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Conference paper

MANIPULATING LAMB GROWTH TO REGULATE THE SUPPLY OF LAMB TO MARKET

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Introduction

The European sheep industry is facing major challenges due to the changing nature of the retail market for lamb. The proportion of lamb sold via supermarket outlets has risen and continues to rise. In the UK, supermarkets account for 40% of lamb sales, in southern Europe the market share held by the supermarkets is smaller but is rising faster, aided by aggressive price discounting strategies to attract new custom (Scanlan, 1995). Supermarkets demand high volume regular supplies of consistent quality which they source chiefly on the basis of price with little regard, trade restrictions excepted, for country of origin.

The level of trade protection which the European nations have benefited from hitherto is being decreased by, principally, the GATT process. This coupled with advances in fresh meat storage technology mean that other countries, for instance New Zealand, can increasingly supply lamb of high specification to the European market (10,000 tonnes per year of fresh New Zealand lamb is currently sold in the EU). Unless the challenge to meet tight specifications and regular supply is taken up by European lamb producers there is danger of losing a substantial share of the lamb market. This will have wide reaching effects where the loss in market share of the lamb market. This will have wide reaching effects where the loss in market share results in the abandonment of sheep production as a viable rural enterprise in vulnerable regions.

The key to meeting this challenge lies in manipulating the timing of lamb supplies to the market. A successful European strategy to achieve this would exploit the differences in seasonality of production which exist across Europe, an example of the UK pattern is shown in Figure 1.

By exploiting the available techniques for spreading production peaks complementarity between regional production patterns could be encouraged. The political, environmental, and socio-economic issues raised by such a strategy are, however, outwith the remit of this paper which focuses on the technical issues relevant to manipulation of the timing of lamb supply namely:

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- timing and spread of lambings;
- breed choice;
- nutritional regimes;
- health and management;
- meat storage techniques,

with particular reference to lamb production in the UK, Greece and Spain which have been the focus of recent studies by the authors.

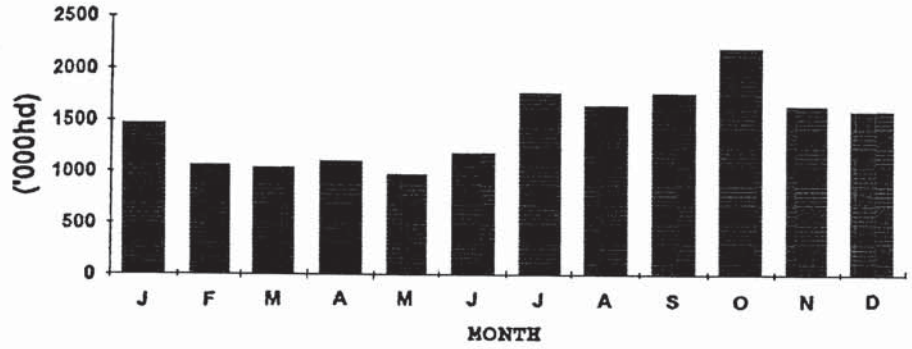

Figure 1. - MONTHLY TOTAL OF LAMBS SLAUGHTERED IN THE UK (mean of years 1992-95) ('000 hd)

Selection of appropriate supply strategies

Selecting the most successful supply strategy for an enterprise or region is itself a complex issue, requiring evaluation of both the market and production conditions. Conditions which are dynamic with respect to time. On the marketing side, regional differences in seasonal price trends (Figure 2), in carcass specifications, retailing and transport infrastructures, as well as local niche markets and scale of enterprise need to be considered. On the production side, the constraints imposed by the indigenous grazing resource, climate and environment, by the primary product to which an enterprise is geared (eg milk or meat), the costs of bought-in resources, and the scale of enterprise are all important factors.

Clearly, the viable options available to a crofter with 20 ewes on the Scottish islands, whose primary product is breeding stock, are substantially different from those available to a large scale dairy producer in mainland Greece with excess male lambs to market. There are, at present, no reliable models in existence to select optimal supply strategies for lamb (see Takase et al, 1992). The development of combined production and economic models to select the optimum production and supply strategy for a given enterprise would make a valuable contributin to this area.

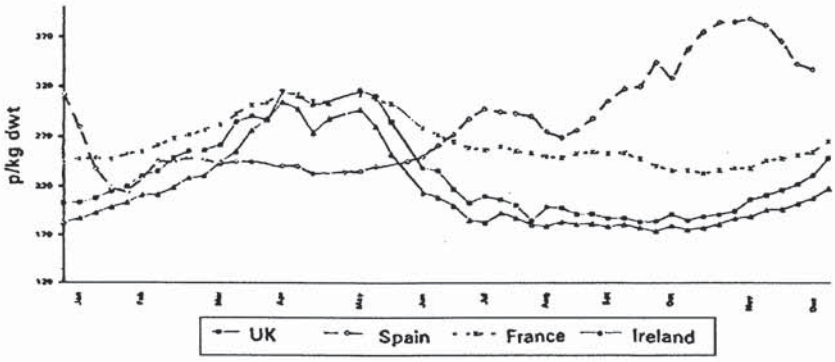

Figure 2. - EUROPEAN LAMBS PRICES 1994

Timing and spread of lambings

Within a region such as the UK there exists a spread in breeding seasons, partly as a consequence of climatic conditions and partly due to breed differences (see Table 1). Typically, a very concentrated lambing period of around 4 weeks is chosen, by controlling access to the ram. Farmers decide usually on a single lambing period for all age groups of ewes, first parity ewe lambs may however be lambed slightly later. This level of control is achieved by stock-proof fencing and is considered essential to a managed UK system where feed inputs and veterinary treatments are strictly scheduled in relation to stage of the reproductive cycle enabling average output levels of around $1^{1/2}$ lambs/ewe/year to be achieved. This concentration of lambing allows flock requirements to be synchronised with the production of grass (see Figure 3) (Speedy, 1980) minimising the need for forage conservation which incurs costs, dry matter losses and pollution risk. The system however gives rise to pronounced seasonal fluctuations in local lamb supply and consequently in price per kg.

Table 1 - BREEDING SEASON OF NUMERICALLY IMPORTANT UK SHEEP AND THEIR LAMBING DATES

Breed type	Seasonal polyoestrus period	Typical range in lambing date
Hill:		
Blackface, Swaledale, Welsh Mountain, Shetland	October/November - February	April - May
Lowland:		
Mule, Welsh and Scotch Halfbred, Greyface	September - February	March
Lowland early breeding:		January - February
Suffolk crosses, Finnish Landrace crosses, Dorset Horn crosses Last parity crossbreds	July - February	January (with sponge + PMS)

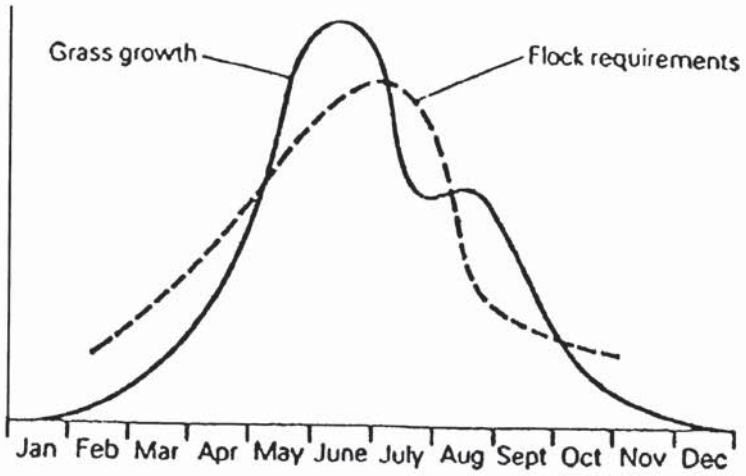

Figure 3. - THE PATERNAL OF HERBAGE PRODUCTION IN RELATION TO TOTAL FLOCK REQUIREMENTS (Speedy, 1980)

Alternative, less markedly seasonal, reproductive strategies have been traditionally associated with the regions of southern Europe where the natural pressures on seasonal breeding are considerably less than in the north of Europe. Historically, this may account for the main focus of dairy sheep production, where marked seasonal peaks lead to processing and storage difficulties, being in southern Europe. The use of a reproductive strategy which does not aim to concentrate lambings has the advantage of requiring a much lower level of management intervention and tends to flatten the seasonal supply curve. This has been a favourable factor for small-scale enterprises in, for instance, Galicia (north-west Spain) where a local retailers and restaurants can source a year round trickle supply of local high specification milk fed lambs which command a high premium, direct from the farm gate (Flores et al, 1991). However, for large scale enterprises producing high volumes this trade is too limited in scale, and lack of control of time of lambing decreases technical efficency and increases production costs.

With regard to modifying timing of lambings, a proportin of UK farms have modified their lambing strategies, driven by price incentives for lambs sold between January and June. Significant numbers of ewes are now mated early to produce lambs for sale in May/June, these production systems are mainly limited to early grass growing areas (south and west Britain) using specialised breeds and may involve considerable supplementary feeding of ewes during lactation and concentrate supplementation of lambs. This is a high cost, high risk option that shows large year to year fluctuations in regurns owing to variation in market prices and costs of feed (Jones, RASE, personal communication).

Recently, a minority of farms in the UK (approaching 30,000 ewes) have opted to extend the season of supply by deliberately withholding the ram until December and consequently lambing late, in May, with lambs sold the following year. Advantages include a reduction in the concentrate input to the ewe (savings of £5-15 are possible) as late pregnancy and lactatonal required are met from grazing. Most farmers adopting the system have done so to reduce fixed costs of production, in particular labour, relying on low levels of intervention in a natural outdoor lambing. Analyses of results for ewes lambing in different times of the year are shown in Table 2. Initial results suggest that there is an economic benefit associated with late lambing.

Table 2 - CONSEQUENCES OF ADJUSTMENT OF LAMBING DATE ON PERFORMANCE AND OUTPUT

Lambing date	Early lambing+ January	Spring lambing+ March	Late lambing* May
Lambs sold/ewe mated	1.5	1.5	1.3
Lamb sale date (value£)	March-May (£50)	June-October (£38)	January-April (£46)
Cost of production:			
Variable costs (p/kg)	1.54	0.79	0.65
Fixed costs (p/kg)	0.75	1.07	0.97
Total cost of production (p/kg)	2.29	1.86	1.62
Margin/ewe (£/head)	54	45	53
Margin/ha (£/ha)	863	562	613

* Interim data from a restricted number of flocks

+ MLC Yearbook 1994

Breed choice

It is well established that the major determinant of the weight range over which acceptable levels of carcass fatness are obtained for a given breed is the mature weight of that breed (McClelland et al, 1976; Croston et al, 1987; Taylor et al, 1989). This applies across unimproved hill breeds and dairy breeds as well as meat breeds (Friggens et al, 1994). Clearly, choice of breed will be an important factor in determining which market to target in terms of carcass weight. However, breed choice, through mature weight, also determines the absolute amount of weight gain required, and hence time taken, for lambs to reach marketable weights (Table 3). Consequently, breed choice can be used to manipulate the timing of supply of lambs to the market. This is particularly important in matching the time taken to finish to the length of the grazing season.

Table 3 - THE EFFECT OF BREED OF LAMB ON TIME TAKEN TO FINISH TO A CONSTANT CARCASS FATNESS IN A CONSTRAINED PASTURE SYSTEM

	Wean weight (kg)	Slaughter weight (kg)*	Slaughter date+
Shetland	15	22.5	22 August
Karagouniko	18	37.5	10 October
Suffolk	23	52	26 October

* Slaughter weight at constant carcass fat content of 20%

+ Based on a lambing date of 1 April and weaning at 8 weeks of age on to pasture.

As this example shows the Suffolk breed would not be able to exploit grazing resources where grass production is constrained to summer growth by climate.

Nutritional regimes

In order to achieve low production costs lamb production systems need to maximise the use of indigenous pastures and other home grown forage products. Low production costs are important to the competitiveness of lamb meat in the market. Recent estimates of variable costs are (£/kg): France, 1.23; UK, 0.9; Ireland, 0.8; New Zealand, =0.4 (Dempsey, personal communication). However, maximising the use of indigenous forages reinforces the seasonal patterns of supply as these largely reflect the availability of such resources. Manipulation of the timing of supplies by nutritional means is therefore a balance between costs of purpose grown forage crops or bought in feedstuffs and benefits from reaping out of season prices.

Significant changes in the seasonality of grass production from indigenous swards can only be achieved by expensive and environmentally damaging reseeding operations, these have in the past been supported by subsidy but are now positively discriminated against and most are not sustainable.

The feeding of lambs beyond the end of the grazing season (October in the UK) either to grow at a fast rate and be slaughtered as quickly as possible, or to grow at a much slower rate providing "long keep" lambs for slaughter at the time of highest prices before the new season, is an established practise in the UK. Recent work in Greece has examined ways in which the feeding of lambs beyond the end of the natural grazing season, either on pelleted feeds indoors or on irrigated pasture, to heavier carcass weights may provide a viable alternative to the traditional early slaughter at weaning (Zygoyiannis et al, 1995a). Systems of this type, if they can be demonstrated to have long-term viability offer the potential for reciprocal trade in lamb from the south to the north of Europe at a time when lamb is out of season in the north. The Atlantic

borders of southern Europe, principally north west Spain and Portugal have extremely long grazing seasons which could relatively easily support such a trade. In Galicia, the dramatic decline in the sheep industry to present day levels and the high fragmentation of land holdings is such that the infrastructure to develop new opportunities is severely lacking. Redevelopment of the sheep industry in Galicia would now be very difficult. The case of Galicia serves to underline the dangers to the sheep sector in not meeting the challenges posed to the European industry.

In order to develop finishing and long keep lamb systems it is important to be able to assess the influence of nutritional quality on growth across a range of breeds. Friggens et al (1994) investigated the effects of nutritional quality on growth across a range of European breeds and found that the depression in growth associated with a decrease in nutritional quality was proportional across breeds, that is, a feed which caused Suffolk lambs to grow half as well also caused Shetland lambs to grow half as well. Absolute performance, within a quality of nutrition, was a function of mature weight (Friggens et al, 1994). This work suggests that the performance may be predicted in different feeding systems given a measure of nutritional quality and readily available estimates of mature weight in the field (Teixeira et al, 1989; Zygoyiannis et al, 1995b).

As well as being able to predict growth performance it is also important to be able to effectively relate liveweight and nutritional regime to carcass weight and composition. Reasonably effective tools to do this have been developed as it is essential lambs are marketed at the correct level of fatness and carcass weight. Finished carcass weight (at MLC fat class 3) is achieved when half the breed mature weight (the average of mature ewe and ram weights) is reached. Correction factors on slaughter liveweight for sex (ewe -10%, castrate +5%), fat class (3L -5%, 2-10%) and finishing systems (intensive, ie early lamb -5%, long keep lamb +5%) have been produced by the Meat and Livestock Commission (MLC, 1993). The current prediction framework is, however, incomplete as it predicts only weight and fatness whereas markets also specify on carcass conformation and it is weak in prediction of effects of store periods and age of lamb.

Within both finishing and long keep systems it has been found that financially important changes in carcass weight at constant fatness can be achieved by manipulation of energy: protein balance. An increase in carcass weight of 2.2 kg (12%) and 0.9 kg (5%) at constant fatness owing to enhanced protein supply was recorded where clover replaced grass (Vipond et al, 1993; Howard, 1990) and where deficient diets such as roots were supplemented with high protein concentrates (Vipond et al, 1990) carcass weight was increased by 0.6 kg (3%).

Feeds low in metabolisable energy, such as straw, used in store systems may result in protein malnutrition particularly as store lambs adjust to the diet from grass. This can affect subsequent carcass weight and finishing performance but can be circumvented by feeding UDP rich supplements during dietary changeover. Similarly overfat lambs can have their fat levels reduced by feeding a diet of straw and fishmeal whilst maintaining muscle mass (Vipond et al, 1989). However, with regard to the effects of such nutritional treatments on eating quality, nutritional manipulations of this kind require further study. They potentially offer a means of meeting low carcass fat levels increasingly demanded by European consumers.

Health and management

Many lambs on grazing systems fail to express their growth potential owing to parasitism. The effects of parasitism are to reduce feed intake and impair protein absorption (MacRae, 1993) with moderate effects on lamb growth rate. The development of natural immunity after 8 weeks results in a return to normal gut function but the cost of developing and maintaining immunity is high in both energy and protein requirements. Maintaining worm-free pasture by annual rotation is a management option of farms with rotational grass or mixed stocking on permanent pasture. The benefits of this are considerable where lambs can be finished in July thereby maintaining a rising sward height owing to reduced stocking rate of a fixed grazing area. Beneficial effects of parasitism are to spread supply from a concentrated lambing date, but at a largely unknown cost in physical resources.

Meat storage techniques

There has been substantial development of new technologies for meat preservation without freezing. These rely, in the main, using lamb which has been slaughtered, dressed and cut using advanced hygiene techniques which maintain ultra-low levels of microbial contamination combined with Captech packaging under CO_2. These techniques have been chiefly exploited by New Zealand abattoirs to produce chilled product with a shelf life of more than six weeks, permitting them to supply fresh lamb to distant markets.

This technology could play an important role in modulating the seasonal patterns in lamb meat production without impairing product quality. Indeed, this type of storage is analogous to a long hanging period which is perceived to improve the tenderness of lamb. These techniques offer alternatives to some of the long keep production systems that are currently employed and which have high costs of production and rely on seasonally high market prices for viability.

Conclusions

Within the limited range of practical production options available to the average lamb producer, their ability to improve carcass quality, beyond those improvements achieved through nutrition and degree of maturity, is severely limited. They have however substantial scope to improve their viability through modifying timing of supply of finished lambs to the market.

Many of the technical tools are now in place or being developed to allow us to manipulate timing of supplies and build systems that can allow Europe to maintain its market share of the European fresh lamb market by meeting high quality specifications on a 12 month basis. However, long term lamb production in Europe competitive at world prices can only be achieved if the costs of production are minimised - this includes reducing variable costs by maximising use of indigenous grasslands/by-products and minimising fixed costs by farm infrastructure changes.

Whilst there are still technical issues which require further investigation, particularly on a European scale, these are insignificant relative to the political, soci-economic and environmental aspects of forging or promoting completementarity of supply within Europe. Support measures to promote rural development, whilst maintaining the traditional environmental balance of Europe's indigenous grasslands need not be incompatible with economically sustainable sheep production. However, the design of support measures to bring together all these elements into a coherent European lamb supply policy is a daunting task which requires urgent research.

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MANIPULIRANJE RASTOM JANJADI U REGULIRANJU OPSKRBE TRŽIŠTA JANJETINOM

Sažetak

Danas se razvija raznolika tehnologija koja će omogućiti opskrbu u određeno vrijeme kao i izgradnju sustava koji će omogućiti da Europa zadrži svoj udio na europskom tržištu svježe janjetine zadovoljavanjem specifikacija visoke kakvoće na dvanaestomjesečnoj osnovi. Međutim, dugoročna proizvodnja janjetine u Europi koja može konkurirati svjetskim cijenama može se postići samo ukoliko se troškovi proizvodnje svedu na najmanju mjeru - to uključuje smanjenje varijabilnih troškova iskorištavanjem postojećih travnjaka - nusproizvoda u najvećoj mogućoj mjeri, te smanjenjem postojećih troškova promjenama infrastrukture gospodarstava.

Dok još uvijek postoje tehnički problemi što zahtijevaju daljnja istraživanja, naročito na europskoj razini, oni su neznatni u odnosu na političke i socioekonomske aspekte, kao i okolišne aspekte jačanja i promicanja vlastite opskrbe unutar Europe. Poticajne mjere seoskog razvoja, koje u isto vrijeme čuvaju tradicionalnu ravnotežu okoliša domaćih travnjaka Europe ne moraju biti u skladu s ekonomski opravdanim uzgajanjem ovaca. Međutim, zahtjevna je zadaća koja traži neodgodivo istraživanje programa poticajnih mjera koji će skupiti sve ove elemente u jedinstvenu politiku opskrbe europskom janjetinom.

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