Nuffield Farming Scholarships Trust

The Company of the Merchants of the Staple of England Award

The future of the UK sheep industry

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CONTENTS

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DISCLAIMER

The views expressed in this document are entirely my own and do not represent the views of the Nuffield Farming Scholarships Trust, my sponsors, my employers or any other sponsoring body

EXECUTIVE SUMMARY

Historians suggest that the origins of the sheep industry can be traced back 10,000 years to Asia. Since that time, sheep have played a major part in opening up the world's frontiers. Early explorers utilised the animals for both clothing and meat as new, particularly colder, continents were developed. More recently, sheep were central to the industrial development and prosperity of the UK with wool representing two thirds of the nation's exports in 1660.

The industry has changed dramatically since then, not least in terms of the decline in the value of wool. Despite these changes sheep production continues to be significant in many parts of the UK and represented 19% of Welsh agricultural output in 2009. The farm I manage is predominantly based on sheep production, as climate, soils and topography limit other forms of agricultural activity. This is true of many upland areas in the UK and I have used my Nuffield Scholarship to investigate whether the 30% decline in the UK sheep population over the past ten years is a trend which is likely to continue in the future.

My starting point was to look at the global statistics, and as a result I decided to focus my study on China, Australia and New Zealand. China represents the largest ovine meat producer in the world with an annual production of 4,000,000 tonnes *(source FAO)* or 30% of the world total. The Chinese sheep flock has continued to expand until recent times and the market is characterised by rapid increase in demand with minimal imports/exports. Australia and New Zealand, by contrast, have witnessed major decline in their sheep numbers but despite this trend continue to export over 75% of the world's traded sheep meat.

The debate in Europe over the future of the industry has tended to focus on the impact of support and regulation. These factors are certainly important and are given due consideration in the report but the main body of the study deals with three core issues:

- can future consumption increases in developing countries benefit UK sheep producers?
- can the sheep industry meet the challenge of climate change and provide ecosystem services?
- and finally the extent to which greater efficiencies in the production chain are possible.

1. INTRODUCTION

I was brought up on a hill farm in North Montgomeryshire in Mid Wales. This was a farming community typical of so many in rural Wales where the land, the people and the history are closely intertwined.

My instincts from an early age were to travel. Having completed a degree in Agriculture at Seale Hayne College, I worked on a sheep farm in Australia followed by a further seven month period working on a beef ranch in Montana, USA.

On my return to the UK I secured a post with the Farmers' Union of Wales, eventually becoming Director of Policy in the year 2000. Following six years in this post, the pull of the land proved too great and I successfully applied for the position of Farm Manager at Hafod Y Llan.

This is a 4,500 acre hill farm rising to the summit of Snowdon in North Wales, which was purchased by the National Trust in 1998 following a public appeal. We farm sheep and cattle with a particular focus on how best to integrate farming and conservation. Increasingly our activity is evolving to include renewable energy, particularly hydro, and more detailed work on how best to deliver multifunctional land use in the uplands.

2. BACKGROUND

The history of the sheep industry is both long and well documented. From its early beginnings in Asia 10,000 years ago sheep farming spread outwards reaching Europe in around 3,000 BC. There is evidence to suggest that the Greeks, Romans and Persians all contributed to improvements in breeds. For example, the Merina breed - a precursor to today's Merinos - is said to have descended from a strain developed during the reign of Claudius, 41-54 AD.

I have been fortunate in that my Nuffield Scholarship has been sponsored by The Company of the Merchants of the Staple of England. The Company of the Staple can trace its ancestry back as far as 1359 when the King of England gave unequivocal control of staple commodities to the Company. The Company's age of prosperity was from 1619 when a new set of charters granted by James 1 gave the Company a monopoly to broker wool.

During the last decade of the 20th century, stock numbers declined in most developed countries with significant sheep industries. This decline has been very marked in Australia, New Zealand and Western Europe and has continued over the past ten years. This trend is shown by the following table.

TABLE 1 – CHANGING WORLD SHEEP POPULATION

Country	Sheep - million head	2008 numbers against peak
China	136	- 3%
New Zealand	34	-75%
Australia	79	-120%
United Kingdom	22	-30%
EU-27	104	-10%

Source – Royal Agricultural Society of England

This decline has been much reported over the past few years. Nonetheless, as a sheep farmer myself I found it difficult to gain a true perspective of the various forces which have driven change to date and perhaps more importantly the forces which will shape the sheep industry of the future. My Nuffield travel was therefore based on a desire to see first hand the challenges and opportunities for sheep meat in both the developing and developed world.

The most striking factor to emerge in my early research pre travel was that almost eighty per cent of the sheep meat produced in 2010 was consumed in developing countries *(FAO figures).* Just over thirty per cent of world production is consumed in China.

Population growth and an expanding middle class is a clear feature of developing counties. It is therefore these markets which show the greatest growth potential for the future. Further scrutiny of the figures also reveals that imports to developing nations only represent 4% of the volume consumed. Exports from developing countries are also minimal at 1.6% of the volume consumed.

TABLE 2 Ovine meat statistics (thousand tonnes, carcase weight equivalent)

	PRODUCTION		IMPORTS		EXPORTS		UTILISATION	
Country/Continent	2010 estim.	2011 f'cast	2010 estim.	2011 f'cast	2010 estim.	2011 f'cast	2010 estim.	2011 f'cast
Asia	7 785	7 842	324	331	95	109	8 01	8 065
Africa	2 450	2 469	40	39	22	23	2 467	2 485
Central America	123	124	28	24	-	-	150	147
South America	342	352	5	8	47	55	300	305
North America	113	108	97	99	9	9	201	198
Europe	1 075	1 070	298	298	14	14	1 358	1 355
Oceania	1 116	1 104	43	43	650	635	510	513
TOTALS								
WORLD	13 004	13 069	835	843	838	845	13 000	13 068
Developing Countries	10 081	10 164	398	404	164	186	10 315	10 381
Developed Countries	2 923	2 905	436	439	674	659	2 685	2 687

Source – FAO

Having decided to visit China for the reasons listed above, my reasoning for studying the sheep industry in Australia and New Zealand was similarly based on statistical data. The volume of sheep meat produced in these two countries is only 8.5% of the world total. However these two countries dominate the export trade with eighty percent of all sheep meat traded originating in Oceania.

Historically, sheep meat trade flows have been between developed nations and I was keen to understand to what extent exports could switch to the developing world as population and disposable income increased.

3. CHINA

The journey through China started in Beijing. We travelled as a group of eight UK Nuffield Scholars – each of us from very different farming backgrounds. Our tour took us to Zhengzhou and Hohot in the North before returning to Beijing and embarking on a series of visits through Guandong Province in the South.

China stretches some 3,123 miles across the East Asian landmass. The scale of the country, the speed of development and the diversity of the agriculture were a revelation. We visited state of the art dairy processing units, a 1,000 cow dairy unit, a modern vegetable packaging plant and met people at the forefront of the shift to a more technically advanced agriculture.

By way of contrast we also visited traditional markets, a rural village in the South and small scale farmers who toiled on less than a hectare of land in order to make a living. These visits provided an insight into the traditional way of life which has shaped China and the hardships which people faced.

There are three snippets from China which have really stuck in my mind:

- The first was a statement made during a conversation with a resident of Hohot . He noted that there are currently 100 Chinese cities with a population of 1 million or more. By 2025 the expectation is that there will be 200 cities with a population in excess of 1 million

- The second was a statement made by Ben Quinn, an Australian, who has lived and worked in China for over twenty years. He commented that the agricultural system which had existed in China up until twenty years previously was remarkably efficient in terms of producing food. It was a model which had evolved over thousands of years and had proved to be sustainable. He merely posed the question whether the technologically advanced farming systems under adoption would prove to be equally as sustainable.

- One of the people whom we met in Beijing introduced his eleven year old son to us with understandable pride. His son was tall for his age and our host explained to us that his own success had enabled him to buy milk for the lad during his formative years. This comment reinforced in my mind the fact that Chinese people will increasingly demand access to the foods which they deem to be most beneficial for their children.

In terms of the sheep industry, historically the greatest densities were found in the Western pastoral regions of Inner Mongolia, Xinjiang, Quinghau, Gansu and Tibet. Production in these areas is based on extensive grazing.

The central plains have more recently witnessed significant increases in sheep numbers in the provinces of Henan, Shandong, Hebai, Shanxi, Jiangsu and Anhui. Production in these areas tends to be more intensively based with the animals being housed and fed with crop.

Published data suggests that there are currently 135 million sheep in China. During discussions with various parties it became clear that statistical data needs to be used with some caution as downward revisions have been needed in the past in response to over-reporting of numbers.

In northern China we visited a Government funded establishment in Hohot devoted to sheep breed improvement. This was one of many such establishments with the objective of breeding up Merino, Perendale and Dorper rams for distribution to commercial farms.

Travelling through China I picked up the following background on the characteristics of the sheep industry.

- **Breeds –** there are 31 native sheep breeds in China of which 9 have been developed. One of the most popular is the small tailed Han sheep

- **Flock structure** – of the 135 million sheep, 32% are found in households which keep 1-4 sheep. 40% are in households keeping 5-49 head, 20% are in households keeping 50- 199 head with 8% in flocks of over 200 head

- **Slaughter** – 52% of sheep are slaughtered through butchers/small scale slaughter facilities. 42% are sent through abattoirs and the remaining 6% are slaughtered by farmers for their own consumption

- **Consumption** – per capita consumption varies from 7kg per annum in Northern provinces to 0.25 kg in Southern China. Furthermore, urban households consume 3.5 kg per year as opposed to a figure of 1.17kg consumed by rural households. Sheep meat is most commonly consumed in a dish called hot pot where strips of meat are dipped in pots of boiling water for ten seconds.

- **Quality** – the low value market dominates. There is a sizeable and fast growing mid value market. As yet, high value premium markets have not developed to any extent.

- **Expansion** – there was a major expansion in the Chinese flock between 1980 and 2000. The volume of mutton produced in Inner Mongolia more than doubled during this period. Production figures have since stabilised mainly due to measures designed to prevent overgrazing and desertification.

- **Volume** – in terms of market share, sheep meat represented 3% of all meat eaten in 2004. This compared to goat meat (2%), Chicken (13%) and Pork (65%). Twenty years earlier the figure for pork stood at 82% thus demonstrating the rise in popularity of other meats.

- **Future Production** – the grassland protection measures introduced in 2003 limit the future opportunity to expand extensive production
- **China is the largest wool processing centre** in the world. In 2009 wool imports into China reached 327kt, accounting for 33% of world output.
- **Tesco** will double the number of Supermarkets In China by 2015 bringing the total number of their stores to 200. The company also aims to have 80 shopping centres either trading or in development by 2015.

These bullet points provide a snapshot of the Chinese industry and the relevance of a developing China to UK sheep farmers will be considered in later chapters.

4. AUSTRALIA

My Nuffield travels in Australia were focussed on New South Wales and began in Sydney where I met with representatives of Meat and Livestock Australia. The headline statistic in terms of the Australian sheep industry is the decline in total numbers from a peak of 160 million to a current population of some 70 million head. However, this headline figure hides many changes in the production output of the sheep industry, most notably the wool/meat balance.

Sheep in Australia

From Sydney I travelled north to Armidale where much of the research work in respect of the sheep sector is undertaken. It is also an area with which I am reasonably familiar, as I worked on a sheep farm twenty miles south of Armidale in 1990. New South Wales continues to be the most significant state in terms of sheep numbers as shown in the following table:

TABLE 3 - AUSTRALIA – Sheep numbers June 2009 *(Source: Meat and Livestock Australia)*

STATE	SHEEP NUMBERS
New South Wales	25.5 million
Western Australia	15.7 million
Victoria	15.1 million
South Australia	10.0 million
Queensland	4.3 million
Tasmania	2.1 million

As in China, the first impressions of the journey north from Sydney have stayed with me. The most striking thing was how few sheep there were to be seen – districts which were dominated by sheep production twenty years earlier were now being utilized for cropping. The sheep/cattle balance also seemed to have tipped in favour of cattle and the density of livestock generally was reduced. This impression was compounded by lush grass growth, something my hosts soon informed me was a complete contrast to the drought of the ten years preceding 2010.

My time in New South Wales was spent on a mix of farms and research establishments plus meeting with representatives of Meat and Livestock Australia. Apart from Meat and Livestock Australia, the two Armidale-based organisations based which I visited were CSIRO and the sheep CRC.

CSIRO (Commonwealth Scientific and Industrial Research Organisation) is Australia's national Science agency and one of the largest and most diverse agencies in the world. CSIRO provides tools for meat and wool sheep breeders to optimise profitability, livestock welfare and on- farm decision making.

The **sheep CRC** is a partnership of Australia's leading sheep industry organisations and is supported under the Australian Government's Co-operative Research Centres program (CRC program). The CRC seeks to turn Australia's innovations into successful new products, services and technologies and make the Australian sheep industry more efficient, productive and competitive.

My findings in Australia were as follows:

- The decline in the national flock was due to four main influences: drought, wool price volatility, competing land uses and an ageing farming population
- The decline in wool prices since 1990 had resulted in a major shift away from sheep and wethers kept purely for fibre production. The proportion of ewes in the adult sheep flock had increased from 55% in 1990 to 75% in 2009 as producers dedicated proportionally more resources to lamb production
- Whilst the drought had broken in much of New South Wales, other parts of Australia – particularly the West - remain incredibly dry. The high value of livestock limited the ability to re-stock in areas where feed was plentiful
- As farmers get older, the trend in the UK is to see holdings switch from being sheep and cattle units to sheep-only farms. In Australia the converse was true. The average age of sheep producers was estimated to be between 55 and 60 and sheep were regarded as being labour intensive. I was quoted numerous examples where farmers had sold their sheep and were now typically keeping 300-400 suckler cows
    - A further issue for the farming industry in general and the sheep industry in particular was the booming mining industry. Farmers told me that sons and daughters were being attracted elsewhere with remote mines paying up to AUD $150,000 for truck drivers

- As I travelled west from Armidale and visited farms in the Boggabri area, the land use pattern, previously based on sheep, was now predominantly cropping. Irrigation and enhanced returns were the primary reason for the switch and no one locally suggested that the trend would be reversed in the near future

- The greater focus on lamb production has resulted in an increase of 30% in lamb slaughtering between 1999 and 2009. This was despite a 37% decrease in the total number of sheep during the same period.

- The higher number of lambs slaughtered together with a 6% increase in average slaughter weights had led to lamb production increasing by 37% since 1999.

- In 2009-10, Australia produced 412,516 tonnes of lamb and 161,774 tonnes of mutton worth AUD$2.9 billion. This represents 8% of the world's lamb and mutton supply

- Australians eat 10.2 kg of lamb and 1kg of mutton per person annually. These represent some of the highest per capita consumption figures in the world and have followed very successful promotional campaigns.

- In 2009-10 Australia exported 45% of its lamb production and ranks a close second, behind New Zealand in terms of lamb exports. 86% of mutton production was exported and some 3,059,687 sheep were also exported live – almost exclusively to the Middle East. This makes Australia the largest live sheep/mutton exporter in the world

- Despite the positive improvements in the financial circumstances of sheep farmers a number of people I met suggested that the industry had lost touch with the so called generation Y. They argued that the clean, green image of Australian sheep farming was at odds with live exports, mulesing, tail docking and castration of animals. Pressure was also growing to reduce greenhouse gas emissions from livestock

- I found that the research focus was broadly focussed on four areas: Animal Health and Welfare, advanced Reproductive Technologies, Genetics - genomics and animal selection - and Production Efficiency.

- One of the most interesting projects was the Information Nucleus generated by the sheep CRC. The Nucleus was based on a series of flocks totalling 5,000 ewes located at eight research sites in widely differing environments around Australia. The work aimed to enhance the accuracy of Australian Sheep Breeding Values (ASBVs) for current traits, contributes to the development of ASBVs for new traits, validates molecular markers for current and new traits, and develops breeding values that combine phenotypic and DNA based information

- Wool production has fallen from 1,000,000 tonnes at its peak in 1989 to 370,000 tonnes in 2008. Prices peaked at $12.69 per kilo in May 1988 falling steadily to $7.64 per kilo in 2008. The turn around since this low has been huge and the season's

average for 2011 was $11.37. Sales in March 2011 reached new highs of $14.36 per kilo.

- Both lamb and mutton prices reached record highs in 2010/11. Lamb prices increased by 18% on the previous year reaching a high of $6.71 per kilo in March. Mutton prices showed a 30% improvement on the previous year. *(source Meat and Livestock Australia)*

The picture in Australia was therefore of an industry which was resurgent, certainly in terms of prices and confidence. The Merino breed in particular has shown marked improvements in prolificacy and weaning weights.

Despite the positives, which include a very strong home market and diverse export destinations, few expected total sheep numbers to increase significantly in the near future.

However, the volume of lamb produced is likely to increase as lambing percentages improve, sale weights increase and the switch to dual purpose sheep continues.

These issues will be considered in the analysis in later chapters.

5. NEW ZEALAND

I arrived in New Zealand at the tail end of lambing with leading commentators suggesting that the 2010 lamb crop would be down by at least 10% due to late snow storms. This figure reinforced the fact that even countries with a relatively predictable climate can suffer extreme weather events which then have a major bearing on production.

New Zealand is obviously a country which is synonymous with sheep production. As in Australia, the total number of sheep has been in decline since a peak of 70 million in 1982. Provisional figures for 2009, showed 22.2 million breeding ewes and 10.2 million ewe hoggets, dry ewes, wethers and rams, giving a total of 32.4 million sheep. Significantly, despite a 43% decline in numbers between 1990 and 2010, the volume of lamb produced remains relatively constant.

I travelled for five weeks in New Zealand, with the greater proportion of my time spent in the South Island. My initial impressions were coloured by the fact that I had visited the country some ten years previously. Given that my arrival coincided with the Canterbury show, this seemed a logical place to start my study.

On a New Zealand sheep farm

The Canterbury Plain provided me with my first insight into the land use changes which have occurred over the past decade and the most obvious was the proliferation of irrigation and the consequential move away from sheep farming. This was a pattern which was to emerge

in many parts of New Zealand but, whereas the trend on the Canterbury Plain was of predominantly livestock holdings converting to cropping, irrigation in other regions had commonly heralded a move away from sheep into dairying.

My time in New Zealand was spent largely on farms, both commercial and pedigree, visiting levy board staff and directors, representatives of the meat industry and research organisations. The following represent a summary of the points I found in relation to the sheep industry:

- The changes to the sheep industry in New Zealand are complex. During discussion with Rob Davidson of Beef and Lamb New Zealand it emerged that the decrease in the area of land devoted to beef and sheep had been 28% between 1990/1 and 2010/11. This represented a loss of 3.51 million hectares. Of this figure 920,000 hectares of prime sheep and cattle land had been switched to dairy production, leaving a 2.6 million hectare loss to other land uses.

- These other land uses included conservation, reversion of pastureland to scrub, forestry, lifestyle blocks and horticulture.

- The two most contentious issues were lifestyle blocks and conservation, or more particularly tenure review. Given the tight planning laws in the UK, the concept of allowing ten acre blocks to be sold for lifestyle purposes seemed very alien. I had long discussions with farmers over the merits of this policy and the overwhelming response was that lifestyle blocks were detrimental to production. Interestingly, when asked the question whether they thought the policy would change in the near future, no one thought that there was political will in favour of change.

- The second land use issue which I found to be charged was that of Crown Pastoral leases and pastoral review. As at the 31st October 2010, proposals had been put to leaseholders relating to 432,000 hectares of land, of which 48% was designated public conservation land and 52% freehold. In essence farmers were being moved off the high country land they had traditionally leased for grazing and were being given freehold of their valley bottom land in return. Over 100,000 acres had already been purchased outright by the Crown for conservation and many of the sheep farmers I met in the South Island openly questioned the wisdom of no longer running livestock on crown land above 3,000 feet high

- When I asked the question why farms in Southland – which were not all dependent on irrigation – were switching to dairying, I was given a clear explanation from a farmer I met in the area. He told me that a typical Southland farm was 220 hectares, and that such a farm could generate a very good living keeping 600 cows. A sheep unit on the same area of land would be barely viable. A consequence of this trend is that sheep farming is being concentrated on poorer quality land where alternative land use was not possible.

- I stayed with farmers who had allegiances to different meat companies and found that the co-operatives showed little will to co-operate amongst each other. Lambs were in tight supply and competition was cut throat.

- There was considerable debate about sustainability in New Zealand and awareness that markets in the developed world would increasingly focus on localism, on the ethical use of resources, and demand clear assurances about methods of production.

- There was also a clear regard to the views of consumers. New Zealand farmers and meat companies are certainly very sophisticated in their marketing and this began with clear market analysis. I felt that many of the farmers I met had a better understanding of the UK market than do British farmers

- In terms of markets, the UK still remains the main destination for New Zealand lamb taking 23% of it. Thirty six percent of production is destined for the rest of Europe while North America takes 14%. North Asia and the Middle East take 10% and 7% respectively.

- Interestingly, New Zealand did not fill its EU quota entitlement in 2010. The shortfall amounted to 30,000 tonnes, out of a total quota of 227,884 tonnes.

- Despite the proliferation of composite breeds in recent years, the Romney still dominates in terms of numbers with 40.8 % of the national flock. I was fortunate to visit a number of leading ram breeders including Derek Daniell, Holmes Warren, Roger Barton and Orari Gorge. There seemed to be a consensus that lamb weights in the future will increase to 20kg plus, thereby emulating Australia where lamb carcase weights are already in excess of 21 kg.

- Most farmers agreed that higher carcase weights will be achieved through bigger ewes (70-75kg not 62-68 kg), higher average weaning weights, better control of internal parasites and higher quality feed. Over the past 25 years average carcase weights have increased from 12.5 to 17kg with a 49% enhancement in the weight of lamb produced per ewe. There was also debate about the relationship between store stock producers and finishers and the need to create partnerships which rewarded both parties

- New Zealanders consume around 12kgs of lamb per head and a roughly equal volume of mutton. This left a total of 370,000 tonnes of sheep meat (93%) and 92,000 tonnes of mutton (91%) available for export *(New Zealand Meat Board 2010)*

- New Zealand wool production peaked at 358,000 tonnes in 1985-86 as compared to a production of 158,000 tonnes in 2008-09. The average price in 2008-9 was 308.7 cents per kg greasy as compared to a much improved 503 cents during the early sales of 2011

Despite the fact that agriculture generated 53.8% of New Zealand's exports in 2009, the surprise to me was that it was an industry apparently unloved and misunderstood by the

urban majority. Issues such as water usage and quality were fuelling tension and in one sense sheep farming had retained its clean green image whereas perceived intensification through irrigation was viewed negatively. These were issues which my hosts discussed freely, and interestingly most were agreed that advanced sheep breeding technologies including genomics were not an issue for most New Zealanders.

As with Australia and China I have used my travel experience to underpin my analysis in the next chapter.

6. ANALYSIS

6.1. UK INDUSTRY - SNAPSHOT

The purpose of my travel was to identify how the sheep industry beyond the European Union was evolving and facing up to the challenges of the future. As has been highlighted earlier the UK industry witnessed a 30% drop in numbers in the period 1998-2008 with this trend replicated in most other EU member states with significant sheep flocks. France saw a decline of 20% during this same period whilst in Ireland numbers plummeted by 43%.

UK production is seasonal and stratified with hill/upland farms providing breeding stock for lowland units. The removal of headage-based support systems has coincided with the downturn in numbers. In order to understand the opportunities for the future it is important to also assess the likely impact of the changing support system, the regulatory framework and the exchange rate, on the UK industry. This brief summary will therefore precede the more detailed analysis of the global factors affecting change.

These are largely personal observations drawn from discussion with people involved in policy formulation. The concept of support was alien to many of the farmers whom I met during my travels, to the extent that I was challenged frequently to defend subsidies. Hill farms such as Hafod y Llan, the farm I manage, could not viably keep sheep without support and the multiple land use which we deliver is dependent on keeping grazing livestock.

Hybu Cig Cymru (Meat Promotion Wales) statistics show that the single payment scheme was worth £261 million in Wales in 2010, with Pillar 2 (rural development schemes) delivering a further £66 million. This equates to almost £200 per productive hectare. The value of payments in other UK countries are similar although the delivery mechanisms vary in the different countries. The support, regulatory and exchange frameworks which have shaped the industry are as follows:

6.1.1 Single Payment

Pillar 1 of the Common Agricultural policy was historically devoted to production support. Up until 2003 this support framework was based on headage payments for cattle and sheep. The introduction of the single payment scheme in 2003 allowed member states to decouple support from production, although the rules require adherence to statutory management requirements and good agricultural practice (cross compliance).

Amongst EU member states, only the UK, Ireland, Italy and Germany implemented full decoupling. The other countries in the EU Fifteen with significant sheep populations, namely Denmark, Portugal, Greece, France, Spain and Finland, took advantage of a provision which allowed retention of 50% of the annual ewe premium up until 2013.

The next reform in 2013 will need to address the expectations of 27 member states. The twelve accession countries had 19% of the total sheep breeding flock in 2009 although this percentage continues to rise as the sheep population of the EU 15 shrinks.

No one can predict the outcome of the 2013 reform but the likelihood is of a static or dwindling Pillar 1 budget shared more equally amongst the member states. Countries such as Wales where the single payments to individual farms are made per hectare according to historic premium claims may be forced to implement flat rate payments whilst member states which have partially decoupled may be required to similarly move to flat rate payments. This is also talk of the greening of Pillar 1 payments

It is therefore likely that on individual farms the value of the single payment will decline, the break with production will be reinforced and the opportunity for the single payment to cross subsidise production will reduce. There is little prospect at this stage of a return to headage payments.

6.1.2 Rural development

The influence of rural development and Pillar 2 measures on sheep farming are more difficult to quantify. The two main measures delivered under this banner, namely additional support for farmers in the less favoured areas and agri-environment schemes, have had a big impact in the uplands but obviously much less so on lowland sheep units.

The response of the Welsh Assembly Government to budgetary pressures has been to create a single scheme called Glastir encompassing all of the Pillar 2 strands. Many upland sheep farmers have significantly reduced their numbers in order to meet agri-environment requirements and it is difficult to see this trend being reversed in the near future.

Despite this historic trend, there is increasing awareness of the wider role sheep can play including their use as tick mops on grouse moors where there are high returns from shooting. There are valued environmental and landscape benefits from grazing sheep but the debate over appropriate stocking densities, particularly in the uplands, is yet to be resolved.

6.1.3 Regulation

The regulatory framework in the UK is often quoted by farmers as one of the main reasons for their decision to cease sheep farming. Electronic tagging, the fallen stock regulations and BSE/TSE controls are often quoted as examples of regulation which add cost. Equally as significantly are the paper trails with regard to movements, the

pressures of farm assurance and the links into support payments which many farmers view as limiting their freedom to farm.

It would be naive to suggest that all these issues are detrimental to production, or indeed that some of the requirements cannot be used to marketing/production advantage However, the fact that only a minority of European member states have sheep is an issue in terms of securing changes to the more onerous regulatory requirements which have stemmed from the BSE and FMD outbreaks.

6.1.4 Exchange rate

The impact of the exchange rate is often overlooked when assessing the fortunes of the UK sheep industry. My discussions with farmers in Australia and New Zealand had reinforced the impact of currency exchange rate on producers' fortunes. Data from Beef and Lamb New Zealand shows that a 10% change in the value of the New Zealand dollar against the US dollar can have an even greater impact on producer prices. Their modelling work showed that a 10% appreciation in the value of the NZ dollar resulted in a 14% reduction in the price of lamb. A 10% depreciation, by contrast, resulted in a 17% increase in producer prices.

The situation in the UK, by contrast, is one where Britain remains outside the realms of the Euro but all support payments are set in euros. As a result, if the pound weakens against the euro not only do support payments increase in value and imports become more expensive but exports become more competitive.

Back in the late 1990s and post BSE the sterling/euro exchange rate stood at one ecu = 86p. I remember one leading banker saying that we would never see such a favourable exchange rate again and that the natural long term position would be around one euro = 70p. Indeed, five years ago the exchange dropped to 63p and it is easy to forget that the current buoyant export trade is being fuelled by an exchange rate which has hovered over the past eighteen months at between 85 and 90p to the euro.

This is very significant as UK sheep meat exports equate to around 10% of world trade. In 2009 this export trade was valued at £300 million and totalled 94,500 tonnes, or 30% of total UK production. These exports are currently almost exclusively to other parts of the European Union with France being the main market. The EU as a whole is 79% self sufficient in sheep meat production.

A return to an exchange rate nearer to the long term normal would have a big impact on the competitiveness of British lamb. The vagaries of exchange also have an impact on the 116,000 tonnes of lamb (88,000 tonnes from New Zealand) which are imported annually to the UK in order to maintain a year round supply.

In order to further analyse the **future prospects for the UK sheep industry** beyond the influences of subsidy and exchange rate, I have split the rest of my analysis into three sections:

- Future markets for lamb
- Carbon footprint and ecosystem services
- Production efficiency

The following sectors deal with each of these in turn

6.2 FUTURE MARKETS FOR LAMB

Having completed my Nuffield travel I feel that I have a much better feel for the world market in sheep meat and the trends that may emerge over the next twenty years. I have split this section down into:

- Global meat demand
- Developing versus developed countries
- The importance of Halal markets
- Carcase/ fifth quarter value

6.2.1 Global meat demand

The global demand for meat will be driven by three factors:

- The first and most obvious is population growth with the human population by 2050 estimated to be 9.15 billion *(UNPD 2008).*
- The second is urbanisation, with experts predicting unprecedented urban growth in Africa and East Asia. Urbanisation results in infrastructure improvements, including cold chains, which allow perishable goods to be traded more widely.
- The final influence is income growth, which is expected to continue into the future, thereby stimulating demand for meat.

Furthermore, the agricultural production sector will be required to supply a standard type diet as supermarkets extend their reach into developing countries.

TABLE 4 – WORLD MEAT BALANCES – million tonnes *(Source: FAO food outlook report 2011)*

	2009	2010 estimated	2011 forecast	% change
Production	277.7	285.1	288.3	1.1
Bovine meat	64.9	64.9	65.0	0.2
Poultry meat	93.6	98.0	100.2	2.3
Pig meat	106.3	109.2	110.0	0.7
Ovine meat	12.9	13.0	13.1	0.5

	2009	2010 estimate	2011 forecast	% change
Total trade	25.0	25.9	26.6	2.4
Bovine meat	7.2	7.5	7.7	1.9
Poultry	11.1	11.5	11.7	1.6
Pig meat	5.8	6.1	6.4	5.0
Ovine meat	0.9	0.8	0.8	0.8

In essence the table shows that sheep meat is currently 4.5% of global meat production and around 3% of the total volume of meat traded.

6.2.2 Developed versus Developing Countries

Currently people in the developed world consume 78 kg of meat each per annum as compared to 31kg per person consumed in the developing world. The FAO projects that by 2030 per capita consumption of meat will increase to 89 kg in the developed world and 38 kg in the developing world.

These figures, although significant, mask the fact that population growth in the developing world will also have a huge impact on future demand. In 2002, the developed world consumed 102 million tonnes of meat, or 42% of the total. By 2030, the developed world is forecast to consume 121 million tonnes of meat, only 32% of the total. The FAO projects that 252million tonnes of meat will be consumed in the developing world by that stage rising to 326 million tonnes in 2050.

It is therefore clear that in terms of demand, developing countries will double their requirements by 2050. These markets are currently characterised by self sufficiency and minimal imports/exports. The challenge for sheep meat producing counties is to take advantage of any import demand. During discussions in New Zealand and Australia it became clear that these markets currently favour low value cuts such as flaps, shanks and briskets and the return per tonne of meat exported to Asia was substantially lower than a tonne sent to US/European markets.

In my opinion, developing markets will provide opportunities to export lower value cuts in the near term, with greater financial prosperity and 'Westernisation' generating the possibility of higher value outlets in the medium to long term. Given

the proximity of Asia, greater volumes of Australian/New Zealand could be channelled to this market, displacing supply normally shipped to Europe. Irrespective of the future volume of sheepmeat consumed in developing nations, they will undoubtedly have a big impact on the world price for protein given their influence on the demand/supply balance.

The developed markets for sheep meat will become more difficult to service as consumers become ever more conscious of health, social and environmental factors. These considerations will play a big part in their decision making process together with convenience and the need for easy meal solutions. They will also expect production systems to be both sustainable and ethical. The big challenge will be to persuade the next generation of consumers of the virtues of lamb with limited promotional resources.

6.2.3 Halal markets

Muslims represent around 2.4 million of the UK population. They require animals which are slaughtered according to strict religious rules as laid down in the Qur'an. These markets are already very important in terms of cull ewes in the UK, utilising 80% of production.

Having looked at the industry in Australia and New Zealand, I was impressed by their proactive approach towards capturing new markets. Halal meat was readily available in both countries, as was the capacity to provide dedicated supply to ethnic outlets.

Muslims are restricted to beef, poultry or lamb in terms of their meat choices. EBLEX have estimated that 30% of British lamb is consumed by the Muslim community, a startling figure given that Muslims represent only 3% of the population *(Mintel research 2002).* Furthermore, across Europe, the Halal food market is estimated to be worth some 15 billion euro with a total of 50 million consumers. These figures do not take into account sheep eaten by non Muslims in the ethnic restaurant sector.

This market is still growing and offers real opportunities for expansion. In terms of the foodservice sector, New Zealand is able to give authenticated assurances that their lamb satisfies the Halal requirements. This is an area of opportunity for the UK sheep industry and a greater focus on the needs of this market is required.

6.2.4 Fifth quarter/carcase utilisation

Lambs kill out at anything between 43-50% depending on factors such as age, sex and how they have been fed. A great deal of work has been done on the carcase and how best to cut up the animal in order to satisfy the needs of modern consumers including the ready meals and service sector. Consumer demand is constantly

evolving and some leading retailers are suggesting that the concept of value for money will be replaced with a greater desire for 'values for money' in developed markets.

Traditionally, marketing and the quest for meal solutions has focussed on the 47% of the animal which emerges at the end of the slaughter line. The real challenge for the future is to find maximum value for the 53% which is cut off before the animal reaches the point where it is weighed and graded.

Of this figure, around 11% is the weight of the fleece and pelt. Discussion with individuals involved in the abattoir sector in New Zealand highlighted the changing situation with regard to demand as supply tightens. Prices for New Zealand skins doubled in 2010 with around 20% used for wool on products such as rugs, boots and accessories. Demand for garment leather was also strong with a further 20% of supply destined for this use.

Global shortage of casings has also stimulated significant price increases, with 2010 values up 30% on the previous year. High crude oil prices have also had a positive impact on tallow values whilst other fats and oils are increasingly diverted into biofuels.

The pet food industry is also an important outlet for fifth quarter products and tight supply is again an issue for this sector. Meat companies in Australia and New Zealand had also identified opportunities within the pharmaceutical industry where parts of the animal could be utilised to maximise financial gain.

Ultimately, the legacy of BSE and foot and mouth disease hangs over the UK industry and changes to the Food Labelling Regulations in 2003 have meant that offal can no longer contribute towards the meat content of processed products. SRM and meat inspection costs have also added cost, and whilst regulation remained an issue in the Southern Hemisphere, the New Zealand industry appeared to be moving towards a greater degree of self regulation.

There are, nevertheless, real opportunities to promote edible red offal as one of the best sources of iron, particularly in the food service sector. Offal consumption is also higher in many other EU countries and markets in developing countries provide attractive outlets for parts of the animal which previously had limited value.

6.3 CARBON FOOTPRINT AND ECOSYSTEM SERVICES

There is clear evidence that UK retailers are increasingly concerned about security/ continuity of supply and environmental sustainability. Local food has taken on a new significance over recent years, as a new generation of celebrity chefs has extolled the virtues of locally produced, quality produce. My study has, in large part, been about looking at the UK sheep industry from the outside and viewing the future from a Chinese/Australian/New

Zealand perspective. However, what we have as farmers in the UK is a mature market on our doorstep and one which increasingly demands environmental sustainability as a condition of trade. Two immediate issues face the sheep industry in my opinion:

- the industry's carbon footprint
- ecosystem services.

6.3.1 Carbon Footprint

This issue was certainly on the radar of farmers in the Southern Hemisphere, and levy boards in both Australia and New Zealand had plotted the relative efficiencies of their industry in terms of livestock emissions and primary energy use. This contrasted with China where the debate was about production and environmental sustainability in a much broader sense.

I found that farmers in New Zealand in particular had been fearful as to the response of their Government to the Kyoto Protocol. These fears had eased with a change in government but there remained a clear disconnect between the position of the farming industry and the general public whose mood appeared to be more sympathetic towards measures to meet Treaty commitments

In the UK there is considerable ongoing work into the contribution of all livestock categories to greenhouse gas emissions. There is a consensus of opinion that, in terms of CO2 emissions per kilogram of meat, sheep emissions are fractionally higher than beef and double those of pork. In terms of primary energy use, lamb is on a par with pork and utilises about two thirds of the energy required by a beef animal to produce a kilo of meat.

The three main efficiency tools to reduce emissions per kilogram of meat produced are increased fertility, increased feed efficiency and improving the longevity of breeding stock.

These measurements do not take into account three crucial factors which are fundamental to the defence of sheep production as a sustainable land use in the context of greenhouse gas emissions. Firstly, the figures are heavily influenced by the poorer quality nutrition and longer production cycles of hill sheep. However, this is also a positive in that these sheep are utilising vegetation which has no alternative use for food production. Secondly, the return of nutrients to the soil in urine and faeces improves the capture of CO2 through photosynthesis and its subsequent incorporation into soil organic matter. Lastly, extensive systems which are most 'expensive' in terms of greenhouse gas emissions are relatively efficient in their use of primary energy.

6.3.2 Ecosystem services

The ecosystem services provided by agriculture have been summarised as the regulation of soil and water quality, carbon sequestration, support for biodiversity, and cultural services. Equally, the accusation is made that ecosystem disservices can stem from bad management and in the case of the sheep industry much of the debate focuses around the loss of habitat through overgrazing.

The challenge of delivering more outputs from less input is a reality. The more subtle challenge for the sheep industry is that globally sheep are increasingly being kept in marginal areas, as land which is capable of growing crops or conversion to more intensive livestock is being lost. During my travels I learnt of restrictions on sheep stocking densities in China due to erosion fears, the removal of sheep from government land over 3,000ft in New Zealand and the conversion of sheep units in Australia/New Zealand to other land uses due to profitability issues.

The hills and uplands of the UK have been shaped by sheep farming and the public in general views the sector positively in terms of a clean, green image. However, many of the habitats grazed by sheep have a high biodiversity value and there needs to be greater clarity as to the benefits of sheep in terms of delivering ecosystem services. The ecosystem services delivered by the sheep industry are positive but will need to be clearly communicated to consumers in order to maintain lamb's positive image in the future. They will also have to be communicated to policymakers if sheep production is going to be viewed positively in terms of its contribution to a sustainable, multifunctional land use.

6.4 PRODUCTION EFFICIENCY

A great deal of my travel time was spent on farms which were at the forefront of sheep breeding and management systems. I also spent time talking to research scientists who were committed to the industry and who were determined that the industry should meet the productivity gains which have been achieved in other sectors.

There was also a recognition that future production would be set against a carbon constrained world economy. Having thought about what I saw, there are five aspects which stand out:

- easy care
- breeding and genetics
- nutrition
- disease resistance

- technological advances in equipment

These aspects are obviously interlinked and are dealt with very briefly in the following analysis.

6.4.1 Easy care sheep

I was impressed by how Australian and New Zealand farmers had used ruthless selection to breed up flocks which were healthy and productive. I met farmers who selected breeding replacements from ewes that reared twins, but before doing so assessed how effectively she had reared both lambs. The assessment was therefore at the point of weaning and also took into consideration the ewe's own condition score. The clear objective was maximum output with the minimum of labour input. Southern hemisphere farmers have also selected heavily for meat production during the past twenty or so years as wool prices initially collapsed and then stagnated.

I have deliberately avoided focussing too heavily on wool despite the fact that prices over the past two years have more than doubled. As a consequence, the type of wool shedding sheep we associate with easy care in the UK will retain their attractiveness in terms of labour requirement, but the loss of the wool may become a cost, particularly if prices continue to improve.

6.4.2 Breeding and genetics

A visit to the sheep CRC in Armidale clarified the work that was being done in Australia on sheep genomics. In so doing, the visit opened my eyes to the potential of this science. Selection within breeds can generate genetic improvements of 1-3% per year in relation to the average. This has been achieved in the pig and poultry industry, although the rate of improvement has been substantially less in the sheep industry. It is also true that the rate of gain in the UK has been considerably less than that in New Zealand.

Scientists estimate that genomic selection has the potential to significantly increase the rate of genetic improvement over the 1-3% achieved through conventional selection. In essence this science enables decisions to be based on genomic breeding values calculated from genetic marker information as opposed to the pedigree information currently used for selection.

A second change is also happening in developed countries in that the breeding focus is no longer exclusively based on sheep productivity. Issues such as disease resistance, sheep welfare and environmental impact will increasingly come to the fore in terms of breeding priorities stimulating assessments of the trade offs between different traits.

6.4.3 Nutrition

How to feed sheep efficiently was also a major consideration on most of the farms that I visited. The most interesting example was a farm in New South Wales which had developed a cell grazing system which could be directly compared with a paddock based system. The challenge in grass based systems is to utilise grass effectively, as average utilisation is estimated to be as low as 50% on UK sheep farms. Much of the innovative work I saw related to effective utilisation of grass and the use of alternative crops, particularly chicory, to fatten lambs.

The need to mitigate greenhouse gas emissions is becoming a key consideration in the quest to find future feeding strategies which deliver a sustainable sheep industry. Given that the industry is extensive in nature, I found that much of the research work in this field is devoted to identifying dietary additives which could reduce methane emissions.

6.4.4 Disease Resistance

Disease resistance featured prominently in the priorities of Australian and New Zealand farmers. This was particularly true in respect of internal parasites. I listened to lengthy debates on the merits of disease resistance as opposed to disease resilience. Resistant sheep can control and reduce worm levels through their own enhanced immune system. Resilient sheep by contrast show good growth rates irrespective of worm challenge. My eventual conclusion was that both approaches are beneficial and reduce industry reliance on anthelmintics.

Having invested some years ago in a FECPAK to count worm burdens, I was also interested to learn that Agresearch in New Zealand had developed the Carla Saliva test which measures protective antibodies to worms. Such developments highlight the potential of DNA based technologies to simplify the process of identifying disease resistance in sheep.

6.4.5 Technological advances in equipment

I also found that farmers in the Southern Hemisphere were keen to embrace technological advances whilst showing admirable resistance to the need to purchase new plant and machinery. In fact one New Zealand farmer told me that he thought too many UK farmers suffered from ‘shiny mudguard syndrome’

Nonetheless, I found that the sheep handling systems on the farms I visited were generally good and many of the pedigree breeders had embraced electronic tagging and reading systems. I also visited commercial farms where electronic

drafting allowed lambs to be automatically split into three groups, depending on weight.

Similarly, the abattoir sector was actively engaged in identifying electronic grading systems to pay for meat on the basis of yield. This development together with more recent announcements on the use of robots in the slaughter process demonstrated a commitment to drive efficiency beyond the farm gate.

7. CONCLUSIONS

My overarching conclusion is that there **is** a future for the UK sheep industry, despite uncertainties over the future support and regulation of the industry. This confidence stems from the perspective I gained during my study and can be summarised under three main headings:

MARKETS

The home market will be challenging and traditional European destinations for UK lamb will also be demanding in terms of consumer perception and product requirements. However, the global picture is one where developing markets will stimulate demand and dominate consumption volumes. In the short term these markets will offer opportunities to export lower value cuts and may become an increasingly attractive outlet for Australia and New Zealand thereby displacing supply destined for the European Union. Real opportunities also exist in terms of expanding sales to the Halal market in the UK and Europe, a market which is already significant in volume terms. Finally the 53% of the lamb which is not carcase has the potential to boost the value of the animal to a much greater extent than has happened in the past.

CARBON FOOTPRINT/ECOSYSTEM SERVICES

The sheep industry has been largely on the defensive in respect of the climate change debate. Having completed my Nuffield study I am much more confident that there are sound arguments in favour of sheep production as a sustainable land use form which delivers a range of benefits to society. The careful management of natural resources will become increasingly important in the mind of consumers and lamb is well positioned to build on its clean green image.

PRODUCTION EFFICIENCY

The UK sheep industry has been slow to embrace techniques which improve productive efficiency. This is in sharp contrast to the pig, poultry and dairy sectors where there have been year on year improvements. The pressure to produce more food using fewer resources will continue and the development of genomics offers the opportunity to accelerate genetic improvement. The sheep industry of the future will be able to draw on these tools, and the opportunity to target traits which are beneficial both to the health and welfare of the animal and to the environment should assist in generating positive consumer reaction to this technology .

8. RECOMMENDATIONS

My recommendations stem from the conclusions of my study:

1. The industry needs to be clear about the future requirements of sheep meat consumers in both developed and developing nations. The levy boards are already investigating the opportunities for sales to developing markets and further research should be commissioned in order to quantify the future export potential of these markets in terms of volume

2. Statistics show that globally sheep meat represents just over 4% of total meat production and 3% of the total traded volume. Mutton and lamb are in direct competition with other meats and many of the challenges are common to sheep producing nations with an export interest. There is therefore a strong case for greater co-operation between these countries and a pooling of resources where appropriate.

3. The Halal Market and outlets for the fifth quarter need to be prioritised by the levy boards as areas where the industry should better understand the needs of the market. Furthermore, marketing strategies should take into full account the raw material produced from the whole sheep in order to ensure that all parts of the animal are exploited to their full potential.

4. In terms of sustainability, the sheep industry has a positive story to tell. I am working with colleagues on the farm in order to identify how best to integrate an extensive sheep system with habitat restoration. We are also starting to do some work on land capability, again in a bid to deliver multiple land use with sheep farming at its core

5. The sheep industry has been slow to adopt selection techniques which maximise production efficiency. With genomics on the horizon, knowledge transfer will need to focus on the gains which are possible through genetic improvement in order for sheep to compete with other protein sources.

9. AFTER MY NUFFIELD

The past two years have been hugely enjoyable for me as an individual. My travels have made me question many things which I previously viewed with certainty, whilst reinforcing the crucial importance of farming and land management to global wellbeing.

The UK sheep industry is certainly in a more positive position than it was two years ago. Prices have improved substantially and the decline in numbers has been arrested.

Back on the farm, one of the most visual consequences of my study has been the purchase of two alpacas which now graze at the foot of Snowdon. Having seen camelids being used to protect flocks from foxes in Australia two gelding alpacas were purchased last March and they successfully defended one flock of sheep during the lambing period.

I have also become more involved in off farm discussion groups and was recently selected to represent Caernarfonshire on the regional committee of the Wool Board.

Nuffield has been a truly positive experience and I can only thank everyone involved for this opportunity.

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