality of meat is enhanced by a good shot with a rifle²³. Groups of animals are usually fed and then up to 20 deer are shot in rapid sequence³⁰. Deer farmers sell the deer carcasses with the skin on directly from the farm to the game trade. The primary recommendation at the experimental station at Glensaugh is that deer should be slaughtered centrally and the carcasses inspected by qualified meat inspectors in order to certify them as fit and safe for human consumption³¹. The Department of Agriculture and Fisheries for Scotland has made it clear that a meat industry based on the red deer would have to adopt hygiene standards similar to those applying to domestic farm livestock⁸.

The economic value of game should not be determined by their use as meat producers alone². Recreational hunting and game viewing on private land has already become a source of revenue for some farmers. It has been suggested that the rise in popularity of game farming has been caused primarily by aesthetic rather than economic motives and this is supported by the fact that the majority of the expansion in game populations took place before the development of the crucial venison export market in 1972 and certainly before any financial feasibility had been studied²⁵. It is possible to conclude, from the remarkable expansion in and popularity of game farming in South Africa, that this form of farming is a highly lucrative activity. The economics of venison export are finely balanced and dependent to a large extent on the price obtainable on the overseas market. This market has now collapsed, leading to the realisation that more emphasis must be placed on developing the local market.

REFERENCES

1. Basson, P.A., McCully, R.M., Kruger, S.P., van Niekerk, J.W., Young, E., de Vos, V., Keep, M.E., Ebedes, H. 1971. Disease Conditions of Game in Southern Africa: Recent Miscellaneous Findings. *Vet. Med. Review.* 2/3: 313-340

2. Bigalke, R.C. 1974. Ungulate Behaviour and Management, with Special Reference to Husbandry of Wild Ungulates on South African Ranches in Behaviour of Ungulates and its Relation to Management. Geist, V., Walther, F. (Eds). Volume 2: 830-851. Proceedings of International Symposium
3. Bökönyi, S. 1969. Archeological Problems Domestication in The Domestication and Exploitation of Plants and Animals. Ucko, P.J., Dimbelby, G.W. (Eds). Proceedings: Research Seminar in Archeology and Related Subjects: 219-229. London University
4. Chapman, D.I., Chapman, N.G. 1982. Some Haematological Data for Fallow Deer (*Dama dama*) in England. Research in Veterinary Science. 33: 205-207
5. Child, G. 1970. Game Ranching. Proceedings of the South African Society of Animal Production. 9: 47-51
6. Conroy, A.M., Gaiger, J.G. 1982. Venison, Aquaculture and Ostrich Meat Production: Action 2003. South African Journal of Animal Science. 12: 219-233
7. Dau, J., Dieterich, R.A., Thomas, W.C., Davis, L.T. 1987. Trip Report: A Visit to the Swedish Reindeer Industry, 1986. Agroborealis 19(1): 6-15
8. Department of Agriculture and Fisheries for Scotland, 1979. Farming the Red Deer. First Report of an Investigation by the Rowett Research Institute and the Hill Farming Research Organisation (Fourth Impression)
9. Drew, K.R. 1976. The Farming of Red Deer in New Zealand. World Review of Animal Production XII (3): 49-60
10. Farm Production and Practice: Ministry of Agriculture and Fisheries (MAF), New Zealand. Deer Carcase Dressing in the Field
11. Fletcher, T.J. 1982. Management Problems and Disease in Farmed Deer. The Veterinary Record. 111: 219-223
12. Haasbroek, J.J. 1983. Bemerkingsstrategie vir Wildsvleis. Address at a Workshop of the District Development Association of Thabazimbi
13. Hamilton, W.J. 1986a. Structure of the Industry: The Background in Management and Diseases of Deer - a Handbook for the Veterinary Surgeon. Alexander, T.L. (Ed). Part I: Management: 5-6. Veterinary Deer Society, London
14. Hamilton, W.J. 1986b. Land Resources and Related Systems of Deer Farming in Management and Diseases of Deer - a Handbook for the Veterinary Surgeon. Alexander, T.L. (Ed). Part I: Management: 7-9. Veterinary Deer Society, London
15. Hemmer, H. 1988. Ethological Aspects of Deer Farming in The Management and Health of Farmed Deer, Reid, H.W. (Ed).: 129-137. Kluwer Academic Publishers

16. Huntley, B.J. 1971. Carcase Composition of Mature Male Blesbok and Kudu. *South African Journal of Animal Science*. 1: 125-128
17. Jarman, M.R. 1972. European Deer Economics and the Advent of the Neolithic. Chapter 3: 125-147 in *Papers of Economic Prehistory*. Higgs, E.S. (Ed). Cambridge University Press
18. Jewell, P.A. 1969. Wild Mammals and Their Potential for New Domestication in *The Domestication and Exploitation of Plants and Animals*. Ucko, P.J., Dimbelby, G.W. (Eds): 101-109. *Proceedings: Research Seminar in Archeology and Related Subjects*, London University
19. Joubert, D.M. 1968. An Appraisal of Game Production in South Africa. *Tropical Science X(4)*: 200-211
20. Joubert, D.M. 1986. Opening Address, Third National Game Conference and Congress of the National Game Organisation of the South African Agricultural Union, Kruger National Park
21. Kay, R.N.B., Sharman, G.A.M., Hamilton, W.J., Goodall, E.D., Pennie, K., Coutts, A.G.P. 1981. Carcase Characteristics of Young Red Deer Farmed on Hill Pasture. *Journal of Agric. Sci. Camb.* 96: 79-87
22. Kirkpatrick, T.H. 1974. Kangaroo Harvesting and Survival. *Queensland Agricultural Journal* 100(8): 368-375
23. Kyle, R. 1987: *A Feast in the Wild*. Kudu Publishing, 1 Lyne Rd., Kiddington, Oxford, OX5 IAE
24. Liversidge, R. 1985. Address: East Cape and Karoo Branch, South African Veterinary Association. Branch Congress: 1985
25. Luxmoore, R. 1985. Game Farming in South Africa as a Force in Conservation. *Oryx*. 19(4): 225-231
26. MacDougal, D.B., Shaw, B.G., Nute, G.R., Rhodes, D.N. 1979. Effect of Pre-slaughter Handling on the Quality and Microbiology of Venison from Farmed Young Red Deer. *Journal Science Food Agric.* 30: 1160-1167
27. Marsh, B.B. 1954. Rigor Mortis in Beef. *Journal Science Food Agric.* 70-75
28. Reinken, G. 1988. General and Economic Aspects of Deer Farming in *The Management and Health of Farmed Deer*: 53-59. Reid, H.W. (Ed). Kluwer Academic Publishers
29. Scotter, G.W. 1972. Reindeer Ranching in Canada. *Journal of Range Management*. 25(3): 167-174

30. Seamer, D.J. 1986. The Welfare of Deer at Slaughter in New Zealand and Great Britain. *The Veterinary Record*: 257-258
31. Sharman, G.A.M. 1983. Slaughter of Deer. *The Veterinary Record*. 112: 500-502
32. Skinner, J.D. 1985. Wildlife Management in Practice: Conservation of Ungulates through Protection or Utilisation. Symposium Zoological Society of London. 54: 25-46
33. Skinner, J.D. 1973. An Appraisal of the Status of Certain Antelope for Game Farming in South Africa. *Z. Tierzüchtg. Züchtsbiol.* 90: 263-277
34. Skinner, J.D., van Zyl, J.H.M. 1970a. A Study of Growth of Springbok Ewes. *Africa Wildlife*. Vol. 24: 149-154
35. Sumner, J.L., Perry, I.R., Reay, C.A. 1977. Microbiology of New Zealand Farmed Venison. *Journal of the Science of Food and Agriculture*. 28: 1105-1108
36. The Sale of Venison: United Kingdom Association of Deer Farmers? 1988: 54
37. Van Zyl, J.H.M., von la Chevallerie, M., Skinner, J.D. 1969. A Note of the Dressing Percentage in the Springbok (*Antidorcas marsupialis*) and Impala (*Aepyceros melampus*). *Proceedings of the South African Society of Animal Production*. 9: 73-87
38. Vigh-Larsen, F. 1988. Deer Farming in Denmark with Special Emphasis on the Management and Handling of Fallow Deer in The Management and Health of Farmed Deer: 61-69. Reid, H.W. (Ed). Kluwer Academic Publishers
39. Von la Chevallerie, M. 1972. Meat Quality of Seven Wild Ungulate Species. *South African Journal of Animal Science*. 2: 101-103
40. Von la Chevallerie, M., van Zyl, J.H.M. 1971. Some Effects of Shooting on Losses of Meat and Meat Quality in Springbok and Impala. *South African Journal of Animal Science*. 1: 113-116
41. Von la Chevallerie, M. 1970. Meat Production from Wild Ungulates. *Proceedings of the South African Society of Animal Production*. 9: 73-87