

LSIRD NETWORK

Ostrich Farming: - A Review and
Feasibility Study of
Opportunities in the EU

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Summary

The ostrich has been farmed for over 150 years in South Africa, first for its feathers and recently for the hide. The hide is the product for which an established market exists, primarily in the Far East for the manufacture of luxury goods, although the meat is increasingly important to the economics of production. The ostrich is a credible competitor in the red meat market in that it produces a very lean red meat.

Production in other parts of the world became possible when Namibia achieved independence. Ostrich farming is now an international industry, with South Africa still by far the major player. There are no reliable comprehensive sources of published information on global production and markets for ostrich products.

Initially the market in Europe was for breeder birds, followed by a transition to a slaughter market over the last year or so.

Many legislative, welfare and operational issues have still to be addressed. Because of the industry's development history, little technical knowledge about ostrich production has been gained through published scientific research.

A lack of market development for meat and leather products, a lack of research into ostrich production under European conditions, and a lack of a developed infrastructure hamper progress towards a successful ostrich industry in the UK and the European Union.

There is a reasonable level of demand for ostrich meat in many countries of Europe, but this is currently being met predominantly from outside the EU.

Increased global production in 1996-7 has combined with the recent Asian crisis, causing the currently depressed state of the industry world-wide.

The future viability of the enterprise will require the development of new products and markets for the highly durable and attractive leather, as well as increasing the existing demand for ostrich meat.

Despite a lack of official support, experience in the UK and elsewhere over eight years of rearing ostriches has formed the basis of a sustainable industry, combining production, processing and marketing within the EU itself.

Research is needed to resolve the outstanding husbandry and welfare issues. The ostrich offers an opportunity to develop a range of value-adding activities as well as a diversification opportunity away from traditional farming systems, and is therefore suited to the concept of integrated rural development in the less favoured areas of Europe.

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1 Introduction

The ostrich is an intriguing animal. It is a bird but it cannot fly. As a member of the flightless family of birds called ratites, it has evolved with a pair of powerful legs capable of propelling it away from danger at speeds up to 70 kilometres per hour. In the wild in its native Africa, it will range daily over an area with a radius of up to 20 kilometres while foraging for food. It is the largest bird found today; its eggs are the largest of any bird - ostrich eggs range from 1kg to 2 kg in weight - and yet ostrich eggs are the smallest of any bird relative to the size of the parent. The ostrich produces a plume of high quality feathers, a high quality hide bearing a distinctive and highly valued quill pattern, and 30-35 kg of red meat with a particularly low fat content. The reliance of the ostrich on legs rather than wings for movement means that virtually all of the muscle development occurs in the legs, thighs and back. Unlike poultry, it lacks the breast muscles that power the wings of avian species and provide much of the edible portion of a poultry carcass.

The ostrich is a unique species in many respects, but following its relatively recent arrival on the agricultural scene in Europe it has not so far been officially regarded as such. For example, it is classified by the EU as farmed game-bird for the purposes of slaughter and marketing and is subject to the UK Poultry Meat Regulations¹ (MAFF 1997). The ostrich is not poultry, and the authorities are now considering whether it should be classified separately from poultry. Because of the official confusion over its identity, the ostrich does not fit neatly into the existing regulatory framework for farmed animals.

Even more fascinating than the ostrich itself is the intrigue surrounding the conduct of the global ostrich industry. Ostrich production is an international industry with South Africa being by far the most important country, while the US and Israel are the other major producers whose industries are fairly well established. In fact it would be fair to say that an “industry” does not currently exist outside these three countries, although ostriches are now being farmed throughout the world. This is because the required infrastructure for production, processing and marketing has not been developed concurrently with the increases in bird numbers in Europe, Canada, Australia and New Zealand, for example. The hide is the product for which an established market exists, primarily in the Far East, for the manufacture of luxury goods. In southern Africa the market for ostrich meat has never developed other than as a local speciality in Zimbabwe and South Africa. Ostrich meat is not eaten in Israel because it is not kosher.

¹ SI 1995/549)

Within South Africa there are signs of a fundamental change occurring in the ostrich industry. Since the leather market developed in the days of apartheid, the industry has been protected by law as a national asset, and a single channel for marketing the hides was established. Control of the industry was therefore in the hands of a small group of people. Although much has changed since then, the establishment is still trying to maintain its control over production and marketing of ostrich hides, and hence a major element of the economics of the whole ostrich industry. The established order in the industry began to change with Namibian independence when some breeding stock slipped through the net of protectionism and the rapid spread of ostrich fever around the world began. This was followed by deregulation of the industry in South Africa, which opened the industry up to new South African entrants, and loosened the culture of secrecy which had surrounded ostrich production and research. Finally, the recent Asian economic crisis has seriously weakened the old order because the floor has dropped out of the market for the single product they had developed: the hide.

Many individuals who had previously been constrained from contributing to a debate about the future direction of the ostrich industry now recognise that the rapidly changing environment requires a fundamental shift of emphasis. This will need to embrace a spirit of greater openness, communication and co-operation with ostrich producers and researchers around the world to take the industry forward. This movement within the South African industry sees the need to increase production efficiency from its current low level, to develop new products and new markets for them, and in particular to regard the ostrich as a producer of high quality red meat for the health-conscious consumers of the developed world.

If the ostrich industry in South Africa is divided in its aims, the same is true of producers in other countries. They are working in a production-led market with products seeking outlets which remain poorly developed, and so there is much fierce competition and undisciplined marketing. The infrastructure does not yet exist to allow producers to concentrate on achieving a quality product for a known market. Some producers see ostrich meat as remaining a niche product in the exotic meat market, while others are trying to shake off the exotic label and offer consumers a healthy red meat alternative on the supermarket shelf.

Because of its history the ostrich remains the production animal about which the least knowledge has been accumulated (Huchzermeyer, 1998). This is true of all virtually aspects of production, including genetics, breeding, nutritional requirements, behaviour and welfare. There is a notable lack of published scientific research through which to establish best practice techniques and enable producers to obtain maximum returns for the minimum investment. Much disinformation about ostrich production has been widely distributed since interest in the ostrich has been stimulated around the globe in recent years.

It is therefore a difficult task to conduct a feasibility study of ostrich production. There is no established system for gathering and disseminating data about ostrich production, and no standards exist on which to base production targets. Reliable information can only be obtained through contacts with industry insiders, and even

then there is likely to be some economy with the actualité.. After all, no business owner would lightly give away commercially advantageous information, particularly in the fierce climate of competition which now exists. There are also many areas of production where producers and processors disagree with each other about what can be achieved. Furthermore, some evidence will be at best anecdotal.

Ostrich farming is an industry facing many problems in need of solutions, but the adaptability of the ostrich, the quality of its primary products and the potential for local value-adding industries mean it deserves serious consideration as a livestock diversification option in integrated rural development. To put ostrich farming in Europe into perspective it is necessary to understand the nature of the industry and the market for ostrich products.

2 The Development of Ostrich Farming

The ostrich has largely been regarded as a single product animal at various times in the past, with the focus of market interest passing through several phases, from feather, to hides and then meat. It is only recently that the multi-product nature of the ostrich has begun to become an economic necessity.

2.1. Feathers

For a long time in Africa, ostriches were hunted for their highly prized feathers to the point where they became scarce. Ostriches were farmed in South Africa to ensure a continued feather supply during the second half of the 19th century. Some birds were also taken to the US and Australia before the turn of the century.

The feather industry was very labour intensive and utilised the plentiful supply of cheap labour for plucking (carried out on live birds) and grading of the plumes.

The feather industry collapsed around the time of the First World War and many birds were released back into the wild. The best stock in South Africa was retained by a few farmers in the event of a future revival.

2.2 The Hide

The second incarnation of the ostrich as a productive animal occurred in the 1940's when the qualities of the hide began to be appreciated, following several attempts to regenerate the feather industry.

The Klein Karoo Kooperasie (KKK) was established in 1947 in Oudtshoorn and became known as the "cradle of the ostrich industry". By law, this co-operative was the only organisation allowed to market ostrich products. It also became illegal to export any genetic material as eggs or live birds from South Africa.

South African producers developed a market for the distinctive leather in the Far East, principally in Japan, and to a limited extent in the US for making cowboy boots. Links were established with those entrepreneurs who saw the opportunity to profit from the exotic leather trade, and these markets still remain the main

outlets for the hides today. Luxury goods made from ostrich hide became a status symbol in the Far East, and ostrich leather traded at prices ten times higher than those achieved for cow hides. However, little effort was put into developing markets for the leather in other parts of the world.

For many years, the hides were sent to London for tanning until a tannery was opened in Oudtshoorn in the late 1960's. The meat from slaughtered birds was often given away to the labour force and local people because the ostrich was not seen as a meat producing animal.

The KKK closely guarded its valuable ostrich resource, and were able to maintain high prices by regulating the supply of hides to the market. The ostrich had been a major source of income for South Africa, along with its gold and diamonds.

2.3 Breeding Birds and Meat

The acquisition of South African breeding stock for production in other parts of the world became possible when Namibia achieved independence, while Bophutswana and Zimbabwe also exported birds as demand for breeding stock grew from abroad. Other countries neighbouring South Africa also seized the opportunity to export.

Deregulation in the South African ostrich industry began in 1993 in response to pressure from producers denied access to the single marketing channel, and the KKK lost its legal control over the industry. At the time of deregulation many new South African producers rushed into the industry, expecting quick, easy and high returns. Farmed bird numbers quickly doubled to exceed the growth in demand for leather. The recent Asian crisis has thus coincided with an oversupply of hides for the established market, creating together a state of depressed prices and profitability in the industry.

Following deregulation, potential overseas producers, including some from the UK, went to learn about ostrich production, slaughter and processing techniques, expecting to find good practice based on sound research and development. They had not appreciated that farming ostrich for production efficiency was new to the industry in South Africa too, and that producers and processors there were also experiencing a steep learning curve.

There had been little incentive for the South African industry to invest much time and effort into increasing production efficiency through research as long as a high value hide could be obtained through existing rearing methods. Little of the research conducted has been published outside South Africa because publication was frowned upon and not seen as beneficial to the industry (Huchzermeyer, 1998).

2.3.1 *The Breeder Market*

The spread of the ostrich industry from South Africa to other parts of the world during the last decade or so has been based on its potential as a low fat, healthy red meat. With the continuing decline in the consumption of red meat in favour of low fat alternatives, the ostrich was promoted as “the meat for the new millennium”; a high-priced exotic meat attractive to health-conscious consumers in the affluent world.

The recent explosion of interest in this third incarnation of the ostrich began in the 1980 s with a pyramid selling scheme that spread rapidly through the Americas, Europe, Australia, New Zealand, and into Asia. Investment companies sprang up in many countries and attracted investors to pay unrealistic prices for breeder birds by promising huge returns: - £15,000 for a breeding pair was not unusual in Europe at one stage, while in 1991 the US price for a breeding pair was around US\$80,000². This is still continuing today in some countries.

The export of birds from Africa involved all sub-species of ostrich found in southern Africa (both Bluenecks and Rednecks with a short history of domestication and the variety called the African Black that had been developed by South African farmers for the quality of its feathers). The stock exported were probably for the most part the least productive birds, at least until buyers had developed some ability to assess their fitness. All kinds of crosses between these three types occurred, resulting in a wide variety of genetic potential from which work to develop the ideal meat/leather producer has hardly begun. It is estimated that even in southern Africa, at the current rate of private research conducted by major producers, it will take another ten years to produce such an animal³.

2.3.2 *The transition to meat production.*

The domestic market for S African breeder birds was limited by the nature of the interest in the ostrich. Breeder birds eventually produced offspring that were reared at considerable cost, but could not be sold for breeding due to the lack of infrastructure and developed markets. Slaughter and processing skills had to be learned by producers determined to succeed in ostrich production.

It is unfortunate that no concurrent efforts were made to develop markets for ostrich meat and other products in Europe. The S African exporters had previously developed markets for ostrich meat in some European countries, including Switzerland and Belgium. It is also regrettable that the ostrich industry attracted speculators and high-risk investment lacking commitment to the long-term survival of the industry. Many misleading claims were made about the production levels that were achievable. For example, calculations are often based on the assumption that one hen would produce 25 surviving offspring each season. In practice there will be very few, if any producers around the world consistently

² Charles Deeming, Pers. Comm.

³ Walter Murray, Lezie *Ltd*; Fiona Benson, Blue Mountain Feeds international. Pers. Comm.

producing this level of output. Another commonly quoted figure claimed that a hen could lay 80-100 eggs per season. While it is possible to achieve this number, it is very much the top end of the range and far above the sort of averages being seen in practice. Many owners have subsequently sold their birds for export to other countries previously untainted by the pyramid selling operation, thus helping to perpetuate the process, although they cannot be criticised for wishing to recover some part of their investment.

A small number of producers in the UK and elsewhere in Europe profited through their involvement in the sale and export of breeder birds to newly emerging breeder markets. They were then able to develop their own businesses and cope well with the transition to a slaughter market. The major producers in the UK fit neatly into this category.

The breeder market in most countries has been going through the transition to a slaughter market over the last year or so, even though many legislative, welfare and operational issues relating to slaughter, processing, distribution and marketing have still largely to be addressed

It is easy to see why the ostrich industry that exists currently in Europe is still very much an entrepreneurial industry. Producers who had weathered the early days of relative ignorance and who had developed methods of husbandry that achieved a reasonable level of output were able to profit from the breeder market and had to learn about slaughtering, processing and marketing their own produce. They developed relationships with local outlets such as hotels and restaurants as well as individual customers who call to buy meat from the farm. Relationships also had to be forged with leather processors and the luxury goods trade. Inevitably, when the promised returns failed to materialise for the majority of investors, some companies were investigated and forced to cease trading and others went into liquidation. Many investors lost a lot of money and the industry acquired a tarnished reputation. Indeed, it is still littered with examples of birds being kept in livery while the owners hope to eventually recoup some of their investment.

Some birds have recently been exported from the UK to other countries in which the market for breeder birds has not previously been developed to the point of saturation, given the undeveloped nature of the product market. Examples include South America, the Far East and European countries such as Denmark, Spain, Italy and Greece. Opportunities in Denmark appear to be exhausted; in Spain the breeder market is coming to an end, while Italy and Greece are seen as new outlets for breeding stock. One UK exporter transported six breeders to Spain in 1997 and made £11,000 profit on the operation, while one year later the sale of eleven breeders to the same destination yielded a profit of only £1,500. *Kezie Ltd*, the largest UK producer, has exported 5,000 birds to fifteen countries around the world in 1997/98. There are still companies in Europe trying to attract hands-off investors to purchase breeder birds⁴

⁴ See for example, <http://www.rainborough.nl/>

3 The Current World Situation

3.1 USA

According to the American Ostrich Association, there is no single, reliable, comprehensive source of information on global production, prices and markets for ostrich products.

It estimates that about 100,000 birds were slaughtered in the US in 1997, giving a meat yield of about 3000 tonnes. Many US producers are currently concerned about prices and profitability in an oversupplied market. Almost certainly, fewer eggs will be hatched this year and bird numbers will decline.

3.2 South Africa

In South Africa the hide has traditionally represented 80-90% of the value of a slaughtered bird, while the meat accounted for only 10-20%. The established industry therefore views the hide very much as the primary product of the ostrich. The meat is seen as a by-product, to be sold at realisation on the markets of Europe, Asia and elsewhere, at prices well below those which domestic producers could afford to accept as rearers of ostriches primarily for meat. A cynical view, which does have some justification, is that meat is being “dumped” as a means of maintaining the importance of the hide to profitability, and thus retaining control of the industry in the hands of the major South African producers. They currently control the hide market, but if producers in Europe and elsewhere were able to obtain appropriately higher prices for their meat, the proportional contribution of the hide to total receipts would decline markedly. The South African establishment would then be less able to control an industry based on ostrich meat as the primary product. During a discussion in June at an International Ostrich Association meeting in Israel, it was reported that whole muscle ostrich meat was trading at 10-15% below the price of beef. In contrast, a South African meat packer reported achieving 30% above the price of beef on sales of venison. The industry itself is now being forced to recognise the need for higher meat prices, but has not yet the means by which it will achieve a higher return through more orderly marketing⁵.

Indeed, the more forward looking producers in South Africa believe that the status quo will only change when other countries are producing large numbers of birds,

⁵ Fiona Benson, Blue Mountain Feeds International. Pers. Comm.

and only then will the industry be able to make progress. It was not until early in 1997 that the South African Minister of Agriculture announced that legislation was in train to allow the export of genetic material from the country.

Many South African producers are also said to be unlikely to hatch eggs from their breeders this season (beginning in June) because of the expected difficulties in finding a market for the meat and leather. An industry meeting in January 1998 determined to bring production levels back to about 200,000 slaughter birds per year after they had doubled within the previous two years.

Many producers are now suffering hardship after operating for years in a protected environment. It is believed that between a quarter and a third of South African producers have gone out of business within the last year through dependency on the Asian market. The farmed ostrich population in South Africa is thought to have been more than 500,000 birds in total prior to the major decline during the last year. Taking the reduction into account would suggest a current population of between 335,000 and 375,000 birds.

It is estimated that well over 300,000 birds were slaughtered in South Africa in 1997, producing 9,000-10,000t of meat, while about 420,000 hides were processed. Hides preserved by wet salting can be stored for several months prior to processing, and countries such as Australia and the UK still send hides to South Africa for tanning due to the lack of established infrastructure in those countries.

Having concentrated primarily on the Japanese market for hides, the current financial and political uncertainty in Japan has left South African producers seriously weakened. Many of the newer entrants to the industry are now disappearing again, and the reduction in numbers may be greater than stated above. One abattoir that should be slaughtering 100 birds a day is now only slaughtering 40-50 birds per week, demonstrating that the Asian crisis has indeed had a serious effect on the established structure of the South African industry.

3.3 Israel

The other major producer is Israel, where the figure of 12,000 slaughter birds per year was given during the International Ostrich Association meeting held in that country this summer. The Israeli industry has until recently been supported by the government, although this support has apparently now ended. Nevertheless, several new producers have come on stream recently, and from the number of breeder birds seen during farm visits delegates expected higher numbers of slaughter birds than this estimate suggested. Even if the figure was several times greater, it would represent only 1,000-2,000 tonnes of meat.

The Israelis have farmed ostriches for their hides since they obtained eggs illegally from South Africa in 1983. Their fertility rates are believed to be low and poor nutrition results in poor meat quality. They also have to recognise the need to adapt to the changing environment and improve production efficiency.

3.4 The UK

The British Domesticated Ostrich Association (BDOA) has attempted a survey of bird numbers among its members, but the poor response rate prevented a meaningful estimate. Producers are apparently reluctant to provide their own figures, although they want to know what others are achieving. The BDOA has around 180 members, but not all UK producers are members of the Association. In fact, there is no centrally collated information concerning either the number of producers or bird numbers in the UK. The only means of monitoring the situation here would be through the Environmental Health Departments of District Councils, which have responsibility for licensing producers under the Dangerous Wild Animals Act of 1976. However, although the information exists, it is scattered around the country and not collated centrally. The RSPCA has also encountered this problem in attempting to monitor the situation in the UK.

It is believed that the UK ostrich population currently stands at 10,000-12,000 birds in total, including about 2,000 breeding females⁶. Clearly the introduction of a separate June Agricultural Census category might be helpful in determining numbers of birds on holdings.

3.5 World Production

Ostriches are now being farmed all round the world but the lack of an established industry infrastructure makes it impossible to be precise about market conditions. Total world production of meat could reasonably be in the region of 500,000 birds, giving a yield of around 15,000 tonnes of meat.

At the First International Ostrich Meat Congress in February 1997, van Zyl of the Department of Agriculture in Oudtshoorn made a plea for a Marketing Intelligence System for ostrich products, because “*we do not know what is happening around the world in our industry*”. He had compiled what he considered were the most reliable figures for world slaughter numbers and exports, based on the limited data available for 1996. Unfortunately these have not been updated for 1997. The data presented by van Zyl are reproduced in Tables 1 and 2.

⁶ Walter Murray, *Kezie Ltd*; David Phillips, *Grampian Ostriches*: Pers. Comm..

Table 1 Estimated World Slaughter numbers 1995-96

	1995	1996	+ (-)
Europe	na	4000	4000
Australia	40	653	613
Canada	1100	3200	2100
USA	15000	25000	10000
Israel	6000	13000	7000
Namibia	8000	17500	9500
Zimbabwe	8064	9393	1329
RSA	175081	273607	98526
TOTAL	213285	346353	133068

Table 2 Tonnage of meat exported

	1995	1996	Change-
Europe	na	na	na
Australia	na	na	na
Canada	na	na	na
USA	na	na	na
Israel	170	370	200
Namibia	0	60	60
Zimbabwe	136	200	64
RSA	1068	1623	555
TOTAL	1374	2253	879

3.6 Europe

The situation in Europe is particularly interesting. The revenue contribution from hides and meat is much closer to parity, though still in favour of a good quality

hide. Demand for ostrich meat is firm in most countries of Europe except for the UK and Germany. In an ostrich fact sheet prepared recently for the UK Ministry of Agriculture by the Agricultural Development and Advisory Service (ADAS), the estimate of a potential market in Europe of 8000 tonnes per annum was given (Church, .undated). One major European producer now estimates that the market could absorb several times this amount. In terms of slaughter bird numbers, these estimates could require the production of 270,000 to 800,000 birds per year.

The regulation of imports of ostrich meat into the EU from third countries is not yet harmonised, although the issue is under discussion by the EU Commission. Imports are dependent on bilateral agreements between the exporting and importing countries. Some European countries are allowing the import of South African or Israeli ostrich meat. Belgium has links with South Africa, and France has links with the Israeli industry, thus enabling meat from these countries into Europe. This meat is not legally permitted to be sold into other European countries, but it is widely known in the industry that South African meat is being sold throughout Europe at low prices through an illegal smuggling operation that disguises the original source of the meat. As a result, although meat buyers in the UK have expressed a preference to buy British meat, they will be under great pressure not to pay more than they have to for their supplies. Concerned UK producers have tried to attract the attention of the authorities to this illegal undercutting of domestic producers, but so far without success.

There is, however, a widely held view that cheap imported meat should not prevent capable, committed producers from developing the potential of local markets, and that it could have the positive benefit of opening up the wider market by increasing consumer awareness of the product. This could well be true, but prices pegged close to those of (illegally) imported meat must constrain the ability of domestic producers to realise reasonable returns in the meat markets of Europe. The newer generation of South African producers are finding that the marketing methods of the traditional ostrich industry causes as many problems for them as they do for producers in Europe.

3.7 Current prospects

Due to the increase in South African production since deregulation and the Asian crisis, there is currently an oversupply of hides on the depressed established market. Many of these hides are of poor quality, and leather prices have dropped substantially. The demand for the best quality hides still exceeds supply, so they continue to fetch better prices. One year ago it was possible to sell hides at US\$32 per square foot, while today the average price is between US\$10-US\$15 per square foot⁷. With the meat market in Europe depressed by means fair or foul and the Asian economy in crisis, the prospects for European producers to diversify into ostrich farming are bleak, given the current structure of the industry.

⁷ Murray, op cit

4 Factors Affecting Profitability

4.1 Revenues

At present the profitability of ostrich farming depends on the production of a good quality hide. For the existing market a hide should be 14-15 sq. ft in size and free from damage caused during growing out and slaughter. Traditionally this means raising birds to around 100 kg at about 12 months of age.

Assuming the current UK producer price of £1-£3 per kg of liveweight, depending on skin grade and meat percentage, and ten surviving chicks per hen, the output of each breeder hen would be worth £1000-£3000 per year. It is said that a hen can breed for thirty years or more, although it is expected that in practice a breeding life of 15-20 years will be the norm. Replacement costs would therefore be low, although improvement through genetic selection would be correspondingly slow. In the UK at present, a mature breeder can be bought for anything between ≤300 for an average bird and ≤1000 for a proven high performer⁸.

4.2 Costs

In full cost accounting terms, the total costs of production per slaughter bird are in the range of £120-£200, with £140-£150 being a fair average. Breeder costs and egg incubation amount to £16-£19 per egg. Feed costs are by far the biggest element, and many producers emphasise the need to reduce the cost of feed in order to ensure profitability. UK producers estimate that they spend £75-80 per bird on feed, and quote feed prices ranging from £120-£200 per tonne. One arable farmer growing his own food and buying a mineral/vitamin supplement is producing good slaughter birds⁹ at 10-11 months of age for a total feed cost of £70 per tonne¹⁰. The amount of feed required to bring a bird to slaughter weight is extremely variable and can range from 330 kg to around 700 kg¹¹.

Chick mortality is currently in the region of £10 per slaughter bird and this is often due to poor standards of management brought about by the lack of understanding

⁸ Linda Ayres, Hangland Farm: Pers. Comm..

⁹ At the time of writing with a sale value of £220-£230 per bird.

¹⁰ Anthony Bolton, Operations Manager, *Osgrow Ltd*: Pers. Comm..

¹¹ Murray, op cit: Pers. Comm..

of the conditions required for ostrich welfare and good production efficiency. Transport costs are estimated at £6 per bird.

4.3 Gross Margins

UK producers do not generally keep management records in the form of gross margins at the present time, nor do they always distinguish the breeding enterprise from the meat production enterprise, although this would be helpful for planning, monitoring and control of the business. On many farms rearing ostriches, overhead costs can be allocated solely to the ostrich enterprise because many of them concentrate exclusively on ostrich production. The industry does however recognise the need for some benchmarking of financial performance in the future.

Table 3 Typical Gross Margin For an Ostrich Breeding Enterprise

	(per trio)	(per ha)
OUTPUT	£	£
60 fertile eggs at £8	480	2400
20 infertile eggs at £3.50	70	350
Cull value	na	na
less Replacement cost	33	167
Total	517	2583
VARIABLE COSTS		
Feed at £80 per bird	240	1200
Vet	15	75
Misc.	30	150
Total	285	1425
GROSS MARGIN	232	1158

Assumptions:

- 1) Birds kept as trios (2 females and 1 male) requiring 0.2 ha per trio
- 2) Breeding life is 15 years with a £500 replacement cost
- 3) 40 eggs laid per hen per season
- 4) Fertility is 75%.

Table 4 Typical Gross Margin for Ostrich Meat Production

	£/ bird	£ / ha
OUTPUT	200	4000
VARIABLE COSTS		
Egg	8	160
Incubation	7	140
Feed	80	1600
Transport	6	120
Chick mortality	10	200
Misc.	3	60
Total	114	2280
GROSS MARGIN	86	1720
Sensitivity Analysis		
£10 per head sale price	10	200
£10 per tonne feed cost	5	100

Assumptions:

- 1) Stocking rate is 20 birds per ha.
- 2) Slaughter at 12 months at 100 kg liveweight
- 3) Sale price of £2 per kg liveweight
- 4) Feed: 500 kg at £160 per tonne
- 5) Reared from eggs, although day-old chicks may be purchased for £25 each.

Whilst an enterprise may realise attractive gross margins per ha¹² for breeding birds of around £1,150 and for meat production of around £1,700, the reality is highly dependent on the feed conversion rates and carcass quality achieved. The overhead costs of labour, land and buildings are estimated to be on average £45 per bird (BDOA, 1998). Hence the net margin per slaughter bird could range from a loss of ≤40 to a profit of £80, reflecting the great variations in carcass quality and costs of production outlined above that currently exist. There will also be many producers currently rearing less than 10 birds per hen annually.

It has not been possible to quantify the establishment costs of a breeding enterprise in terms of fixed equipment and buildings, given that there are currently few comparable standards of accommodation in the various breeding enterprises presently in existence. For chick rearing, poly-tunnels may indeed be appropriate, though larger buildings are needed for the breeding hens. Many producers have

¹² Compared with gross margins per ha for hill cows of around £400 per ha and for hill sheep of £300 per ha in which some 33% of the total receipts are in the form of subsidies.

converted or adapted existing buildings. For a meat producing enterprise, the additional costs are relatively minimal if an existing building for shelter is used. The principal additional cost is for fencing at £3.50 per linear metre.

For a producer with an integrated production and processing facility, the cost of slaughter, processing and packing is estimated to be £40 per bird. The cost of tanning the hide, which is still mostly done in South Africa, and transport to the market would add a further £50 to the overall cost. The total cost of producing meat and leather for market would therefore be about £230 per bird.

In June 1998 ostrich steak cuts were trading in Europe at US\$7-\$10 per kg while fillet cuts sold for US\$11-18 per kg. A carcass should yield 8 kg of fillet and 12 kg of steak with the remainder being trim. Assuming a price of US\$7-\$10, the meat would be worth about £130. The hide would therefore need to fetch £100 in order for the producer to break even. This would require a price of around £7 per sq. ft for the tanned hide. This represents around US\$11, and with current prices averaging US\$10-\$15 per sq. ft, it can be seen that a good quality hide is essential to a profitable business operating in this way within the current structure of the industry. It is the difficulty of obtaining realistic prices for slaughter birds that has led many producers to concentrate on developing local or domestic outlets for meat which provide better returns than can be obtained on international markets.

That is not to say it cannot be done, but before even thinking about the necessary husbandry skills, a producer needs to have access to a tannery. In Europe, there are only three tanneries processing significant numbers of ostrich hides: two in France process hides from Israel, and there is one in Italy. There are nine tanneries in South Africa. The problem is that the tanning process is said to be very specialised and it is also labour intensive. Evidently previous attempts to automate the process and reduce the labour input have failed. Some industry observers have noted that tanneries without experience of processing exotic leather would need to invest considerable effort to achieve the quality the established market requires¹³. Despite this, some UK tanners are now processing ostrich hides themselves (See Section 5.1). Even when the hide is tanned it is very difficult to find a channel into the exotic leather manufacturing chain, which places more emphasis on trust than price when dealing with suppliers.

It is now becoming accepted even within South Africa that the domestic industry needs to change its approach to ostrich production in order to maintain its position in the new fiercely competitive environment. There appears to be no prospect of the leather market recovering to its previous level in the short term, so South African producers will have to work hard to develop new markets for the hide and place greater emphasis on the ostrich as a meat producer. Processors are recognising the need to work closely with producers to improve the efficiency of production. This means increased egg production, better hatchability, better chick

¹³ Murray, op cit: Pers. Comm..

survival and faster growth rates, as well as lower production costs and more attention to the quality of the end products (Huchzermeyer, 1998).

From the culture of secrecy that previously existed in Oudtshoorn, researchers and scientists are now calling for it to become the symbol of openness and international co-operation for the global ostrich industry. This is driven by the recognition that much work remains to be done in a climate of limited funding. Researchers also dislike the 'crooked reasoning' whereby the results of research have largely remained in the hands of those providing the funds. Logically this is done to preserve the comparative advantage of the major players in the industry, but it does mean that much duplication of effort is required before others can benefit from advances in knowledge.

In spite of the potentially attractive gross margins for those producers rearing and finishing birds efficiently, and with access to slaughter facilities and market outlets for the hides and meat, the current structure of the industry will still necessitate some determination in starting up an ostrich production enterprise.

5 Industry Market Development Issues

There are three major obstacles hampering progress towards a successful ostrich industry in the UK and the European Union. These are the need for development of sustainable markets for meat and leather products; the lack of research into ostrich production under European conditions; and the lack of infrastructure to provide the regulatory framework and guidance producers need, and to ensure producers can slaughter and process birds when they are ready for market.

These challenges are closely related to each other, and addressing them would require substantial investment beyond the means of producers and processors themselves. The International Ostrich Association has considered whether it could impose a levy on producers to help fund research, but the idea has met an unfavourable response from producer associations whose members are struggling to survive in a harsh economic climate.

5.1 Producer Associations

Many national and regional ostrich associations now exist in many countries of the world. A list of national associations is also available on the National Ostrich Processors Association of South Africa (NOPSA) Web site¹⁴, and includes links to those with their own sites for distributing information to their members and other interested parties.

In Europe the European Ostrich Association has held annual conferences for the past few years. The 1998 conference should have been taking place at the end of October, although this year it has not had the necessary support because of the economic downturn in the fortunes of the industry.

In 1997 S Africa, Israel and other producing countries decided to form an International Ostrich Association (IOA) in order to agree on consistent international standards on which producers and consumers can rely, and to facilitate the research needed to assure a future for the industry by combining their efforts.

In the UK, the British Domesticated Ostrich Association (BDOA) has seen a decline in membership over the last year or so. The Association is organised around a national committee of four persons, and meetings are organised on a regional basis by five regional representatives in England, and one each in Wales,

¹⁴ <http://www.nopsa.com>

Scotland and Northern Ireland. Within regional groups there is some co-operation on an ad hoc basis among members to generate economies of scale in the purchase of bulk feed for example. The BDOA is unhappy with the current licensing arrangement at the local level because the conditions attached to the granting of a licence can vary widely, even between adjacent Districts. This disparity can obviously put some producers at a disadvantage with respect to others, and common sense would suggest that more central guidance to ensure even-handed treatment of producers would be appropriate, along with collation of producer and bird statistics collected at the District level.

5.2 The Products

5.2.1 Meat

The decline in red meat (beef and lamb) consumption in affluent parts of the world is largely due to dietary concern that excessive consumption of animal fat is not conducive to good health, as well as to the lack of product versatility to meet modern lifestyles which poultrymeat possesses. Whilst the issue of saturated fat in red meat is somewhat contentious, the benefits of meat from other species such as ostriches has been promoted on the basis of its lower fat content.

The ostrich is a particularly promising substitute for traditional red meat alternative in that it produces a fine-grained red meat with similar protein and iron levels to beef, but unlike beef and lamb for example, fat deposits on the bird are restricted to sub-peritoneal and subcutaneous layers. There is no visible intramuscular fat (Deeming, 1995), so it is very easy to separate the fat during processing and produce a very lean red meat. In fact, the fat content of raw ostrich meat is less than half that of raw chicken breast, at about 0.5 percent (Sales and Horbanczuk, 1998).

A claim often made for ostrich meat relative to beef and chicken is that it also has a lower cholesterol content. Cholesterol has a physiological role in the transport and digestion of fat, but is synthesised in the liver and found in all the body tissues.

The cholesterol content of the three raw meats is in fact comparable at around 57mg per 100g [Sales *et al*, 1996].

The nutritive value of ostrich meat undeniably makes it worthy of consideration by consumers looking for healthier alternatives to traditional red meats.

From the retail perspective meat quality is largely affected by the rate of pH decline following slaughter and the final pH value. Ostrich meat shows a rapid decline in pH following slaughter and reaches a high final pH value of around 6.0 within six hours or less depending on the particular muscle. This high final pH value is thought to be due to a depletion of glycogen reserves through stress prior to slaughter (Sales and Horbanczuk, 1998).

A high final pH leads to a risk of microbial growth and reduced storage life, and ostrich steaks are normally vacuum-packed to increase shelf life. Despite this, refrigerated storage life is only about two or three weeks, and so it is very important to get the meat to the consumer as soon as possible after slaughter (Sales and Horbanczuk 1998). *Sainsbury* keep their ostrich meat on the shelf for only nine days because they are concerned to be very conservative with regard to possible health issues related to meat quality¹⁵.

5.2.2 *Hide*

The hide of the ostrich is distinctive for the diamond-shaped crown containing the highly valued quill pattern that extends along the back and down to the wingfold and stomach quill. For grading purposes the crown is divided into four quarters, and for the existing market a grade 1 hide must have three quarters completely free of defects. One quarter may have a defect, often caused during skinning or by feather pecking, not larger than 40*40mm. The exotic leather industry utilises the crown for its luxury goods and the remainder of the hide is discarded.

There is still much of myth and mystery surrounding the production of a good quality tanned hide. Producers themselves are trying to discover whether the techniques employed by the established South African tanners do in fact result in a superior product to the hides produced by tanneries elsewhere, as for example in the US. Perhaps this is not surprising given the emphasis attached to this product by the South African industry up to now. Lack of information about this aspect of ostrich production would clearly help to ensure that established tanners retain their position of control and importance in the industry. However, any significant future for the industry will involve the development of new products and markets for the hide, which could allow for a wide spectrum of requirements in terms of price, size, thickness and colour consistency for example.

Unfortunately most Europeans would not even recognise an ostrich hide if they saw one, and so education and promotion of the product would be an important priority in developing a European leather market. Most of the hides processed in France and Italy have been destined for the Far East market.

In South Africa birds have traditionally been reared extensively and slaughtered at 12-14 months in order to achieve the requirement of the exotic leather goods industry in the Far East for a hide of 14.5 sq. ft. It is known that the age of the hide is not crucial to achieving this market requirement¹⁶, so achieving slaughter weight at a younger age through improved nutrition would not affect hide quality. However the level of fat on a slaughter bird does influence the success of the tanning process. Hides from over-fat birds are more difficult to clean without damaging the leather, and salting to preserve the hide before tanning may be less efficient, resulting in microbial damage. The uptake of chrome in the tanning

¹⁵ N Bundock, *J Sainsbury plc*; Pers. Comm.

¹⁶ Murray, op cit

process is also affected, resulting in greater colour variation. All of these things will affect the value of a hide for the established market.

Ostrich meat standards and hide grading standards can now be viewed on the Web site of NOPSA.

5.2.3 Feathers.

After plucking the feathers have to be graded into many different categories for the requirements of the feather market. This is a time-consuming and labour-intensive process, and is generally only considered to be worthwhile in areas where cheap labour is plentiful.

Under European conditions the feathers are also frequently too contaminated by soil and dirt to be of much value. For these reasons producers do not believe feather processing is a viable option, and any contribution to the economic value of a slaughter bird should be discounted. However, some UK producers do offer feathers for sale, and may charge £1.50 for a single plume for example¹⁷.

It may well be possible to develop new uses for ostrich feathers in addition to the traditional uses in the fashion trade and as anti-static dusters in the automotive and electronics industries.

5.2.4 By-products

There is also potential for other value-added products from an ostrich enterprise. The fat can be rendered to produce an oil which is claimed to have therapeutic value in the treatment of skin complaints. It is also possible to produce extremely attractive ornaments from intricately carved and decorated ostrich egg shells.

5.3 Marketing

5.3.1 Recent Market Developments

The ostrich can no longer be regarded as a single product animal. The collapse of the Asian luxury goods market for the hides is forcing the South African industry to reappraise the potential for the meat as the primary product of the ostrich.

It is unlikely that ostrich farming will ever be profitable on the basis of the meat alone. However there is a widely held view in the industry that the justifiably healthy image of ostrich meat as a low fat red meat could enable it to gain a sufficient share of the world meat market to justify co-operation rather than competition between producing countries. There would nevertheless be a limit to

¹⁷ Ostrich feathers may also now be purchased over the Internet from www.Ostrichonline.com. Feathers are sold in bulk of approximately 144 ranging in length from 17-22 inches for US\$60 plus shipping costs.

the attainable price differential as a red meat alternative on the supermarket shelf. Therefore the hide will continue to be an important consideration in the economics of ostrich farming. The viability of the enterprise will require the development of new products and markets for this highly durable and attractive leather, as well as increasing the existing demand for ostrich meat.

The changes that the established producers of ostrich leather and meat are now having to face should result in a more transparent market for the emerging producing countries. The downturn in the Asian economy places greater emphasis on markets elsewhere, and there is an established European market for ostrich meat which is currently being supplied predominantly from outside the EU.

South African producers will be at a disadvantage as the relative contribution of the meat to financial returns continues to grow. The need to increase the price obtained for their meat, coupled with the distance from the European market (and the uncertainty of legal access to it) and lack of domestic demand means they will face a difficult task in maintaining a position of prominence in the industry. However, to their advantage is the knowledge and experience gained during 150 years of ostrich farming, together with the natural adaptation of the ostrich to the environmental conditions obtaining in southern Africa.

It has not been possible to quantify EU demand for ostrich meat reliably for this study, so there is a need for further research to assess the potential of the market. In June 1997 the Mintel International Group published a Food and Drink report on the UK market for exotic meats (Mintel 1997). The market research survey found that only 2% of respondents did not like the idea of eating ostrich meat, and 29% said they might buy it if it was readily available.

5.3.2 Retail Demand in the UK

The BSE crisis in the UK which came to the public's awareness in late 1989, and again yet more prominently in 1996 has stimulated media interest in the qualities of other meat species. Consumers were introduced to the possibility of trying meat from species other than the traditional beef, lamb, pork and poultry they were used to. In the UK there are a few companies specialising in the sale of exotic meats including ostrich, e.g. **Barrow Boar** in Somerset, but they have a low turnover and serve a niche market. Other companies such as **Booker Foods** who distribute to the smaller grocers also began to list ostrich meat in their list of products. However, **Booker** has recently delisted the product following opposition from pressure groups hostile to the sale of "exotic" meats.

The BSE crisis and a rapid declining beef sales in 1996 raised the prospect that there might be an opportunity for ostrich producers to benefit from strongly increasing demand, but in the event this hope was somewhat over-optimistic. Some multiple retailers began to stock alternatives to beef, including ostrich meat, which was only sold as vacuum-packed steak cuts. **Tesco** pioneered the introduction, and by mid-1996 it carried the product in 300 stores across the UK.

Asda introduced ostrich steak in 1995 but have since ceased to stock it. *Somerfield* decided not to stock the meat after some consideration. *Safeway* and the *Co-op* also decided not to stock the meat. *Marks and Spencer* say there is insufficient demand to make ostrich meat a viable product, but are keeping the situation under review. *Waitrose* are now trialling the product at selected stores.

Tesco and *Sainsbury* sourced their meat from the same US supply. *Tesco* subsequently failed to develop regular demand following the recovery in beef sales and ceased carrying the product, while *Sainsbury* succeeded in establishing regular demand, albeit at a low level. This difference is thought to be due to the own label range of exotic meats which *Sainsbury* developed, and which was trusted by their customers. *Sainsbury* are the only national supermarket chain to stand by their decision to stock ostrich meat over two years ago. *Sainsbury* took concerns about the suitability of the European climate for ostrich farming very seriously, and sourced their supply from a region of the US where climatic conditions were more similar to the natural environment of the ostrich. They sent a food technologist to check that their intended supply of meat had been reared and slaughtered to their satisfaction, and remain confident that welfare concerns over the product are unfounded¹⁸. *Sainsbury* now sells 300 kg of ostrich steak per week. This is a very small volume as it is offered in around half their 400 stores, but it does help the process of exposing the product to consumers and starting to attract a loyal customer base. The company is currently considering its procurement policy and whether the UK and other European sources might be preferable. If so, they would give serious consideration to the realities of the welfare concerns which prompted them to source from the US in the first place.

Supermarkets are known to require the fresh meat they buy to have the oval stamp used by EU-licensed, full throughput abattoirs. There is only one such premises licensed to slaughter ostriches in the UK, so a decision by UK multiple retailers to sell domestically-reared ostrich meat would be likely to depend on a single source.

Among the multiple retailers, *Marks and Spencer* are now considering whether to stock the retail packs of smoked ostrich products recently developed from birds reared in the UK. *Asda* has already begun to stock these products in its stores.

¹⁸ Bundock op cit

5.4 Slaughtering and Marketing in the UK

Several methods of marketing UK-produced ostrich meat are currently employed, depending on the permitted use of meat from the three types of premises described by MAFF where birds are slaughtered (MAFF 1997). A map of current slaughter premises in England, Scotland and Wales is contained in the Appendix.

5.4.1 *Exempt Premises*

Following the demise of the market for breeder birds, the emphasis shifted to keeping birds for slaughter. The lack of infrastructure led some producers to set up slaughtering facilities on-farm as an “exempt” premises permitted to sell meat direct to consumers in the same or adjacent geographical areas. Such premises must be registered with the local authority as “food premises”. Official advice was very difficult to obtain: poultry departments denied responsibility for slaughtering requirements because the ostrich was a red meat animal, while red meat departments denied responsibility because the ostrich was a bird¹⁹.

Some producers developed sufficient contacts with the public, and local outlets such as hotels and restaurants to market their produce by that route. Meat from the farm sold as steak may cost £5-£6 per lb. at the present time. *Scotostrich* in Scotland is an exempt premises which processes the output from a group of three producers. *Scotostrich* is able to sell all of its output solely to local hotels and restaurants to meet growing demand²⁰. This marketing group utilises a mobile abattoir deployed as a static slaughtering unit. *Scotostrich* has now applied to be licensed as a low-throughput premises and the application is currently being processed.

5.4.2 *Low-Throughput Premises*

Within the last two years, a small number of low-throughput slaughtering premises have been licensed around the UK. These premises are allowed to slaughter up to 10,000 birds per year for sale in the UK or other countries around the world, but are not approved for export to the EU. The meat from such premises is marked with the square stamp to denote its source. Low-throughput premises are covered by the Poultry Meat (hygiene) Regulations 1976.

Osgrow Ltd. in Shropshire was the first example of such a premises, and was set up in adapted farm buildings. Producers may have their birds slaughtered at the unit and then choose whether to have the processed and packed meat returned to them for direct sale, or for *Osgrow* to sell the meat as well as the leather. Under

¹⁹ L Ayres op cit

²⁰ D Phillips op cit

the “fast track” scheme the company will charge £125 to slaughter, cut and pack the meat from a bird, which is then returned to the producer. This price is reduced by an allowance for the hide as follows:

Grade of Hide	Allowance for Hide (£)	Overall Cost (£)
A	70	55
B	60	65
C	40	85
D	10	15

There are still major problems related to supply and demand, and slaughtering usually only takes place on one day per week at the present time. It is possible to slaughter about 30 birds per day using these facilities, with about 20 minutes being required to slaughter, pluck, skin and prepare each carcass for chilling before processing. *Osgrow* is working hard to stimulate demand in domestic niche markets, and to obtain regular supplies of good quality birds and is very optimistic about the future of the business. Such a unit would need a throughput of 80-90 birds per week to be successful, and *Osgrow* is confident that this will be achieved.

Meat is sold to outlets such as wholesalers, brewery chains and department stores (e.g. *Harrods* and *Selfridges*), and are keen to develop markets through multiple retailers for their newly-developed range of smoked ostrich products. *Osgrow* has now started to supply these products to the *Asda* chain.

Osgrow has also developed a relationship with a tannery in the Midlands of England which processes the hides. The tanning process is entirely manual and very different to tanning other leathers. *Osgrow* and the tannery have developed the process together because existing tanners of ostrich leather are unwilling to share information of value to competitors. The quality of the hides produced is said to be extremely good, and the cost of each hide tanned is in the region of £50²¹. This is comparable to the cost of tanning in South Africa, although the latter does include the transport costs²².

Some of *Osgrow*'s processed hides are manufactured by a luxury small leather goods company. For example, a small hand-made coin purse is available for retail at £96 each. This is clearly a high value niche market for ostrich leather products, and a promising start for leather processing in the UK.

Osgrow is now addressing the problem of transporting birds over considerable distances for slaughter at the plant in Shropshire. It has also been assisting an existing poultry slaughterhouse in Devon to set up appropriate facilities and obtain a low-throughput licence for the slaughter of ostriches on the premises. *Osgrow* will book birds in to be killed at the Devon facility, and the carcasses will be

²¹ Bolton oop cit

²² Marray op cit

transported to Shropshire for further processing. A similar arrangement applies at a new facility in Lincolnshire (*Humber Ostriches*) which has recently obtained a low-throughput licence.

Owners of low-throughput processing units are concerned that they may face additional costs due to a requirement for full veterinary supervision of the slaughter process. Increased monitoring of UK abattoirs by the EU during the BSE crisis revealed a difference in the interpretation of EU Directive 71/118 as amended by Directive 92/116 regarding the supervision of Article 7 (low-throughput) premises during slaughter. At present full time veterinary supervision is required at full throughput premises such as *Kezie Ltd.*, but supervision of low-throughput premises has been carried out by Plant Inspection Assistants who are designated company employees. The EU is presently discussing whether the Directive requires these premises to employ qualified veterinary personnel to supervise the slaughter process²³. The additional cost would pose a serious threat to the future of processors such as *Osgrow Ltd*, who are striving to develop the business as a sustainable and profitable enterprise under difficult conditions.

In July 1998 a new low-throughput premises at Five Trees Farm in Monmouth, Wales received a licence as a slaughterhouse and cutting plant, increasing the capacity for timely slaughter of market-ready birds. This plant was set up in adapted farm buildings, and a similar establishment on a green-field site would require some £20-£30,000 of establishment capital. The unit also has a relationship with the UK Leather Technology Centre for processing its hides²⁴.

5.4.3 *Full Throughput Premises*

The only full throughput, EU licensed premises in the UK is run by *Kezie Ltd* in Berwickshire, Scotland. This unit is licensed to slaughter more than 10,000 birds per year, and its target markets are mainly in Europe and world-wide where it competes with meat from Africa and the US, for example. The price achieved for meat and leather is therefore dependent on international market conditions. For example, the top producer price for a good quality bird is £2 per kg liveweight at *Kezie*, compared with a top price of £3 per kg paid by *Osgrow*. *Kezie* also sells to wholesalers in the UK. There is a group of 15 ostrich farms which receive viable chicks from *Kezie* and produce slaughter birds for the integrated breeding, rearing, slaughtering and processing unit, though birds from all over the UK are processed. Consistent supply of birds from producers is also a problem for *Kezie* at the moment, and this makes it more difficult to win contracts with potential buyers. The company slaughters the output from about 1000 breeder birds, which is believed to be about half of the UK breeder population. However, further integration between the unit and the supplying farms would be needed to guarantee the consistency of supply the company would like to see.

²³ A Greenleaves, Deputy Head, Public Health Unit, MAFF: Pers. Comm..

²⁴ J Betts, Five Trees Ostrich Farm: Pers. Comm.

Kezie management believes that the investment required to set up a enterprise management system capable of achieving the best performance from ostriches under UK conditions would not be viable with less than 300-400 breeding females. Such a system would be highly dependent on achieving the highest standards of bird health and welfare, and require considerable capital investment in breeding stock and associated facilities.

6 Husbandry and Technical Development Issues

6.1 Welfare

Welfare considerations are an important element in determining whether ostrich farming in Europe is a viable proposition. Ostriches have been farmed in the UK since 1991 when eggs were imported from Namibia (Deeming et al 1993). Since then animal welfare organisations have been concerned that the introduction of a new species to a colder, wetter climate would not be conducive to the good health and welfare of these birds. These concerns were not based on scientific evidence, but stemmed from the view that caution was appropriate where climatic suitability and other welfare issues had not been addressed.

The Royal Society for the Prevention of Cruelty to Animals (RSPCA) did not approve of ostrich farming, but recognised there was no legal basis for banning the enterprise. Therefore it took the lead in providing guidance to producers and licensing authorities by publishing guidelines on ostrich welfare standards (Bertram 1993). Unfortunately some ostrich farmers used the guidelines to imply that the RSPCA approved of ostrich farming, which was not the case. The organisation believes there is an urgent need for specific legislation, which does not currently exist, to safeguard bird welfare, and that all ostrich producers should attend training courses to ensure they are competent and able to properly care for these animals.

In early 1994 the UK Ministry of Agriculture issued guidelines prepared by the Farm Animal Welfare Council regarding the welfare of ostriches on-farm (FAWC 1993). These guidelines state that ostriches are not suited to intensive farming systems. Both of these sets of guidelines provided basic information based on the limited knowledge available at the time.

In 1997 the Council of Europe issued a Recommendation Concerning Ratites under the Standing Committee of the European Convention for the Protection of Animals Kept for Farming Purposes, which came into force in October of that year. The Recommendation is not legislation, but should have a powerful influence on conditions under which ostriches are farmed. Article 2 states that: -

“no ratites shall be kept if

- a) . *the conditions of this Recommendation cannot be met, or if*
- b) *the animal belongs to a species whose members, despite these conditions being met, cannot adapt to captivity without welfare problem”.*

Article 4 of the Recommendation states that a substantial period of training is necessary for those who will handle ratites, and this competence shall be assessed in accordance with national legislation. Article 9 states that ostrich farms should only be situated in areas where environmental conditions allow birds to be kept outside most of the day in any season, to satisfy their need for exercise and grazing. Article 14 states that “*ratites shall not be permanently housed*”. It further states that birds over 3 months of age should have access to outside areas each day. If extreme weather conditions prevent this, the period of confinement should never be more than ten days per month. It also states that transport should be minimised by considering the slaughter of ostriches on farms in order to minimise stress.

6.2 Research

6.2.1 General

As previously stated, the imperative for enhancing production efficiency has only been evident recently, and it is believed that serious research interest has only been stimulated in South Africa during the last few years.

A review of the research requirements for ostrich farming has been conducted recently by the Macaulay Land Use Research Institute in Scotland. Priorities identified by a sample of prominent people involved in ostrich farming were in the areas of nutrition (ration formulation, grazing management and feeding behaviour); management (environmental conditions, breeding, incubation); and health and welfare (stress, malformations, transport and slaughter) (Davidson et al undated).

Unresolved husbandry issues are related to all aspects of production including breeding, chick rearing and growing out. The vast majority of problems occur before three months of age, and by six months the birds are relatively hardy in terms of environmental requirements and immunity from disease.

Much of the stock exported from Africa does not have a long history of domestication, and the ostrich is well known to be susceptible to stress. Thus a major objective of good management is to minimise exposure to stressful situations. Stress is implicated in many of the problems encountered by ostrich producers, including poor breeding performance and chick survival.

It was fortunate that the first ostrich farm in the UK, Hangland Farm in Oxfordshire, owned by F and L Ayres, was able to employ a full-time researcher between 1993 and 1996. Most of the pioneering published research by C Deeming

into ostrich farming in Europe to date has been based on this work. A considerable amount of knowledge and experience was rapidly accumulated in developing a successful system of husbandry and management under northern European conditions, on which Deeming is now recognised as an authority on the behaviour of ostriches in farming environments.

In its native environment the ostrich has to survive a wide variety of climatic conditions, ranging from above 30°C to below -10°C and including heavy rain and snow. The fact that the ostrich is being farmed, albeit with varying success, around the world is evidence of its adaptability. It is believed by researchers and commercial producers with several years of experience in farming ostrich that the climate in northern Europe does not in itself pose a serious impediment to successful ostrich farming so long as the behavioural and environmental requirements are understood and management systems take these factors into due account, especially during the first few months of life when mortality rates seen in practice are undoubtedly too high^{25 26}.

Ostrich paddocks need to be sited on well drained soil that never becomes waterlogged, and the ground should be fairly level to minimise injury through loss of footing in wet conditions, although some producers say that sloping ground need not present a problem for the birds. Shelter should be available from high winds. Rain is not a big problem for older birds unless combined with a severe wind-chill factor, although chicks under three months old would not perform well if allowed outside in winter.

It is advisable to ensure birds are housed in dry shelters at night, and this can be achieved by feeding in the shelter as a routine. The ostrich responds well to management systems that establish a routine for it to learn and depend on, and this routine helps to keep stress at a low level²⁷. It is important to establish a set routine within the first six weeks of a chick's life in terms of feeding, handling and exercise, for example (Lambrechts et al, 1998). Ostriches need to be housed during the winter months, while being given access to exercise outside as much as possible.

6.2.2 *Artificial Rearing*

The future of ostrich production depends largely on the ability to rear sufficient numbers of viable chicks to provide an adequate return on the required investment, and successful artificial incubation is an important factor in achieving this goal.

In the wild under natural breeding conditions a male and female will share incubation duties, with the more camouflaged female sitting on the clutch during the day and the male taking over at night. An ostrich can accommodate up to

²⁵ C Deeming: Pers. Comm.

²⁶ F W Huchzezmeyer, Onderstepoort Veterinary Institute S Africa: Pers. Comm.

²⁷ Murray op cit

twenty eggs under its body, but a typical clutch would contain 10-15 eggs. Allowing for mortality, natural incubation would therefore restrict production during a laying season to a low level. In order to maximise egg production eggs are removed from the nest and can be stored for 7-10 days without affecting hatchability before being incubated artificially in batches (Deeming 1997).

Removal of the eggs for artificial incubation means that chicks learn to respond to their human handler as the parent figure through filial imprinting, and there may be long-term consequences of this in terms of their ability to relate to their own species at sexual maturity (Bubier et al 1998). A major cause of stress for chicks may be the perception of parental desertion when reared artificially (Lambrechts et al 1998). The guidance given by parents under natural breeding has to be provided by a human parent figure, and this requires human presence for much of the time in teaching chicks to feed and exercise, and to provide the security and reassurance they need. Ostrich farming therefore requires great commitment and enthusiasm from those responsible for the chicks' welfare.

6.2.3 Productivity

At present overall mortality up to 4 weeks of age is still over 50% in Europe, and much higher than the levels seen in other farmed species with a long history of domestication²⁸. This high level is not uncommon in other producing countries, and reflects the lack of attention given to husbandry and management techniques for efficient production.

Under conditions of good management it could currently be expected that 80% of eggs laid are fertile; 80% of fertile eggs would hatch; and 80% of chicks would survive.

Therefore for every 100 eggs laid: -

- 80 would be fertile
- 64 would hatch
- 51 would survive.

6.2.4 Fertility

The production of fertile eggs depends on the female being sufficiently interested in her male partner to stimulate egg development, and to allow mating to occur.

It takes about 48 hours for an ostrich egg to develop, so in an ideal world eggs could be produced on alternate days for the length of the laying season (about six months from April to September/October in the UK). Thus the figure of 100 eggs per season is often quoted misleadingly. In practice, a hen might lay for two or three weeks, and then produce no more eggs for another three weeks, for example. The typical number of eggs produced per hen is believed to be around 30-40 in a season. It can be difficult to know whether eggs are being fertilised, as

²⁸ Murray per comm.

mating may only occur once a day and the hen may be stimulated into egg production by a male in an adjacent paddock, for example.

A common problem causing low egg production and poor fertility is that the females are not given the opportunity to select their own male partner as they do in the wild²⁹. Careful observation is required to ensure the hen shows a preference for a particular male before they are paired in a breeding enclosure if egg production and fertility are to be maximised. Observation needs to be carried out from some distance, because sexual imprinting on humans can stimulate sexual behaviour and lead to a false impression of successful breeding. Courtship behaviour induced by the proximity of a human appears to be common in ostriches, but may constitute aberrant behaviour which impedes successful mating rather than encouraging it as is believed by many producers.

Young breeders are believed to be best kept in pairs for good productivity³⁰, while from 5-6 years of age it can be more economical to use a breeding system where birds are kept in trios of one male to two females. In the wild a clutch often consists of eggs produced by a bonded female (the major hen) and other hens who wander into the pair's territory (minor hens) and mate with the male bird. Conversely a male bird may have fertilised eggs which are incubated by another male.

6.2.5 Hatchability

There will be wide variation in the 80% of fertile eggs in terms of their potential for successful incubation. The size of eggs and the porosity of the shells can vary widely, and incubation conditions depend on surface area to volume ratio and gas exchange properties of the egg (Deeming, 1997a). Incubation aims to achieve a reduction in egg weight of about 15% through moisture loss over the incubation period of around 42 days, and variation in egg size and porosity make this difficult. Large eggs and eggs with imperfect shells have lower hatchability and experienced producers aiming for quality rather than quantity often avoid setting these eggs.

Ostrich eggs are also very susceptible to microbial contamination when exposed to moisture, even from the dew which forms overnight. Therefore it is considered to be important to remove the eggs as soon as possible after they are laid, and this is often done at night when the adult birds are more docile. Good egg hygiene following collection is also necessary to minimise losses during storage and incubation.

The selection of eggs and chicks for quality would therefore further reduce the number of surviving chicks per 100 eggs laid.

²⁹ Deeming pers. Comm.

³⁰ *ibid*

6.2.6 *Livability*

According to experienced producers most chick losses after hatching are caused by: -

- Impactions of the proventriculus thought to be related to stress and possibly the lack of parental guidance
- Infected yolk sac related to poor egg hygiene
- Chick deformities which are probably related mainly to genetics and nutritional factors.

Chicks in less than full condition are not thought to merit the effort involved in rearing them. Another cause of losses through starvation, in addition to impaction, is poor temperature regulation in the chick accommodation. Chicks can starve if the ambient temperature is too high through lack of appetite, or by remaining under a brooder lamp and ignoring feed if ambient temperature is too low.

6.3 Nutrition

The nutritional requirements for efficient feed conversion have still to be established with any certainty. Because the ostrich is a bird, producers have until recently relied on poultry nutritionists to recommend the appropriate ration formulations. It is now recognised that the ostrich is not poultry and that it utilises nutrients very differently, so the art of ostrich nutrition is far from an exact science.

Nutrition is vitally important in the economic viability of ostrich farming. Feeding costs are identified by producers as a crucial element in achieving profitability. However, some have argued that reducing feed costs is not necessarily the way to improve profitability³¹ and that the best available ration formulation will cost more per tonne but will result in lower meat production costs through improved conversion efficiency. This area of contention has not been investigated scientifically, and producers are reluctant to commit to higher costs before the validity of this approach to ostrich nutrition has been investigated. The balance between growth performance of slaughter birds and their nutritional requirements for health and welfare is far from fully determined. Nutrition is therefore the most important factor governing the appropriate level of production intensity. Farmers with previous experience of livestock farming often say that, *ceteris paribus*, the ostrich responds better to good nutrition than any other farm animal. Nutrition is also likely to play a key role in good breeding performance.

In terms of nutritional requirements the ostrich has more in common with ruminant animals than with poultry. It is a true avian herbivore and is able to digest large amounts of fibre in the diet. Sufficient fibre is essential for efficient

³¹ For example, F Benson of Blue Mountain Feeds International : Pers. Comm.

digestion. It is known that ostriches can obtain more than 50% of their energy requirement for body maintenance from fibre through the production of volatile fatty acids in the foregut and the hindgut. Passage of food through the digestive system of adult ostriches is around 48 hours, compared with 4-8 hours in poultry (Deeming et al 1996).

Until 1995 diets for ostriches were based on poultry diets “with an ostrich interpretation”. It was then realised that the metabolisable energy (ME) values of specific ingredients were significantly higher for ostriches than for poultry (Angel, 1996). This may explain the incidence of obesity which is still common in slaughter birds outside of South Africa where extensive rearing systems based on grazing lucerne and other pasture plants are employed to a larger extent. Diets can now be formulated using true ME values for ostriches, but the true digestibility of amino acids is also thought to vary significantly between the two species (Cilliers, 1998). The optimum inclusion levels of minerals and vitamins is also currently a subject of debate.

There is consequently still much to be learned about ostrich nutrition, although many feed companies will prepare a range of concentrate diets for ostriches from the information available.

Kezie Ltd have stated that the best growth rates seen in practice have achieved an overall feed conversion ratio of 3.5:1 over a group of 4000 birds. Given an average of 1.5-2kg of concentrate ration per day and a slaughter weight of 100kg, this would produce a slaughter bird for market at 6-8 months of age for a total feed cost of 350kg concentrate.

If a consistent year round market for ostrich meat is to be supplied from the current laying season in northern Europe, birds would need to be slaughtered at a range of ages. There is some disagreement among processors as to how this could be achieved. Some believe five different feeding regimes could be used to produce the required size in a slaughter bird at a range of ages from six to fourteen months. The impact of varying nutrition on the quality of the meat produced would need to be determined, but is not thought to be significant. The issue of achieving slaughter weight through nutrition at a young age would need to be addressed from a welfare point of view. Others believe consistent demand could be supplied by slaughtering at 10-18 months using a less intensive nutritional regime to safeguard bird welfare. The imperative of obtaining a balance between fast growth rates and high standards of bird welfare is an area that merits further research, because cashflow revenues would be improved by a shorter production cycle.

It is claimed that some producers are already growing birds to 140-150kg (yielding 40-50kg of meat) by 14 months in the US and South Africa³². UK processors believe such birds would be too fat and leather quality would be poor, but further work is needed to resolve this issue.

³² F Benson: Pers. Comm.

6.4 Slaughter

6.4.1 *Mobile Slaughter Units*

Concern over the welfare of birds during transport led to anticipation by the UK MAFF and the Council of Europe that the majority of ostrich slaughtering would take place on the farm of origin. Interest was thus stimulated in adapting existing mobile abattoirs for use with ostriches. The “exempt” unit run by *Scotostrich* is one example, and a similar unit exists at Crinacott Ostrich Farms in Devon, which is licensed as a low-throughput premises.

Technically these units are suitable for the intended purpose, but problems related to the licensing of slaughter premises have so far prevented their use as mobile units in practice. A licence would have to apply jointly to the mobile slaughter unit and any farm where slaughtering takes place. This imposes conditions on each farm in terms of the provision of lairage facilities, a gutting room and waste handling facilities, for example³³. Most producers are unable to commit themselves to the additional costs involved, given the economic climate pertaining at the present time.

6.4.2 *Welfare at Slaughter*

The absence of proven humane slaughtering techniques for the slaughter of market-ready birds was one of the primary concerns of welfare organisations such as the RSPCA. The South African industry was also aware of consumer worries over this aspect of ostrich production. These concerns have been addressed by two recent European studies, both of which were carried out in South Africa.

In early 1996 the UK Ministry of Agriculture commissioned the Department of Food Animal Science at Bristol University to review commercial practises used in South Africa and to make recommendations for the welfare of birds at slaughter. This study is still unpublished, but the Ministry incorporated the findings into a document titled “*Guidance on the Slaughter of Ostriches – Welfare*” (MAFF, 1996).

There is no specific legislation governing the ostrich, and despite the stated intention of MAFF (MAFF, 1998) to produce a Code of Practice for ostrich welfare no work appears to have been done to date. The ostrich is covered by the same legislation that protects the welfare of all farm animals at slaughter. Although still officially regarded as poultry, ostriches need to be treated individually at slaughter because of their size, in the same way as red meat species.

³³ A Greenleaves Pers. Comm.

The usual method of slaughtering ostriches is through exsanguination preceded by electrical stunning. Electrical stunning involves the application of a current to the head by means of tongs with electrodes which span the brain. Although hooding the birds individually can make it easier to move them from the holding pen to the point of slaughter, stunning hooded birds makes achieving an effective stun more difficult by reducing the current applied to the brain.

An effective stun produces a loss of consciousness that should last until death occurs through bleeding. The stun induces a *tonic* phase when the bird becomes rigid, and this is followed by a *clonic* phase of kicking. Shackling and hoisting the bird for bleeding out should ideally occur during the *tonic* phase, although a pivoted bar is often used to restrain the legs during the *tonic* phase to facilitate these operations. The onset of the *clonic* phase can be delayed by extended current application, and a six second stun is often used. The *Osgrow* facility in Shropshire uses a double stun of six seconds each time to achieve effective stunning.

The MAFF guidance suggests a current of 400mA applied using clean electrodes for three seconds will produce an effective stun in unhooded birds. Saline sponges are often used in the tongs to increase contact area and current flow. Bleeding should be carried out as soon as possible after stunning by a complete ventral cut of the neck below the head. With extended stunning the application of the current is often the actual cause of death.

The Dutch study recommended that at least 500 mA should be used to achieve an effective stun for all birds, and recommended that bleeding out should begin within 20 seconds of stunning to prevent resumption of rhythmic breathing and consciousness. This study also looked at the effect of different stunning procedures on meat quality, and recommended a current of 500 mA applied for six seconds for the best results, along with a short stun-to-stick interval (Lambooij *et al*, 1998).

6.5 Transport

Unknown environments and disruption of routine are known to be stressful for ostriches. The ostrich only has two legs, and injury or death can result if a bird falls during transport. In practice the major problems related to transport are caused by heat stress. The temperature in the transport vehicle can itself be the cause, so ostriches are often transported during the cooler parts of the day. The stress of loading birds into vehicles is another cause, and should be carried out calmly and use a minimum of incline on the loading ramp to avoid heat generation in the birds. It is also important not to load birds at too high a density into vehicles. The largest producer in the UK uses a refrigerated truck kept at 10-15°C to ensure bird welfare during transport.

7 Ostrich Farming-An Option for the Less Favoured Areas?

7.1 A Suitable Enterprise for Northern Europe?

The intrinsic quality of ostrich products and the possibility for value-added processing of meat and leather in an integrated operation makes an attractive proposition for rural development in the less favoured areas of Europe. The problem is that scientific evidence so far cannot resolve the question of whether bird welfare is compromised by production systems which achieve economic success under European conditions, although Deeming (Deeming 1997b, 1998a, 1998b, 1998c) has conducted some research into seasonal and gender differences in behaviour. Some producers have expressed the view that slaughter birds would perform better in northern Europe if they were housed throughout the growing phase. Anecdotal reports suggest that at least one UK producer is in fact using this system, presumably with the knowledge of the licensing authority. It seems unlikely that such a practise would meet with approval from animal welfare organisations or indeed from the British public, who are known to give high priority to animal welfare issues when purchasing meat.

It is certainly true that the laying season in northern Europe will produce chicks late in the year which will need to remain housed for at least the first few months of life in order to provide the environmental conditions required for their health and welfare.

Exercise is also very important in the life of a growing ostrich. From 1-2 weeks of age chicks should be spending over half their time walking around the enclosure and feeding. Exercise stimulates a healthy appetite which produces good rates of growth (Deeming et al 1996)⁷. Up to 8 weeks of age a feed conversion ratio of 2:1 or even better is said to be possible (Smith et al, 1995). By 3 months of age a chick should weigh up to 35kg, and will need correspondingly more exercise which may possibly be restricted by bad winter weather.

There is therefore an urgent need to establish unequivocally the suitability or otherwise of northern European conditions for ostrich production if it is to enter into the mainstream of alternative enterprises for the Less Favoured Areas. Climatic conditions in Southern Europe will clearly be more favourable to the ostrich, but there, size of holding and enterprise scale may be limiting factors to growth.

At the present time it is claimed that the top producers, starting with the best genetic stock available, can realistically aim for an output per breeder hen of 15 slaughter birds per year. Researchers and producers believe that with further work to improve genetics and management, an output of 20 birds per year would be attainable.

7.2 Integrated Operations

The entrepreneurial origins of ostrich production in Europe has led producers wishing to slaughter, process and market their products to develop their businesses in a co-ordinated manner. This has been done in a piecemeal way without any official support, and despite the lack of co-ordination between producers and traditional meat processors. It has also involved significant transport distances from farm to processor which is a major stress on the birds and not conducive to good meat quality. However, producers now have the skill, enthusiasm and commitment to stay with the enterprise in the long term. Developing the beginnings of a processing and marketing chain has required significant investment at some risk, but consistent supply and demand are beginning to coexist, even here in the UK.

The integrated operation of *Kezie Ltd* in Scotland is the best example on a significant scale in the UK, and could provide a model on which to base any further demonstration projects within the EU. The unit is served by farms within easy reach, and combines breeding, chick rearing, slaughter, processing, packing and distribution. The company also has links with a tannery in and its hides are currently processed there.

It is possible to envisage a completely integrated operation with centralised incubation and chick rearing units, surrounded by farms producing eggs and growing birds for slaughter. Value-added activities could include slaughter and processing, packing and marketing, and craft industries utilising by-products of the enterprise. Leather manufacture could also be carried out locally, and the construction of a tannery could also be part of the operation. A similar integrated operation is currently under consideration in South Africa.

Such an integrated development would address the infrastructure problems which currently exist and enable production efficiency to be maximised, while providing the best conditions for the health and welfare of this unique species. It could facilitate the development of new products and markets and be useful in proving husbandry and management systems.

7.3 A SWOT Analysis

7.3.1 Strengths

- Potential for excellent product quality across a range of products
- A good market exists already for meat in the EU
- Potential for high production levels of breeder birds
- Potential for good food conversion efficiency in slaughter birds
- Longevity of breeder birds
- Long-term commitment of producers to the future of the farmed ostrich
- A base of production knowledge and experience gained over the last 8 years in the EU
- Development of basic infrastructure for processing and marketing of meat and leather in the EU.

7.3.2 Weaknesses

- Lack of consumer awareness of meats and leather
- Lack of scientific research
- Lack of official support
- Lack of market development in the EU (apart from meat)
- Lack of access to leather processing in the EU
- Low level of productivity currently achieved
- Seasonal egg production
- Unknown implications of artificial rearing (this is a global issue)
- Concerns of retailers and animal welfare organisations over climatic suitability in northern Europe.
- Short storage life of fresh meat
- Product Image

7.3.3 Opportunities

- To provide EU support to producers and processors in order to resolve outstanding legislative, welfare and technical issues.
- To research and develop markets in the EU for domestic production
- To co-operate with researchers and producers elsewhere to increase understanding of the ostrich as a farmed animal.
- Capitalise on broadening consumer tastes

7.3.4 Threats

- Low priced competition from abroad
- Risk of supply exceeding demand if markets not developed
- Adverse publicity from animal rights groups and animal welfare organisations
- Risk of increasing demand being satisfied from outside the EU

7.5 Conclusions

The entrepreneurs who began farming ostriches in Europe at the beginning of this decade have established the enterprise as a long term venture largely reliant on developing local niche markets for the meat. Domestic processing and manufacturing of hides has also now begun. The hide is equally as important to profitability as the meat, but the hide market is currently depressed world-wide, and the global industry has contracted significantly as a result. Prospects for new producers to enter the industry at present are not favourable, but the sector is entering a period of change which will present new opportunities for industry development. The market for ostrich products in the EU will be developed by third country producers and processors if domestic producers are not encouraged to supply current and future demand.

Expansion of European production will require support to increase knowledge of the ostrich as a farmed animal through research. Several fertile areas for future international collaborative research have been identified. The most important of the various welfare considerations is to establish the climatic suitability of conditions in northern Europe for successful ostrich farming. Increased demand for ostrich meat and other products will depend on consumer acceptance of the methods employed in production of ostriches in the EU, as there is no fundamental resistance to the concept of eating ostrich meat..

The ostrich industry will also need assistance in developing and expanding markets for ostrich products, and a consistent legislative framework in which producers and processors can operate is still required. The EU Commission may need to investigate allegations of illegal S African meat imports to ensure that competition does not unfairly disadvantage EU producers. However, the enterprise can be viable without subsidies, although initial capital set-up costs for breeding stock may be prohibitive on very small farms.

The range and quality of products derived from the ostrich are potentially excellent and present the opportunity to develop value-adding activities which could contribute to part of the economic activity of existing farming businesses and in other parts of the rural areas of Europe.

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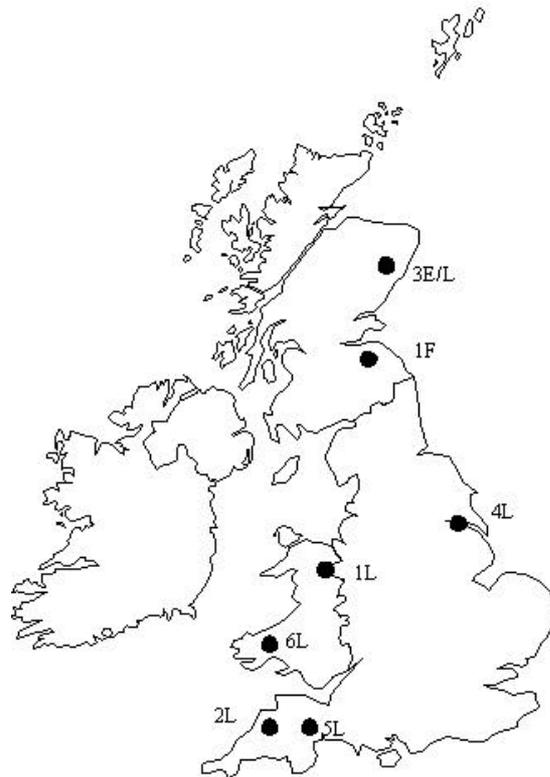
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APPENDIX: LOCATION OF UK SLAUGHTER PLANTS



- 1F Kezie Ltd
- 1L Osgrow Ltd
- 2L Crinacoot Ostrich Farms
- 3E/L Scotostrich
- 4L Humber Ostriches
- 5L M C Kelly
- 6L Five Trees Ostrich Farm

E exempt
L low throughput
F full throughput