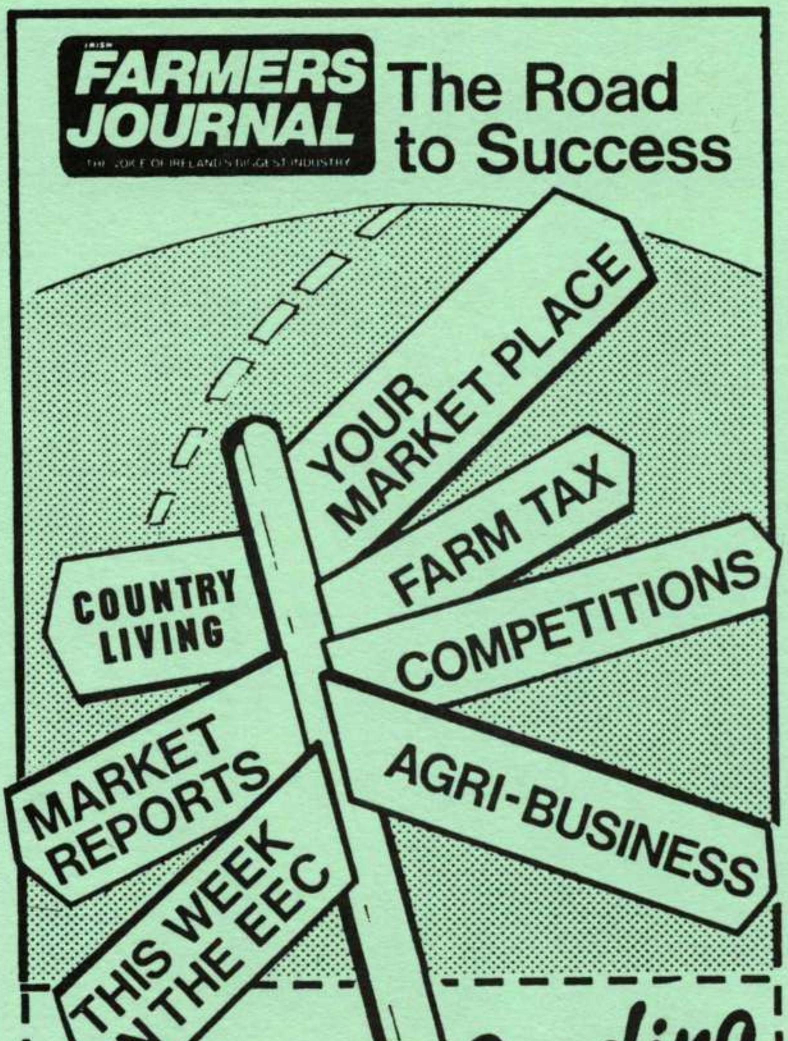
Irish Grassland & Animal Production Association Journal 1994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Why Calving Date and Compact Calving are so Important to Profitable Dairying

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Introduction

Calving date and compact calving around that date is very important because it has a large influence on farm profitability. For both summer and winter milk production systems, the selection of calving date is one of the most powerful tools available to the dairy farmer in order to target a high quality and low cost feed (grass) to the cow during lactation.

Calving date and compact calving has also an influence on the milk production system in terms of animal health, labour demand, cost of feeding cows etc. The milk supply pattern available to the Food industry is primarily influenced by the calving pattern on dairy farms. This in turn has an influence on the product mix which can be manufactured and ultimately on the milk price paid to the dairy farmer. Optimum calving dates for summer and winter milk production is also influenced by Quota constraints on dairy farms.

Effect of calving date on the seasonality of milk supply

The milk production profile for three herds calving in early spring, late spring and in the autumn is shown in Figure 1.

Calving date has a large influence on the seasonality of milk production. Consequently the quantity and type of feed required during lactation will vary throughout the year. This will therefore affect the yield and quality of the milk produced as well as the cost of milk production.

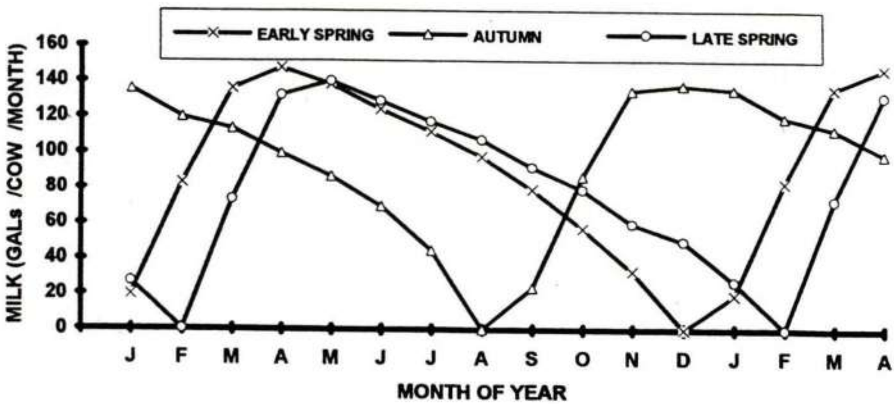

Fig 1 – Milk production profile for three herds calving in early spring, late spring and in the autumn

Calving date for summer milk production

In general terms, the optimum calving date for summer milk production is dictated by the fact that there is no differential in milk price throughout the year for milk with a given level of milk composition. Farm profitability is then maximised by producing as much milk as possible from a low cost and high quality feed such as grass. The effect of calving date on milk yield per cow has also to be considered as this has a large influence on receipts. The effect of calving month on margin per gallon of milk quota and on the opportunity cost of alternate calving months is shown in Table 1.

Table 1
The effect of calving month on margin per gallon of milk quota and on the opportunity cost of alternate calving months

Date of calving	Opportunity[a] cost £	Addition to margin (p/gal.) of farm milk quota
January	-57	-5.4
February	-22	-2.1
March[b]	**0**	**0.0**
April	-22	-1.1
September	-126	-11.7
October	-104	-9.7
November	-91	-8.5
December	-60	-5.6

[a]The opportunity cost of capital and land is included in the above calculations
[b]The optimum calving month

The opportunity cost is the revenue (margin) lost per cow by calving in an alternate month to the optimum calving month. In Table 1, the optimum calving month is March. For every cow that calves in January instead of March, the farm margin is reduced by £57. Likewise for all the other calving dates. The data in Table 1 also show the effect of calving date on farm margin per gallon of milk quota. If the herd calves in January instead of March, then the margin per gallon of farm milk quota will be reduced by 5.4 pence per gallon. It is important to recognise that the opportunity costs and margins shown in Table 1 represent the independent effects for each month. You cannot therefore add the values for a number of months together.

The reduction in margin from April calving seems to be relatively small. This reflects the interaction between the number of cows to fill the quota and the cost of milk production. The performance of late calving herds is very much dependent on the level of feeding towards the end of lactation. It is evident from Figure 1 that a lot of milk (>20%) is produced in late autumn/early winter. It is important therefore that a high plane of nutrition is maintained during this period. The detailed system of management is described in this Journal (Dillon et al 1994).

It should be noted that the financial effect of calving date and compactness of calving is also influenced by the yield level of the herd, the price received for the farm output and the prices paid for the inputs used.

Calving pattern

The calving pattern is dictated by the service pattern. High submission rates are necessary to achieve a compact calving pattern. It is important to recognise that calving pattern does not follow a normal distribution. Calving pattern has a skew distribution as is illustrated in Figures 2 and 3. While mean calving date is generally used, it is important to recognise that the distribution of calvings is also important. The use of mean calving date and the proportion of the herd calving in the spring and autumn does not give enough information on the calving pattern. The number of calvings per week over a particular period from the start of the calving season is a better system for evaluating a calving pattern for a particular milk production system.

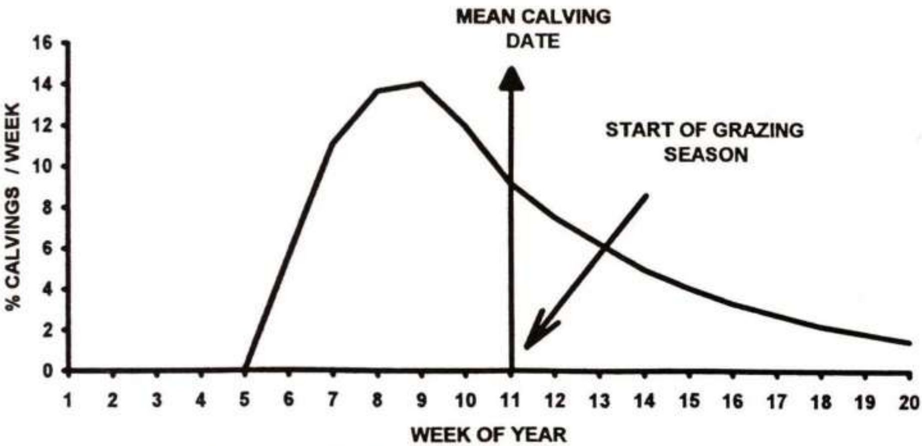

Figure 2 – Bad calving pattern based on spring calving

In Figure 2, the calving season starts in week 5. The mean calving date is in week 11 by which time only 65% of the herd have calved. This coincides with the start of the grazing season in this situation. It is evident that the calving pattern is relatively scattered with the result that a large number of calvings (35%) are recorded after the start of the grazing season. This reflects poor targeting of calvings so as to optimise grass.

In Figure 3, the calving season again starts on week 5 but there is a much more compact calving pattern with 90% of the herd calving before turnout date (6 weeks). The mean calving date has a different meaning in terms of its location on the graph. The important issue is that most of the herd has calved before the start of the grazing season. The management issues in relation to achieving a compact calving herd, are outlined elsewhere in this Journal (Ryan et al 1994).

The calving patterns shown in Figures 2 and 3 also have implications for

Figure 3 – Good calving pattern based on spring-calving

the amount of grass that can be included in the diet of the lactating cow. The demand for grass for the herd illustrated in Figure 2 will be much less than that for the herd shown in Figure 3 for the early part of the grazing season. Calving date and compactness of calving are important variables influencing the demand for grass especially early and late in the grazing season.

Calving date for winter milk production

The optimum calving date for winter milk production will depend to a large extent on the winter milk scheme available. The main difference with the different schemes operated by a number of milk purchasing companies is in the bonus payment level for the winter months and the quantity of milk quota which must be supplied during the winter months. The scheme currently offered by Waterford Foods was used to analyse the effect of calving date and the effect of compactness of calving on farm profitability. The results are shown in Table 2.

Table 2

The effect of calving date on the opportunity cost of alternate calving dates

Date of calving	Opportunity[a] cost
January	-68
February	-42
March	**0**
April	—
September	**0**
October	-2
November	-29
December	-33

[a]The opportunity cost of capital and land is included in the above calculations

The optimum calving dates to maximise profit from this system is based on March calving (60% of herd) and September calving (40% of herd). Calving in April was restricted for the above calculation. The data show that if a cow calves in January instead of the optimum calving pattern then farm profit will be reduced by £68 per cow. The data illustrate the importance of compactness of calving as well as having the correct calving month. This has to be calculated for the scheme available. (Correct means correct for the scheme available).

The effect of a good calving pattern and a poor calving pattern for winter milk production relative to spring milk production is shown in Table 3.

Table 3
The effect of calving pattern on the profitability of winter milk production relative to a spring milk production system

Date of calving	Calving Pattern (% calvings per month)		
	Summer milk system	Winter milk system	
		Good	Bad
January	0	0	19
February	40	12	13
March	59	51	2
April	1	1	0
September	0	23	0
October	0	12	21
November	0	1	28
December	0	0	17
Addition to margin (P/gallon)	0	+4.4	+ 2.4

The data in Table 3 show that a good calving pattern for the winter milk scheme resulted in an increase of 4.4 pence per gallon of milk quota relative to an optimum summer milk production system. The data also show that a less than optimum calving pattern results in a reduced margin of 2.4 pence per gallon of milk quota relative to an optimum summer milk production system.

Other losses associated with poor fertility management

Poor fertility management can also result in other losses. These include a loss in overall farm profit if the calving interval goes over 1 year. This is estimated to amount to £3 per cow per day. There are also losses associated with higher involuntary culling due to poor reproductive performance. It is important that compact calving is not achieved by high culling rates for infertility as this can be very expensive. A survey of 5,500 cows in the Munster region is shown in Table 4. The average results for the years 1991/92 are shown and are expressed as a % of the cows culled. The average culling rate was 14%.

Table 4
Cow disposal rates from commercial dairy farms by primary reason for disposal

Primary reason for culling	Average 1991-92 %
Infertility/late calving	30.8
TB/Brucellosis	1.7
Abortion	1.8
Low production	6.8
Injuries	5.4
Mastitis	15.7
Surplus	13.5
Other reasons	24.3
Total	100.0

Infertility and late calving was the most important reason for culling. It is estimated that replacement costs amount to about £650 per cow culled and at a 14% culling rate amounts to about £91 per cow in the herd. Since about 4.5% of the cows were culled for infertility in this study, the estimated losses for this reason would amount to about £30 per cow in the herd. AI costs are now important costs of production on dairy farms. Semen charges are now significant with sires costing in the range of £20 - £90 per straw. It is important to note that the cost of semen is not always related to RBI and careful selection should be made. The use of additional inseminations as a result of poor fertility management will reduce the margin per gallon of milk produced on the farm.

Calving pattern for liquid milk production

A liquid milk quota is a valuable asset. It increases farm margin in proportion to the size of the liquid quota. The optimum calving pattern will be dictated by the size of the liquid milk quota. It should, however, be concentrated towards the start of the grazing season. Many farmers with liquid milk quotas have calving patterns which result in significantly more milk being produced during the winter period than what is required for the liquid milk quota. While additional bonuses are often available during this period, it is very debateable whether they result in improved farm margins.

Summary

Calving date and compactness of calving can have a significant effect on the profitability of milk production. Calving date along with stocking rate on the farm are some of the most powerful tools available to the dairy farmer in order to target high quality low cost feed (grass) to the cow during lactation.

References

Dillon, P. and Crosse, S. (1994). Summer milk production - the role of grazed grass. Irish Grassland and Animal Production Assoc. J. 28: 40-45, 1994.

Ryan, D. and Mee, J. (1994). Management of herd fertility to achieve compact calving. Irish Grassland and Animal Production Assoc. J. 28: 46-53, 1994.

Reproductive Management and Compact Calving in the Dairy Herd

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Abstract

F ailure to achleve high submission and pregnancy rates in dairy cows results in a spread calving pattern. The principal causes of infertility are management factors, cow factors, A.I. factors, bull factors and mineral deficiencies. Research developments in oestrus detection and synchronization, nutritional modulation of reproduction, sex selection and *in vitro* fertilization, and the immune system to improve submission and pregnancy rates in dairy cows are discussed.

Introduction

Compact calving in the dairy herd is dependent upon high submission rates and pregnancy rates to a single service. An analysis of breeding records from DairyMis (unpublished) for 1993 spring calving herds showed that submission rates for the first three weeks of the breeding season averaged 63% with a range by farm of 27 to 94%. In addition, pregnancy rates to first service for the same year averaged 55% with a range from 31 to 71%. Using a submission rate of 90% and pregnancy rate of 70% to each service, in excess of 90% of the herd should be pregnant after the first six weeks of the breeding season.

The objectives of this paper are to outline for the dairy herd 1) the causes of infertility, and 2) research work to improve reproductive performance and compact the calving season.

Causes of infertility

The causes of infertility can be listed under the headings of management factors, cow factors, A.I. factors, bull factors and mineral deficiencies.

Management factors

The principal management factors are heat detection efficiency, calving to service interval, nutrition and time of service. Heat detection is the single most important factor in achieving good reproductive performance. The average duration of heat is less than 10 hours and 33% of heats are interrupted by breaks in standing behaviour. In addition, up to 15% of heats may be two hours or less in duration.

As a general rule, pregnancy rates to a single service increase by approximately 1% per day until cows are calved about 50 to 60 days and thereafter pregnancy rate remains constant. Cows may have to be bred less than 40 days post-calving in an attempt to maintain a compact calving season subsequently. Pregnancy rate to these services may be low but they do not compromise pregnancy rate to subsequent inseminations.

Dairy cows should calve down in a body condition score of 3.0 or greater. As cows are in a state of negative energy balance early post-calving, it is normal for cows to loose body condition. However, the sooner the cows return to a positive energy state is correlated with the resumption of ovarian activity and the interval from calving to pregnancy.

As a general rule, cows detected in heat in the morning should be served in the aftemoon and those in heat in the aftemoon should be served the following morning. The viability of sperm of low fertility bulls is shorter than for high fertility bulls and may account for a small proportion of herd infertility. When a bull with low sperm fertility is used, insemination should be carried out closer to the time of ovulation, i.e. 18 hours after the onset of oestrus. However, the use of semen from low fertility bulls can only be justified by a very high breeding index for these sires.

Cow factors

The cow factors affecting reproductive performance are calving difficulty, uterine infection, intercurrent disease and hormonal problems.

Heifers have a significantly higher incidence of stillbirths than mature cows and where stillbirths occur there is an associated higher incidence of retained foetal membranes, which reduces fertility. When calving difficulty is moderate, pregnancy rates can be reduced by between 5 and 15%, severe calving difficulty will reduce pregnancy rates by between 25 and 45%. As a general rule, it is advisable that cows which retain the foetal membranes be examined about 20 days post-calving to ensure there are no uterine infections.

Lameness can affect between 5 and 30% of the herd annually. If the condition occurs during the breeding season, fertility will be reduced. Lame cows exhibit poor signs of heat and rarely stand to allow mounting by other cows.

Cystic ovaries and inactive ovaries are associated with hormonal dysfunction. Cystic ovaries generally develop within 45 days of calving and its incidence is related to genetics, nutrition, milk yield and season of the year. Inactive ovaries may be associated with nutrition, milk production, difficult calving or season of the year. Treatments involve diagnosis by a veterinarian and treatment based on the diagnosis.

A.I. factors

The important A.I. factors are operator, time of A.I., handling facilities and semen storage. Problems have arisen with the advent of D.I.Y. A.I. where the operators have not had a retraining course prior to the beginning of the breeding season. This is essential to ensure good operator technique and good pregnancy rates. For the purposes of A.I., cows should be properly restrained and the temptation to inseminate cows in the milking parlour avoided. In cases of D.I.Y. A.I., it is important that the semen storage container be topped up with liquid nitrogen at regular intervals. Containers do leak and a lot of expensive semen can be lost if levels of liquid nitrogen are not regularly checked.

Bull factors

Semen quality varies between bulls and there may be up to 15% difference in fertility between sires. Contrary to popular belief, pregnancy rates to natural service are no better than to A.I. if heat detection is carried out properly. In general, semen used for A.I. is evaluated for viability characteristics in the laboratory prior to packaging. In contrast, natural service sires may have good fertility one year and poor fertility the next year as a result of some intercurrent disease or testicular damage. When using natural service it is important to have a semen evaluation on the bull prior to conducting services.

Mineral deficiencies

Mineral deficiencies, particularly trace element deficiencies, have been linked with abortion, stillbirth, neonatal death, retained placenta, low immunity and infertility. The main trace elements associated with infertility are copper, selenium and iodine. Studies conducted at Moorepark have shown that 75% of dairy herds are deficient in one or more of the above trace elements. However, these herds do not necessarily have herd fertility or production problems.

Research in Reproductive Management

The current areas of research pertinent to reproductive management of the dairy herd include systems to increase submission rates, nutritional modulation of reproduction, sex selection and in vitro fertilization and the immune system (Mee *et al.*, 1994).

Increasing submission rates

Oestrous detection

Failure to achieve high submission rates in cows calved beyond 40 days in the first 3 weeks of the breeding season is mainly associated with poor heat detection. The average duration of heat is less than 10 hours and up to 15% of heats may be less than 2 hours in duration. Up to 90% of heats can be detected with 5 times a day heat detection without tail paint (O'Farrell, 1992), but a figure closer to 60%, on average, is achieved on farms. Research focused at improving heat detection has investigated the use of tail paint, pedometers, intravaginal electrical impedance and elevation in milk temperature.

Tail paint has proven to be the greatest aid in heat detection under Irish conditions. Up to 90% of heats can be detected with the use of tail paint and three daily observations (O'Farrell, 1992). However, the uptake of this simple practice on many dairy farms has been poor.

Cows in heat exhibit increased walking activity. This is the basis of timing insemination by strapping a pedometer to the leg of the cow (Redden *et al.*, 1993). This system can be as efficient as four times daily observation in detecting an overt heat. The development of electronic pedometers has resulted in one study with over 90% of heats being detected and a similar accuracy of heat detection (Cohen *et al.*, 1990). This system has been used elsewhere as the sole method of heat detection in automated computerised management systems (Carmi, 1987; Spahr and Lewis, 1991). Changes in electrical impedance of the vagina have been measured using radiotelemetory with an efficiency and accuracy of oestrus detection of 91% and 80%, respectively (Gordon and Timms, 1988; Lehrer *et al.*, 1991). However, under Irish management conditions there is little scope at present for use of this high cost technology. Changes in milk temperature (Schluensen *et al.*, 1987; Fordham *et al.*, 1988) have also been used as aids in heat detection. However, the detection rate and accuracy of heat detection based on the elevation in milk temperature is poor.

Hormonal treatments

The principal hormones used in reproductive management are prostaglandin, progesterone and GnRH.

Prostaglandin is effective in inducing heat in cows with an active corpus luteum on the ovaries. Cows have to be at a specific stage of their heat cycle for this treatment to be effective. In the research programme in Moorepark we are currently investigating the use of prostaglandin in a reproductive management programme to increase submission rate of dairy cows to first service and identify potential problem breeder cows early in the breeding season.

Progesterone can also be effectively used in heat synchronization schemes. Progresterone is administered either through an intravaginal device (PRID or CIDR) or an ear implant (CRESTAR). In addition, animals with inactive ovaries can be effectively induced to show heat following this type of treatment (Godke and Ryan, 1993). This is of particular importance in later calving cows, which need to be bred early post-calving if a compact calving pattern is to be achieved. The loss rate of the PRID ranges between 6 and 10% (O'Farrell, 1984), whereas recent unpublished findings have shown that the loss rate of the CIDR to be 0.8% (Macmillan, 1993, unpublished). The CIDR would, therefore, have a distinct advantage over the PRID.

Synchronization programmes for dairy cows at the onset of the breeding season should incorporate diagnostics by ultrasonography for those cows failing to be inseminated during the synchronization programme. Furthermore, breeding cows over a short period at the onset of the breeding season facilitates early non-pregnancy diagnosis using ultrasound and short-cycling of non-pregnant cows (Ryan, 1993).

The principal hormone treatment used to increase pregnancy rates is gonadotropin releasing hormone (GnRH). Various studies have been carried out in Ireland (Ryan *et al.*, 1994a) and elsewhere (Macmillan *et al.*, 1986; Ryan *et al.*, 1991) to investigate the use of GnRH treatment either at AI or on Days 11 to 13 after AI to increase pregnancy rates. The results of these studies have been variable. At AI, GnRH was proposed to reduce the incidence of delayed ovulation and improve early embryonic development. On Days 11 to 13 after AI, GnRH was proposed to increase the opportunity for maternal recognition of pregnancy, which takes place at this time. In 1992, we conducted a trial in Moorepark with a GnRH analogue. GnRH was administered to 1,661 cows either at the time of AI, Day 12 after AI, or the cows remained untreated. Pregnancy rate averaged 61% for all cows and was not affected by treatment.

Nutritional modulation of reproduction

Energy

During the early post-calving period the lactating cow is in negative energy balance. The interval to return to normal ovarian activity is closely correlated with a return to a positive energy balance (Butler *et al.*, 1981). On this premise, the more ovulations and consequent oestrous cycles prior to the desired time of breeding results in a greater pregnancy rate assuming other factors are optimal. With the emphasis on production of 80% of milk from grazed grass concurs the demand to produce the peak milk at grass and to re-breed the cow during the same period. Grazing management procedures to maintain sward quality and inclement weather conditions, as experienced in the Spring of 1993, may reduce dry matter intake and place the cow in negative energy balance. In a grazing experiment conducted in Moorepark in the Spring of 1993, cows grazed to 4, 6 or 8 cm, (tight, optimal and lax grazing, respectively). The mean dry matter intakes for cows grazing to 4, 6 and 8 cm were 13.5, 14.2 and 16 kg, respectively. There was evidence ($P < 0.05$) of an inverse linear relationship between post grazing height and the calving to pregnancy interval (Figure 1).

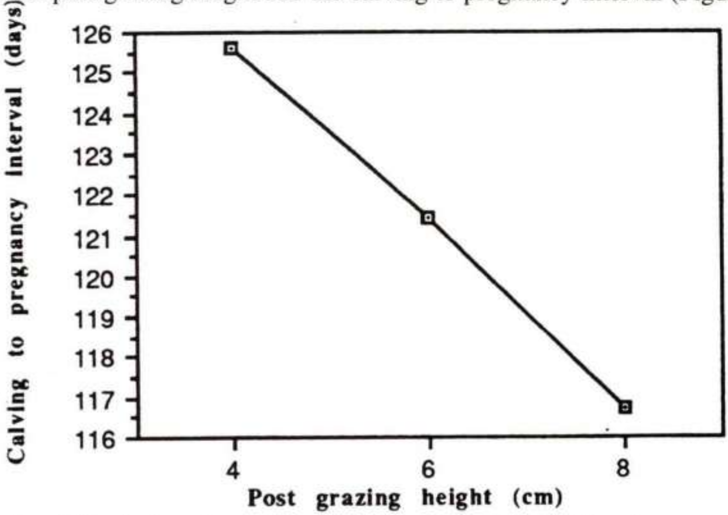

Fig. 1 – Effect of post grazing height (cm) on the calving to pregnancy interval (days).

Protein

As a feed, grass is high in degradable protein and a grass-based diet places the cow in deficiency of the essential amino acids, lysine and methionine. The effects of protein degradability on fertility are variable between studies, but are more related to the protein concentration of the diet and its degradability. Attempts to manipulate the protein degradability of the diet have included the feeding of fishmeal. Fishmeal is high in undegradable protein and work conducted in Teagasc, Belclare Research Centre has shown positive effects on fertility in beef heifers and cows at pasture (Diskin *et al.*, 1993). The integral factors resulting in the improved fertility have not been delineated.

Lipids

An alternative approach to improving fertility by nutrition has been the addition of lipid to the diet. Fat sources such as soybean oil, tallow, fish oil and cottonseed are rich sources of lipid. When fed to the cow in poor body condition and under nutritional stress, they have had positive effects on fertility (Williams, 1989; Hightshoe et al., 1991; Wehrman et al., 1991; Ryan et al., 1992). Furthermore, linoleic acid has recently been identified as an integral factor in maternal recognition of pregnancy. Therefore, inclusion of lipid in the diet may not alone be an energy rich source but may also have an additional independent positive effect on fertility.

Trace element deficiencies

There are relatively few published papers on the relationship between trace element deficiencies and infertility in Irish dairy herds (Mee and Rogers, 1993). Prior to the mid 1980s, work conducted by An Foras Taluntais had shown no relationship between copper deficiency and infertility. However, in the late 1980s, collaborative research work between U.C.D. and An Foras Taluntais reported that while low copper status *per se* did not adversely affect pregnancy rate, a combination of long-term, high, dietary molybdenum intake and low copper status may ($P>0.05$) reduce pregnancy rate in beef heifers (Vaughan *et al.*, 1989). This work needs to be repeated in dairy heifers and cows. No published Irish trial has shown an improvement in herd fertility following selenium supplementation. Unpublished data from a recent large-scale Moorepark DairyMIS experiment tend to support this synopsis. There are no published data on the effect of iodine deficiency on fertility in Irish dairy herds. Unpublished data from a recent large-scale Moorepark DairyMIS experiment suggest a poor response. A relationship between cobalt or zinc deficiency and herd fertility has not been examined in Irish dairy or suckler herds. Work carried out at Grange Research Centre and U.C.D. indicated that a mixture of mineral 'proteinates' (Cu, Zn and Mn) and yeast culture improved fertilization rate in superovulated beef heifers (Fallon *et al.*, 1993). Effects on trace element status were not measured. Recently, work in dairy heifers and cows at Moorepark Research Centre showed a poor response to prolonged feeding of 'chelated' trace elements. These conflicting data suggest the need for further independent research on the relationship between trace element deficiencies and fertility in Irish dairy herds.

Sex selection and *in vitro* fertilization

Attempts to predetermine the sex of children has been of interest to man for many years. Methods employed in the past have included acid or alkali douches of the vagina to alter pH, dietary manipulation and timing of insemination (McEvoy, 1992).

In the recent past, two methods of sex selection have been developed, which have high accuracy. The first of these methods involves embryo sexing. In this case, embryos are sexed prior to transfer to recipient cows (Schroder *et al.*, 1990). The most accurate of these methods incorporates DNA probing. Accuracy is close to 100% and there is no reduction in embryo viability after the procedure. However, the efficiency of producing offspring of desired sex from a limited pool of genetic material is poor as the embryos generated *in vitro* will on average be 50 : 50 male to female.

The second approach is more efficient and involves sexing of semen prior to fertilization of eggs. Basically, the method employs flow cytometry and staining of the spermatazoa with a DNA-specific fluorescent dye (Johnson *et al.*, 1987). The sex chromosomes termed "X" and "Y" determine sex of offspring. Spermatazoa carry either one "X" or one "Y" chromosome. An egg fertilized with a spermatazoa carrying an "X" chromosome will result in a female and "Y" will result in a male. The "X" chromosome is larger than the "Y" chromosome and will fluoresce more after staining. It is the degree of fluoresence which enables the sorting of spermatazoa by flow cytometry into male and female.

The technology to date can only sex small numbers of sperm in a given period (400,000 sperm per hour), which limits application for use in A.I. However, only small numbers of spermatazoa are required for in vitro fertilization (IVF) of oocytes. It is from this aspect that the technology has developed to date (Johnson *et. al.*, 1994). Developments in ultrasonography now enable oocytes to be collected from the ovaries of the cow on a weekly basis by transvaginal needle guided ultrasonography (Pieterse *et al.*, 1992). From an application perspective, oocytes can be collected from non-pregnant (Pieterse *et al.*, 1988) and pregnant cows (Ryan *et al.*, 1993), which are then fertilized *in vitro* with sexed semen, cultured *in vitro* for seven days and then transferred to recipient cows.

Sex selection will transform the industry as we know it today. We will be able to produce females for replacement purposes from the best genetics available and to produce animal protein more efficiently by using male spermatazoa to produce male offspring using the rest of the herd as recipients.

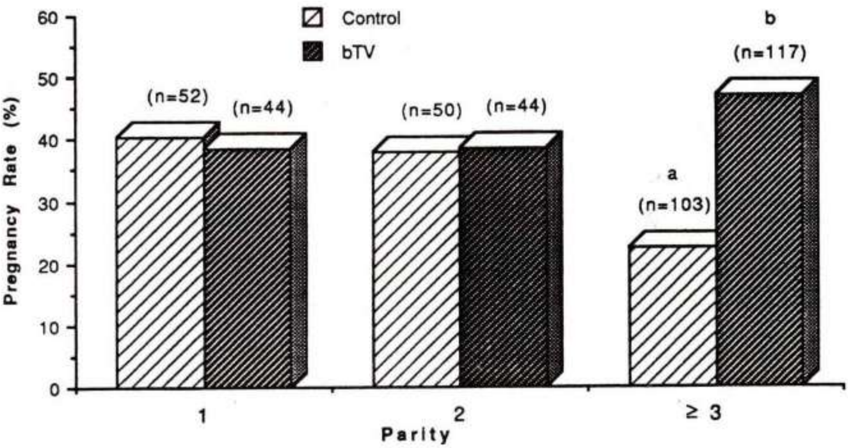

Fig. 2 – Effect of parity on pregnancy rate response in dairy cows bred ≤ 55 days post partum to either bovine trophoblast vesicle (bTV) transfer or carrier medium alone (control) between days 5 and 7 after AI

(ab Within parity grouping, columns with different superscripts are different ($P<0.05$))

Immune system

An area of research that has recently gained increased attention is the relationship between the immune system and reproduction. The developing embryo in the cow can be regarded as foreign material and can undergo rejection. The embryo prevents this from taking place by causing an immune response which prevents rejection. The trophoblast surrounding the embryo proper must produce a sufficient signal by Day 14 of pregnancy for maternal recognition of pregnancy. It is this signal which sets in train the events that prevent the cow from returning to heat.

Based on this signalling system, we conducted trials on Dairy Mis farms and Moorepark in 1993. We generated bovine trophoblast vesicles (bTV) from Day 13-14 embryos. The bTV were frozen in straws and transferred to the uterine horn of cows on Days 5 to 7 after AI. The cows were either less than or greater than 55 days calved at the time of AI. The pregnancy rate to AI among cows calved less than 55 days was 31% compared with 52% for cows calved greater than 55 days. Among cows calved less than 55 days and in third or greater lactation, the transfer of bTV increased pregnancy rate by 25% (Figure 2).

This research has shown that insufficient embryonic signalling to maintain pregnancy can account for some of the lower pregnancy rates in older cows bred less than 55 days post-calving (Ryan et al., 1994b). Further research is required to identify the reasons for this problem and to develop a system to prevent the embryonic loss.

References

Butler, W. R., R. W. Everett and C. E. Coppock. 1981. The relationships between energy balance, milk production and ovulation in postpartum Holstein cows. J. Anim. Sci. 53:742-748.

Carmi, S. 1987. Automatic computerized herd management: heat detection, mastitis and health monitoring. Proc. 3rd Symp. on 'Automation in Dairying', IMAG, 9-11 September, 1987, Wageningen, Netherlands, pp. 18-27.

Cohen, T., M. Eisenberg, M. Amir, M. Etam and E. Aizinbud. 1990. Estrus detection in dairy cows by a computerized system using pedometry and milk recording. Hassadeh Q., 1:21-23.

Diskin, M. G., A. P. Moloney and J. M. Sreenan. 1993. The effect of protein or energy supplementation on cow fertility during the Spring-early-summer period. IGAPA, 19th Annual Research Meeting, April 1993, pp.87-88.

Fallon, R. J., R., Mantovani, J. F. Roche and M. P. Boland, 1993. Effect of proteinated minerals and yeast culture on fertilization in superovulated heifers. Ir. J. of Agric. and F. Res. 32, 111.

Fordham, D. P., P. Rowlinson and T. T. McCarthy. 1988. Oestrus detection in dairy cows by milk temperature measurement. Res. Vet. Sci. 44:366-374.

Hightshoe, R. B., R. C. Cochran, L. R. Corah, G. H. Kiracofe, D. L. Harmon and R. C. Perry. 1991. Effects of calcium soaps of fatty acids on postpartum reproductive function in beef cows. J. Anim. Sci. 69:4097-4103.

Godke, R. A. and D P. Ryan. 1993. Synchronization of oestrus. In: Current Veterinary Therapy - Food Animal Practice. Ed. J. L. Howard. W. B. Saunders, Philadelphia, U.S.A., pp. 776-779.

Gorden, P. and L. L. Timms. 1988. Evaluation of a vaginal conductivity probe, and milk progesterone, from calving to conception. J. Dairy Sci. 71 (Suppl. 1):228.

Johnson, L. A., J. P. Flook and M. V. Look. 1987. Flow cytometry of X and Y chromosome-bearing sperm for DNA using an improved preparation method and staining with Hoechst 33342. Gamete Res. 17:203-212.

Johnson, L. A., D. G. Cran and C. Polge. 1994. Recent advances in sex preselection of cattle: flow cytometric sorting of X and Y-chromosome bearing sperm based on DNA to produce progeny. Theriogenology 41:51-56.

Lehrer, A .R., G. S. Lewis and E. Aizinbud. 1991. Electrical resistance of genital tissues during reproductive events in cows, and its possible on-farm applications: A review. Wien. Tieraerztl. Monatsschr. 78:317322.

Macmillan, K. L., V. K. Taufa and A. M. Day. 1986. Effects of an agonist of gonadotropin releasing hormone (buserelin) in cattle. III. Pregnancy rates after a post-insemination injection during metoestrus or dioestrus. Anim. Reprod. Sci. 11:1-10.

McEvoy, J. D. 1992. Alteration of the sex ratio. Animal Breeding Abstracts 60 (2):97-111.

Mee, J. F. and P. A. M. Rogers. 1993. Prevalence and relevance of trace mineral deficiencies on Irish dairy farms. Proceedings of the Irish Grain and Feed Association, pp 1-29.

Mee, J. F., K. J., O'Farrell, and P. A. M. Rogers. 1994. Base-line survey of blood trace element status of 50 dairy herds in the South of Ireland in the Spring and Autumn of 1991. Ir. Vet. J. (In press).

O'Farrell, K. J. 1984. The control of dairy herd fertility. In: Moorepark 25th Anniversary publication. Part II: Animal health and machine milking. Ed. J. O'Shea. pp. 1-36.

O'Farrell, K. J. 1992. Management factors affecting the reproductive performance of spring calving dairy cows in Ireland. Ph.D. thesis - Trinity College Dublin, Ireland.

Pieterse, M. C., K. A. Kappen, Th A. M. Kruip and M. A. M. Taverne. 1988. Aspiration of bovine oocytes during transvaginal ultrasound scanning of the ovaries. Theriogenology 30:751-756.

Pieterse, M. C., Vos Plam, Th A. M. Kruip, Y. A. Wurth, Th H. van Beneden, A. H. Willemse and M. A. M. Taverne. 1992. Repeated transvaginal ultrasound-guided ovum pick-up in ECG treated cows. Theriogenology 37:273 Abst.

Redden, K. D., A. D. Kennedy, J. R. Ingalls and T. L. Gilson. 1993. Detection of estrus by radiotelemetric monitoring of vaginal and ear skin temperature and pedometer measurements of activity. J. Dairy Sci. 76:713-721 .

Ryan, D. P., E. Kopel, M. P. Boland and R. A. Godke. 1991. Pregnancy rates in dairy cows following the administration of a GnRH analogue at the time of artificial insemination or at mid-cycle post insemination. Theriogenology 36:367-377.

Ryan, D. P., R. A. Spoon and G. L. Williams. 1992. Ovarian follicular characteristics, embryo recovery and embryo viability in heifers fed high-fat diets and treated with follicle-stimulating hormone. J. Anim. Sci. 70:3505-3513.

Ryan, D. P., E. G. Blakewood, W. F. Swanson, H. Rodriguez and R. A. Godke. 1993. Using hormone-treated pregnant cows as a potential source of oocytes for in vitro fertilization. Theriogenology 40:1039-1055.

Ryan, D. P. 1993. Ultrasound for non-pregnancy diagnosis. Ir. Farm. J. 45(32):25.

Ryan, D. P. S. Snijders, T. Condon, M. Grealy, J. Sreenan and K. J. O'Farrell. 1994a. Endocrine and ovarian responses and pregnancy rates in dairy cows following the administration of a gonadotrophin releasing hormone analog at the time of artificial insemination or at mid-cycle post insemination. Anim. Reprod. Sci. 34:179-191.

Ryan, D. P., L. D'Hoore, S. Snijders and K. J. O'Farrell. 1994b. Intrauterine transfer of bovine trophoblast vesicles during dioestrus after breeding to increase pregnancy rates in dairy cows. Anim. Reprod. Sci. (Accepted).

Schluensen, D., H. Roth, H. Schoen, W. Paul and H. Speckmann. 1987. Automatic health and oestrus control in dairy husbandry through computer aided systems. J. Agric. Eng. Res. 38:263-279.

Schroder, A., J. R. Miller, P. D. Thomsen, K. Roschlau, B. Avery, P. H. Poulsen, M. Schmidt and M. Schwerin. 1990. Sex determination of bovine embryos using the polymerase chain reaction. Anim. Biotech. 1:121-133.

Spahr, S. L. and G. S. Lewis. 1991. Computer aided reproduction control. Proc. 23rd Int. Dairy Congress, 8-12 October 1990, Montreal, Canada. Int. Dairy Federation, Ottawa, Ont., pp. 543-551.

Vaughan, L., D. B. R. Poole, F. H. Smith, M. P. Boland and J. F. Roche. 1989. The effect of molybdenum-induced copper deficiency on fertility in heifers. Proc. of the 40th Annual Meeting of the European Association of Animal Production. 1, 263.

Wehrman, M. E., T. H. Welsh, Jr., and G. L. Williams. 1991. Diet-induced hyperlipidemia in cattle modifies the intrafollicular cholesterol environment, modulates ovarian follicular dynamics, and hastens the onset of postpartum luteal activity. Biol. Reprod. 45:514-522 .

Williams, G. L. 1989. Modulation of luteal activity in postpartum beef cows through changes in dietary lipid. J. Anim. Sci. 67:785-793.

A Farmer's View of Calving Date and Compact Calving

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Introduction

The essence of all good systems of production is simplicity and in my view calving date and compact calving are the two key issues that will allow us to achieve this goal.

Compact calving need not be a complicated matter and I outline the steps that we have taken to achieve this.

What is Compact Calving

Compact calving is the combined effect of high submission rate and high conception rate.

1. ***Why do we have Compact Calving***

i Our aim is to calve cows as closely as possible to spring grass. Cows calving too early are costly in terms of winter feed; cows calving too late miss out on early cheap grass and on lactation days.

ii Compact calving increases labour demand in the short term but reduces it over the long term.

iii Compact calving enables the farmer to concentrate on one very important specific job at a time. First the calving of the cow and second, getting the cow back in calf.

iv In spring calving herds compact calving will enable the farmer to have a break between very intensive calving and very intensive breeding. Also in spring calving herds the farmer can take a break from milking for about one month each year. This enables him to face each specific task that is, calving and breeding with vigor and enthusiasm.

2. ***Our Breeding Programme for Compact Calving***

Our breeding programme can be broken up into the following areas.

i Calving
ii Pre-Breeding
iii Heat Detection
iv Insemination
v Replacement Heifers
vi Targets
vii Results
viii Future of Breeding
ix A word on Embryonic Deaths
x Summary

i ***Calving***

(a) Type of bull

We have already decided on how compact next year's calving will be by the type of bulls we have used. For example using continental bulls on cows that go two to three weeks over time and then result in a very difficult calving will reduce the time they come back in heat by 6/8 weeks. This is time you cannot afford to loose if you want compact calving

(b) Bulls within breeds
Even using breeds where cows calve to time such as Friesian on Friesian; Hereford on Friesian; Belgium Blue on Friesian, some bulls within these breeds will result in difficult calvings. When choosing bulls, select bulls with high RBI and easy calving rates, also select the bull to suit the cow. Do not inseminate a small cow with a bull that will bring big calves.

(c) Hygiene at calving
Always use plastic gloves when calving a cow, also have calving boxes clean and well bedded down. This reduces the level of infection that can be introduced into the cow at calving. Calving is a natural process and should not lead to infection.
We seldom have to wash out a cow due to infection, infections mean that cows are slower to go back in heat. Remember 90% of cows will calve without assistance.

ii ***Pre-Breeding***

(a) Tail paint
24 days before start of breeding season tail paint all cows with matt vinyl emulsion paint. Tail painting is essential and must be done for optimum efficiency.

(b) Vet in
At the end of 24 days intensive heat detection the Vet is called in to handle any cow over 40 days calved and not seen in heat. Prostaglandins are used on cows with cysts, non uterine involution and cows possibly not seen in heat. Progestagens are used on cows not cycling.
It is very important to have good records for the Vet before he handles a cow. He can then make a diagnosis with as much information as possible. These records should include calving date, calving difficulties if any, whether placenta was retained or not and also breeding problems in the past. The Vet is brought in every three weeks until all cows have been served.

(c) On the day before the start of the breeding programme, all the cows are painted again and subsequently the colour is changed after each insemination

iii ***Heat Detection***

(a) The signs of standing heat are standing to be mounted, clear mucus, cows off milk, not letting down milk, agitation and swollen vulva. All the above will be confirmed by the paint being removed.
(b) Cows that are mounting the cows in heat or cows that are agitated when a cow is in heat will invariably come in heat in the next 3/5 days.
(c) Studies have shown that in spring calving herds some cows will stand

in heat for up to 30 hours. The average is 9 hours and 1/3 of all heats may be less that 6 hours duration. Some may be as low as 2 hours.

(d) The best time to observe cows in heat is when they are at rest. It can be difficult to observe heats around yards.

(e) When bringing in cows for milking in the morning in particular, watch cows for 5/10 minutes before opening the paddock or shouting at the cows. Always have a note book to record cows in standing heat or even cows that you may be suspicious that are coming in heat. This can be confirmed later. Remember 40% of cows are in standing heat at 7.00 a.m. and 30% of cows are in standing heat at 10.00 p.m.

(f) Cows should be observed for heat between 3/5 times per day.

iv ***Insemination***

(a) Conception rate is highest by inseminating cows 12/18 hours after observed heat onset.

<u>BASIC RULE</u>

Morning in heat - Inseminate in evening

Evening in heat - Inseminate in morning

(b) If you are inexperienced at D.I.Y. A.I. never inseminate too many cows together.

(c) Handle semen carefully, once thaw-out starts, it starts to die.

(d) Once an animal is inseminated tail paint with a new colour.

(e) Record insemination

NB The less stress at insemination the better.

v ***Replacement Heifers***

(a) Our target is to have replacement heifers at 330 kg at mating (14/15 months) and 550 kg at calving.

(b) Breed to high RBI bulls consistent with easy calving.

(c) Inseminate heifers before or at least at the beginning of the cow breeding season.

(d) Heifers stand in heat for shorter periods, but they are easier to inseminate.

(e) The bull goes in once all the heifers have been inseminated usually in three weeks. The bull is out after 4 weeks and into the cows. The same pre-breeding routine and tail painting applies to the heifers.

NB Heifers are kept near the house as we have found that tail painting is not as successful with heifers.

vi ***Targets***

Our targets are as follows:

(a) 90% submission rate
(b) 65/70% conception rate
(c) Start breeding season 1st May - Finish 10th July
(d) Bull into heifers after three weeks breeding to A.I. and bull out of heifers after four weeks.

vii ***Results***

YEAR	SUBMISSION RATE	CONCEPTION RATE
1992	89%	66%
1993	89%	66%

Year	Total No. Calved	Jan.	Feb.	Mar.	April	Date Finish Calving
1990	95	56	28	8	3	5th April
1991	95	27	46	17	5	12th April
1992	95	14	52	21	8	27th April
1993	89		57	21	11	28th April
1994	102		73	25	4	10th April

viii ***Future of Breeding***

The following is an outline of how we hope to keep our calving compact in the future.

(a) Heat detect as normal day - 24 days to 0 i.e. 1st May

(b) Record all cows in heat - 24 days to 0 day.

(c) Inseminate as normal from day 1 on.

(d) On day + 6 inject all cows that were in heat from day -10 to day 0 with prostaglandin.

(e) Inseminate these cows as they come in heat. These cows should conceive 10 to 11 days earlier than would otherwise be the case.

(f) On heifers by using Prids or Crestar, we can induce heat response of 85/95% with the majority 80% in heat between 24/60 hours after treatment. About 10% of animals fail to synchronise but come in heat within one week.

ix ***Embryonic Deaths***

I think it is important that we fully understand the impact embryonic deaths can have on compact calving. It is an area that little is known about and where further research is needed.

(a) Most embryonic deaths have occured by day 18 after breeding.

(b) Embryo deaths before day 16/17 result in normal 18/24 day repeat intervals.

(c) Embryo deaths after day 16/17 result in long and irregular repeat intervals.

(d) From day 50 to term the incidence of foetal death is 5/8%.

Conception failure in most instances is almost synonymous with embryonic death.

From the above it can be seen that if we want compact calving, it is important to have plenty of replacement heifers.

x ***Summary***

In my opinion, the key to profitable spring milk production is calving close to grass with compact calving. Compact calving can be achieved with good heat detection allied to tail painting and proper animal husbandry. This should lead to high submission rates and high conception rates which is COMPACT CALVING.

Summer Milk Production – The Role of Grazed Grass

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Introduction

Traditionally, milk production systems in Ireland (pre quota) were driven by the achievement of high output/acre and generally resulted in a highly seasonal milk supply pattern. With the introduction of milk quotas, the decision-making process to devise the optimum system on dairy farms became more complex. There is less emphasis now on very high stocking rates. To achieve the maximum return from the milk quota available on the farm, the dairy farmer has to consider the milk supply and milk quality requirement of the food industry. High margins can be achieved by maximising the receipts from the farm as well as controlling costs. Receipts will be dependent on milk yield/cow, milk price and a high price for calves and cull cows. Costs (variable, fixed and depreciation costs) are also very important and need to be continuously reviewed. Care must be taken in the drive to reduce costs so as not to reduce the receipts/cow on the farm too much. The goal should be to maximise net margin from the farm. Losses due to reproductive wastage, animal health, etc. need to be controlled. The milk production system will need to be sustainable economically and in terms of its impact on the environment and on the quality of life for the farm family.

Calving date

Calving date has a large influence on the seasonality of milk supply, on the costs of milk production and on farm profit. The spread of calving pattern is also very important. A comparison of 2 different calving dates at an overall stocking rate of 0.85 acre/cow is shown in Table 1. Delaying the calving date from January to March reduced milk yield per cow by 92 gallons. However, later calving increased milk fat and protein per cent. This resulted in no difference in yield of fat or protein per cow. Concentrate was reduced by 435 kg/cow on average. Later calving reduced receipts per cow by £39 and variable costs by £64/cow. This resulted in an increase of £25/cow in gross margin due to later calving. In terms of a milk quota situation on dairy farms, delaying calving date increased the gross margin by 8p per gallon of milk quota.

Later calving allowed a closer match of the milk supply pattern to the grass growing year. This allowed a greater amount of milk being produced from grazed grass (72% vs 85%) (Fig. 1). However a closer match of calving date to grass supply is very much dependent on compact calving just prior to turn-out to grass. Calving should start 4 weeks prior to the expected turn-out date to grass.

Table 1
Comparison of 2 different calving dates over 3 years

		January Calving (A)	March Calving (B)	Difference (A - B)
Calving date	(MCD)	21/1	15/3	
Concentrate input	(kg/cow)	620	185	-435
Silage/cow	(t)	7	7	0
Milk yield/cow	(gal.)	1253	1161	-92
Fat	(%)	3.60	3.76	+0.16
Protein	(%)	3.20	3.37	+0.17
Receipts/cow	(£)	1387	1348	-39
Variable costs/cow	(£)	300	236	-64
Gross margin/cow	(£)	1087	1112	+25
Margin* per gallon of quota (p/gal)		88	96	+8

* Gross margin plus adjustment for opportunity costs for capital and land

Stocking rate

Delaying calving date resulted in lower milk yield per cow. This was mainly due to inadequate feed supply in the autumn. The objective of lowering the stocking rate would be to increase the supply of grass from mid-season onwards and to a limited extent in the spring period (Fig. 1). Two stocking rates (0.85 and 0.95 ac/cow) were evaluated over three years (Table 2). Reducing the stocking rate by 0.1 acres per cow increased milk yield per cow by 35 gallons on average over the three years. There was slight increase in fat and protein

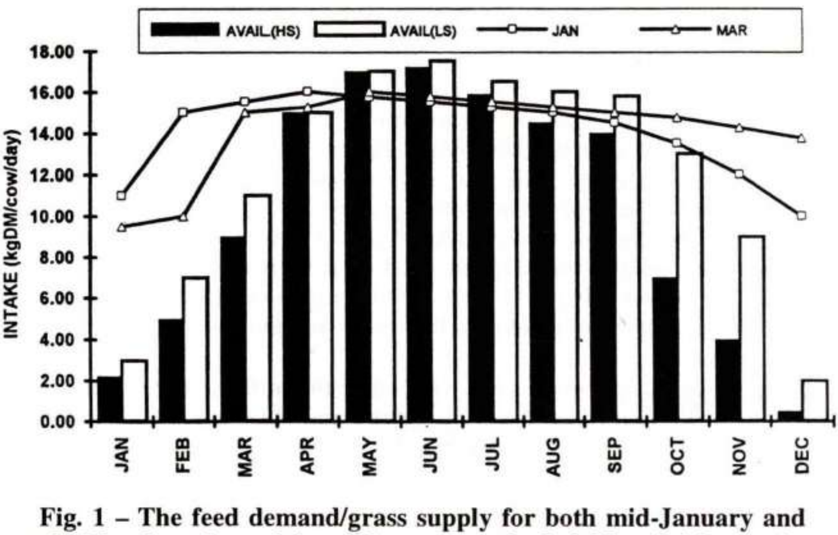

Fig. 1 – The feed demand/grass supply for both mid-January and early-March spring-calving dairy cows at both 0.85 and 1.0 acres/cow

concentrations. The financial results show that milk receipts increased by £45/cow. Variable costs were reduced by £4/cow. This resulted in an increase of £49 per cow in gross margin. In terms of a milk quota situation, reducing stocking rate increased the margin by lp per gallon of milk quota. There were large differences between years in this study. In the first (1990) year (which was a more typical year in terms of grass production) there was a large improvement in milk yield per cow (86 gallons) in favour of the lower stocking rate. The second year (1991) was a poor grass-growing year. The high stocked herd had to be fed concentrates during the grazing season whereas no concentrates were necessary at the low stocking rate (silage was used as the supplement). In 1992 the grass growth rates were well above normal in the autumn period. This reduced the necessity to supplement the lower stocked herd untll the end of October.

Table 2
Comparison of 2 different stocking rates over 3 years for cows calving in March

		High S.R. (B) (0.85 ac/cow)	Lower S.R. (C) (0.95 ac/cow)	Difference (C - B)
Concentrate input	(kg/cow)	185	80	-105
Milk yield	(gal.)	1161	1196	+35
Fat	(%)	3.76	3.87	+0.11
Protein	(%)	3.37	3.38	+0.01
Receipts/cow	(£)	1348	1393	+45
Variable costs/cow	(£)	236	232	-4
Gross margin/cow	(£)	1112	1161	+49
Margin* per gallon of quota	(p/gal.)	96	97	+1

* Gross margin plus adjustment for opportunity costs for capital and land

The decision to allocate extra land to the dairy enterprise will depend on the opportunity costs of the extra land. The opportunity cost of the land has been considered in the present calculations. If the return from alternative enterprises in general are relatively low, then it makes sense to reduce stocking rate on highly stocked farms. A lower stocking rate facilitates a greater proportion of silage coming from first cut and a large supply of grass in early spring and autumn period. The relationship between nitrogen input and stocking rate should also be recognised.

Feeding value of early spring grass

Winter feeding of silage and concentrates can amount to a significant proportion of the dairy cow's feed bill. Since grazed grass is the cheapest feed available on the farm, therefore the provision of early spring grass is important for the spring-calved cow. As we have seen, the matching of calving date to the start of the grazing season is important. However the provision of early spring grass is still important in that it will influence the length of the grazing season and the target calving date. Due to the low growth rates in early spring period, grass supply will not be adequate to meet the dairy cow's demand when first turned out to grass. This will be influenced by overall stocking rate, previous autumn grazing management, prevailing grass growth conditions and calving pattern. The grass available in spring is as a result of the grass carried over from the previous autumn plus that which grew over the winter. Data from Johnstown Castle and Moorepark have shown that the loss in yield in spring by grazing up until early December is not balanced by the grass consumed previous to late autumn. Delaying closing by six weeks in autumn 1993 (22 October - 2nd December) reduced grass yield by 620 kg DM in late January for a removal of 320 kg DM the previous autumn. The option of grazing the whole farm is available to most dairy farmers (as well as the area available for grazing in the April-June period, the area that will be cut for first cut silage). Grass production data from Moorepark have shown that a grazing in late March resulted in a reduction of 13% (1500 kg DM/ha) in silage yields cut on 25th May (McCarthy, 1984). However when the yield taken as grazing was added to the first and second cut silage yields, no loss in dry matter production was recorded.

The results of a recent study in Moorepark where grass silage was supplemented with concentrates and early spring grass is shown in Table 3. The objective of the study was to (1) quantify the effect of including up to 50% of the diet as grazed grass as compared to silage only, (2) to establish the response to level of concentrate feeding when silage and early spring grass are part of the diet. The first group were indoors full-time on *ad lib* silage (72 DMD) and 6 kg of concentrates. The other three groups were turned out to grass from 27th

Table 3

Intakes, milk yield and composition

		Treatment			
		Indoors Silage + 6 kg Conc.	**Grazing+Silage + 6 kg Conc.**	**Grazing+Silage + 4 kg Conc.**	**Grazing+Silage + 2 kg Conc.**
Silage intake	(kg DM)	8.5	5.0	5.7	6.2
Grass intake	(kg DM)	-	6.6	6.2	6.3
Concentrate intake	(kg DM)	5.3	5.3	3.5	1.8
Total intake	(kg DM)	13.8	16.9	15.4	14.3
Milk yield (gal/cow/day)		4.7	5.3	5.0	4.7
Fat	%	3.63	3.60	3.75	3.69
Protein	%	3.06	3.17	3.15	3.12
Lactose	%	4.63	4.55	4.61	4.53
Liveweight change		-0.7	+0.2	-0.4	-0.2

Experimental period: 8 weeks (27 January - 24 April)

February from about 9 am. to 3 p.m. each day given an allowance of 7-8 kg DM (> 4 cm). The three groups were fed the same silage overnight and 6, 4 and 2 kg of concentrates respectively.

Dry matter intakes were increased substantially by supplementation with grazed grass (13.8 vs 16.9). Silage intakes were reduced and grass intake was similar for all three groups. Cows fed 6 kg of concentrates outdoors by day and indoors by night produced 0.6 gal/cow/day extra with higher protein content (0.1%) than the comparable group which was indoors full-time on 6 kg of concentrates. Cows fed 2 kg of concentrates, grass by day and silage by night produced similar milk yields and composition as the cows indoors full-time on 6 kg of concentrates.

In a milk quota situation where quota is not limiting the optimum system was grazing by day, silage by night and fed 4 kg of concentrates. Margin per gallon of milk quota was increased by 2p/gallon over the group indoors full-time on 6 kg of concentrates. Therefore the availability of early grass for the spring-calving cow is critical.

Spring grazing management

Grass growth and grazing conditions can be erratic in the late April-May period depending on climatic conditions. Grass intakes of 15-16 kg DM per cow per day have been measured in Moorepark with spring-calving dairy cows over this period under good grazing conditions (1990 and 1992). This period also coincides with the start of the breeding season. To obtain good fertility performance, cows need to be in a positive energy balance at this stage. Therefore in periods of poor growth rates/difficult grazing conditions, supplementation may be required. A supplementation study was carried out in Moorepark over this period in 1993, which was a period of poor grass growth and difficult grazing conditions (Fig. 2). The intakes and milk yields are shown in Table 4. The milk yields are the average daily milk yields over the 9 weeks of the experiment,

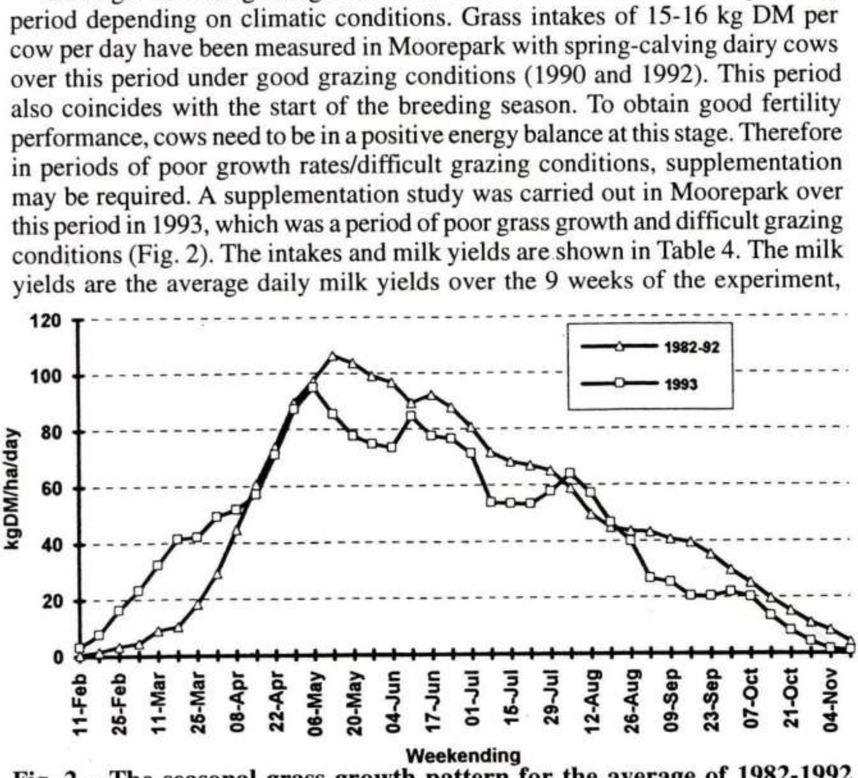

Fig. 2 – The seasonal grass growth pattern for the average of 1982-1992 and 1993

Table 4
Intake, milk yield and composition

		Grass only	Grass+2 kg Conc.	Grass+4 kg Conc.
Grass intake	(kgDM)	13.3	13.2	12.8
Conc. intake	(kgDM)	-	1.8	3.5
Total intake	(kgDM)	13.3	15.0	16.3
Milk yield	(gal/cow/day)	5.2	5.5	5.6
Fat	(%)	3.66	3.54	3.60
Protein	(%)	3.35	3.36	3.34

Experimental period: 9 weeks (10 April - 12 June)

while the intakes represent just two weeks when grazing conditions were poor. The cows were stocked at 0.45 acres per cow with an allowance of 18-19 kg DM (> 4 cm) per day. The intakes of the grass only group was much lower than measured previously where intakes of 15-17 kg DM have been measured. The substitution rate of grass for the concentrate supplement was very low (almost no substitution at the 2 kg level and only 0.14 kg of grass/kg of concentrate at the 4 kg level). The milk yield responses shown in Table 4 are lower than that obtained in the two weeks that intakes were measured. The results indicate that in situations of poor grass supply and poor grazing conditions in early spring that supplementation is required. Supplementation should be introduced swiftly and be large enough in quantity to maintain milk yields and then taken out when grass supply returns to normal. For later calving herds, particular attention needs to be paid to the feeding of the animals during the breeding season.

Mid-season grazing management

With a compact spring-calving herd with a mean calving date of March 1st, 45-50% of total production will be produced in the months of May to August. Given that grazed grass is the main component of the diet of the lactating cows over this period, grazing management will have a large influence on milk production. The main factors in achieving high performance from dairy cows on grazed pastures have already been described (Stakelum, 1993).

Autumn supplementation

The autumn period on dairy farms coincides with large changes in the type and quantity of forage available for dairy cows. The milk supply pattern at this time of year can vary widely depending on calving pattern of the herd and feeding level. Table 5 gives the expected milk yield per cow for early spring-calving cows, late spring-calving cows and a supply pattern for herds with 40% autumn-calving (Sept./Oct.) and 60% spring-calving cows.

Table 5

Expected milk supply pattern per cow for early Spring, late Spring and Autumn/Spring-calving cows (gal/cow/month)

Month of Year	Early Spring-Calving	Late Spring-Calving	Autumn/Spring-Calving
September	79	92	65
October	57	79	82
November	33	60	90
December	20	50	85

Yield level of 1,100 gallons per cow with a good system of management

The potential milk production for early to mid March calving herds at this time of the year should be noted. Table 6 shows the effect of two different feed allowances as measured by stocking rate on milk yield from September to the end of the year. The considerable improvement in milk yield was due to the availability of extra grass and the availability of extra silage which was fed when grass supply was less than the requirements of the herd. No concentrate was fed in these situations.

The supply of grass from September onwards will depend on current grass growth rates, stocking rates, previous grazing management, calving pattern and nitrogen application. Figure 3 shows the feed demand/feed supply available for a March-calving cow stocked at 0.85 acres/cow using average growth rates 1982/92. The rapid reduction in growth rates from the end of September onwards results in feed supply being less than feed required to sustain target milk yields. The grazing management over the spring/summer period will affect the quantity and quality of grass available for grazing going into the autumn. An objective for dairy farmers is to have a good farm cover of high quality grass in mid-September. The timing of last application of nitrogen will depend on the response in terms of dry matter production, the demand for grass, soil type and the milk production potential of the animals to be fed. In Moorepark the last nitrogen is applied by the end of September (based on a response of 8.5 kg DM per kg of N).

Table 6

Milk production profile for 2 herds with a mean calving date in mid-March but with two different stocking rates (gal/cow/day)

Month of Year	Stocking Rate 0.85 ac/cow	Stocking Rate 0.95 ac/cow	Difference
September	3.82	3.82	0.00
October	2.49	3.11	0.62
November	1.89	2.68	0.79
December	1.54	2.13	0.59

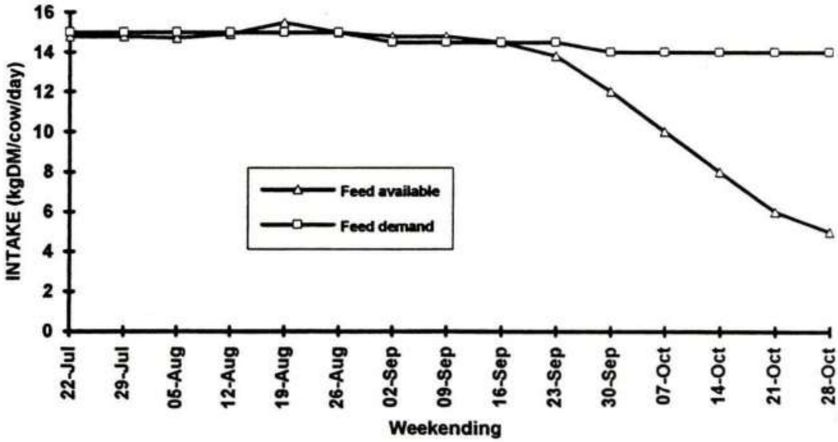

Fig. 3 – The feed available under grazing at a stocking rate of 0.85 ac/ cow and the feed demand of an early-March calving dairy cow using average growth rates 1982-1992

The response to concentrate supplementation has been shown to vary over the grazing season. A better response is usually recorded in the autumn (Crosse and Gleeson, 1987). Shortages of grass can result in large responses to concentrates. Forages (silage or hay) may be used to supplement grazing, particularly when herbage is in short supply, and usually have the benefit of being cheaper than concentrate. The results of a recent trial carried out in Moorepark where autumn grass was supplemented with concentrates and silage is shown in Table 7.

Grass supply was considered not to be a significant limiting factor in this experiment as the cows were not allowed to graze below 6-7 cm. The concentrate

Table 7

Supplementation of autumn grass with silage and concentrates (Spring-calving cows)

		Grass only	Grass+2 kg Silage DM	Grass+4 kg Silage DM	Grass +2 kg Concentrates	Grass+4 k Concentrates
Milk yield	(Gal/cow/day)	2.39	2.50	2.31	2.80	2.99
Response	(Gal/cow/day)	0.0	+0.11	-0.08	+0.41	+0.60
Fat	(%)	4.29	4.12	4.02	4.07	3.91
Protein	(%)	3.76	3.68	3.67	3.74	3.81

Experimental period: 10 weeks (14th September - 23rd November, '92).

fed was 25% maize distillers and 75% beet pulp. First cut silage was fed (72% DMD) and it was well preserved. Supplementation with silage gave little or no response in milk yield. It also had a very negative effect on milk composition. Supplementation with concentrate had a very positive effect on milk yield. The response was 0.4 gallons of milk for 2 kg concentrate and 0.6 gallons milk for 4 kg of concentrate. Concentrate feeding had a negative effect on the fat content of the milk but it had a slight positive effect on the milk protein and fat yield.

Autumn supplementation would have to be economically beneficial within the overall milk quota. Systems where additional concentrates are fed and which result in increased milk yield per cow will have the effect of reducing the number of cows in the herd. In a low cost system of production (which has high margins), then the cost of displacing a cow will be higher. This is illustrated in Table 8. Table 6 shows the effect of feeding 2 kg of concentrates/cow/day on margin/ gallon of milk quota. In order to obtain a margin of 0.5 p/gal of quota with a milk price of 120 p/gal last autumn, concentrates should not cost more than £120/tonne when the farm costs are £500/cow, while if concentrate cost was £150/tonne then you would get a similar margin at a farm cost of £700/cow.

Table 8

Effect of feeding 2 kg of concentrates/cow/day on additional margin/ gal of milk quota (p/gal) in the autumn

Farm Costs	Conc.	Milk Price		
£/cow	Cost £/t	100	120	140
500	120	0.0	+0.5	+1.0
	150	-0.4	+0.1	+0.6
	180	-0.8	-0.3	+0.2
700	120	+0.4	+0.9	+1.4
	150	0.0	+0.5	+1.0
	180	-0.3	+0.2	+0.6

However, in many farm situations grass supply will not be adequate. In a previous experiment carried out in Moorepark, a milk yield response of 0.7 gallons/cow/day was recorded over a six week period for a silage input of 8.5 kg silage DM/cow/day (Crosse and Gleeson, 1987). It had however a detrimental effect on milk composition. It should be noted that grazing conditions were not as good in this case and grass supply would also have been limiting. Obtaining target milk production over the autumn/early winter period will depend on getting the correct blend of grass, silage and concentrate into the diet of the milking cow.

Autumn grazing management

Autumn grass in terms of feeding value is not as high as primary spring grass; however, it is still better in feeding value than grass silage (average to good quality) and is cheaper to produce. Therefore, strategies that would increase

Table 9
Stocking rates (acres/cow)

Period	System			
	A (0.65-0.85)	B (0.65-1.0)	C (0.55-0.85)	D (0.55-1.0)
1 (26/6 - 20/8)	0.65	0.65	0.55	0.55
2 (21/8 - 6/12)	0.85	1.00	0.85	1.00

the proportion of grazed grass in cows diet in the September - December period would be desirable. A study was carried out in Moorepark in the autumn/winter of 1993 (26/6 - 6/12) to investigate strategies on how this could be achieved. Two approaches could be used to do this. The first approach was to adjust the proportion of the farm allocated to second cut silage. The standard stocking rate during this period is 0.55 acres/cow. Reducing the stocking rate during this period (0.65 ac/cow) would allow less feed to be fed on the form of grass silage (approximately 0.7 t/cow) and a greater proportion as grazed grass. The second approach would be an overall stocking rate adjustment, the two stocking rates used in this experiment were 0.85 and 1.0 acres/cow. The four systems of milk production are shown on Table 9. All pastures were grazed to a post-grazing sward height of 6-7 cm. Rotation length was maintained at 21 days or greater. When grass supply was not adequate to maintain the desirable post-grazing surface height then grass silage was used as a buffer feed. The experiment ceased when the grass supply in all grazing treatments was used up (6/12/93). Nitrogen levels (units/acre) were similar for the four systems. Figure 4 shows the weekly

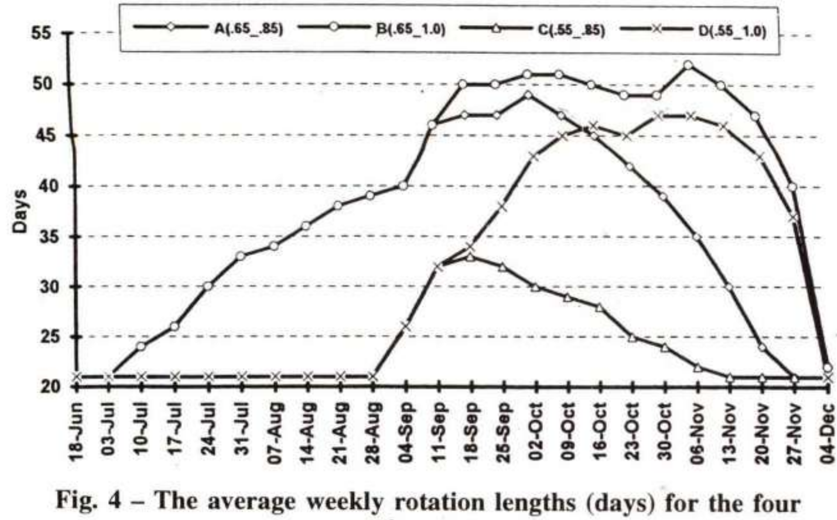

Fig. 4 – The average weekly rotation lengths (days) for the four grazing systems

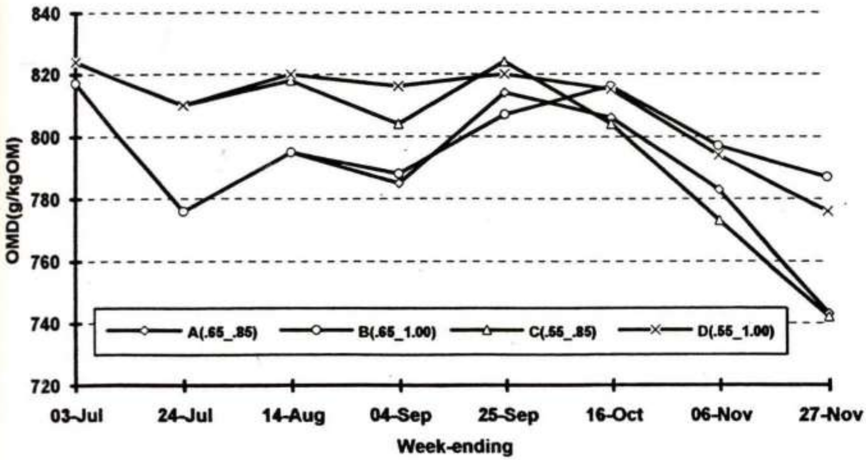

Fig. 5 – The digestibility (OMD) of the grass on offer (>4 cm) available for grazing in the four grazing systems

rotation lengths in days over the experimental period. Rotation length was maintained at about 21 days at the higher stocking rates (during the second cut silage period) up until the end of August, while at the lower stocking rate (0.65 ac/cow) during the second cut silage period rotation length had reached 40 days by early September. Rotation length reached a maximum in early October (49 days) and early November (52 days) mid September (33 days), early November (47 days), for treatments A to D respectively. The digestibility of the grass on offer (> 4 cm) was lower at the lower stocking rates during the second cut silage period (0.65 ac/cow) up until mid-September (Figure 5). Where the overall stocking rates were 1 acre/cow the digestibility of the grass on offer was generally higher during the month of November. The cows in systems A and C consumed 0.7 and 1.5 tonnes of silage per cow, respectively; no silage was fed in systems B and D.

Table 10 shows the milk production data for the four herds. Lowering the stocking rate during the second cut silage period (i.e. systems A and B) resulted in lower milk yield (29 gal) fat yield, protein yield and protein content. Lowering the overall stocking rate from the end of August onwards (System D) gave slightly higher milk yield (+ 13 gals/cow) and slightly higher milk composition than the standard system (C). However, it also resulted in a saving of 1.5 tonnes of silage/cow.

The results of this study showed that going to rotation length of 30-35 days during July and August (i.e. lower stocking rates during second cut silage) will result in reduced milk yield and protein content. This resulted in a reduction in margin/gallon of milk quota of almost 2p. Going to a long rotation length starting in early September (lower overall stocking rates) will result in slightly higher milk yields and reduced silage feeding with spring-calving dairy cows

Table 10
Performance of the four systems

Period		System A (0.65/0.85)	B (0.65/1.0)	C (0.55/0.85)	D (0.55/1.0)
Milk yield	(gal)	491	502	519	532
Fat	(%)	4.04	4.07	4.10	4.19
Protein	(%)	3.54	3.58	3.60	3.66
Lactose	(%)	4.38	4.43	4.48	4.47
Liveweight change		0.60	0.68	0.60	0.71

up until early December. In this situation when the extra land and reduced supplementation are considered the margin per gallon of quota was increased by 1-2p/gal.

Conclusions

Compact calving just prior to the start of the grazing season increased profit from the farm quota even though there was a considerable drop in milk yield per cow. Most of the loss in milk yield was due to an inadequate feed supply in the autumn. The increased margin came from reduced costs (4p/gallon) and increased milk value (4p/gallon). The reduction in cost was associated with lower concentrate feeding. Later calving allowed for a closer match of the milk supply pattern to the grass growing year. This allows the maximum amount of milk to be produced from grazed grass. Calving should start 4 weeks prior to the expected turn-out day to grass.

Compact calving just prior to the start of the grazing season resulted in lower milk yield per cow, mainly due to an inadequate feed supply in the autumn. The objective of lowering the stocking rate in this study was mainly reflected (in terms of feed supply) for the grazing cow from mid-season onwards. The higher milk yield for the lower stocked cows (35 gallons on average) was as a result of a greater supply of grass in the autumn as well as the use of the extra silage produced as a supplement, from mid-September onwards. Lowering the stocking rate increased the margin per gallon of quota by lp per gallon.

Our current grazing season extends from early March to mid-December. At high stocking rates (0.8 - 0.9 ac/cow) grass growth is not adequate to meet the full feed requirements of a dairy cow in early spring and in the October/December period. In spring the supply of grass is a major determinant of the level of supplementary feed which needs to be fed in order to support a high level of milk production with spring calving. Therefore spring grass at the start of lactation is far more important than grass at the end of lactation. The extent to which, and how much, grazed grass will be used in spring and autumn will depend on overall stocking rate, calving pattern and soil type.

In the past, spring-calving cows dried off in the autumn due to insufficient feed to maintain milk yield. To allow late spring-calving cows to have long lactation lengths of (300 days), additional feed will have to be introduced into the system in the autumn. This feed may be in the form of grass (lower stocking rate), grass silage or concentrates, or a combination of all three.

Good autumn milk production will depend on getting the right blend of grass, silage and concentrates. Where adequate quantities of high quality grass are available high milk production can be obtained. In this situation little response will be obtained in terms of milk production in using silage as a buffer feed. In a creamery milk situation with spring-calving cows it will generally be economic to feed 2 kg of concentrates in the autumn; however, overall milk quota situation will have to be considered.

Lowering the stocking rate during the second cut silage period and allowing rotation length to extend to 30-35 days will result in lower milk yield and protein content. Going to long rotation length from early September (i.e. lower stocking rates) tended to increase milk production and allowed a large reduction in silage requirement up to early December. It also emphasises that at lower stocking rates (less than 1 acre/cow) there is large potential for extended grazing both in spring and autumn/winter provided soil conditions allow.

References

Crosse, S. and Gleeson, P. (1987). Supplementation of autumn grass with silage and concentrates for grazing dairy cows in late lactation. Irish Journal of Agricultural Research, 26: pp.69-75.

McCarthy (1984). Milk production from grassland. Moorepark 25th Anniversary Publication, Part 1: Milk Production, An Foras Taluntais, pp.3-60.

Stakelum, G. (1993). Achieving high performance from dairy cows on grazed pastures. Irish Grassland & Animal Production Assoc. J. 27: 9-18.

Is There Money in Extended Grazing?

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The theme question to this paper could be asked another way, viz, "Is there money in grazing animals later in autumn and earlier in springtime? But it is too long a heading, however, it better explains to all of us what "extended grazing" is about.

More than anything "Extended Grazing" is an attitude which involves a commitment to providing grass so that the letting out date in springtime can be moved forward by so many days. In the autumn it involves having grass while animals are "out". In North Tipperary cows are "out' until 20th November, approximately; they are then taken off the pastures and housed. Unfortunately, most of these pastures are as bare as the floor from early to mid October, so we must endeavour to have grass while they are "out".

In the springtime extending the grazing season means different times to different farmers. It may mean moving the "letting-out" date from 1st May to 20th April for one man or moving from a "letting-out" date of 1st April to 15th March or earlier for another farmer. Similar targets should be set for the autumn. Reducing the cows silage requirement by one tonne and replacing with grazed grass increases milk profits by 0.75 pence per gallon.

The other arm of this concept is utilisation of grass. As animals are going to be grazing fields at marginal times, that is, early and late in the year when ground conditions may vary from very wet to fairly wet, grazing techniques must be practiced to limit poaching damage and maximise animal intakes while at the same time utilising 80-100% of the growing grass. These utilisation techniques for grazing, widely discussed in the farming press and covered by other speakers today, can and should be applied, at anytime during the year. For instance some farmers had to use them in the wet June of 1993, and farmers on wet land will always have to use them to varying degrees.

Answer the question!

If meal is five times more expensive and silage is nearly three times more expensive than grazed grass then there must be more money in extended grazing. Moorepark have shown that grazed grass increases protein levels. But what if some progressive farmers who were managing their grass well decided to push out the limits further? Over the last few years I have monitored two groups of farmers, let us call them a "Conventional Group" and an "Extended Group". All these farmers are excellent and highly motivated as reflected by a milk yield per cow of 1155 gallons and 1070 gallons from 12.9 bags and 8.6 bags of meal for the Conventional and Extended groups respectively.

Table I shows the changes in Margin over Feed and Fertiliser (MOFF) per cow, per acre and per 1000 gallons that have taken place from 1992 to 1993, having adjusted 1992 to 1993 milk price and allowing for protein change.

Table 1

Change in MOFF per cow, per acre and per 1000 gallons from 1992 to 1993 (1992 Milk Price adjusted upwards for 1993 price)

Change in MOFF	Conventional Group	Extended Group
Per Cow	-£12	-£19
Per Acre	+£44	-£46
Per 1000	-£11	+£27

MOFF = Margin over Feed and Fertiliser

It may seem surprising that MOFF per cow decreases for both groups, £12 and £19 for the Conventional and Extended Groups respectively. But it does reflect the difficult year we had. Per cow performance is important where a farmer has insufficient cows to fill quota and if he is selling pedigree stock. Where land and buildings are also limited this measure is also important.

The Conventional Group increased MOFF per acre by £44 because they increased stocking rate from 1.08 to 1.13 livestock units per acre. While the Extended Group decreased MOFF per acre by £46 because their stocking rate decreased from 1.18 to 1.15 livestock units per acre. The margin MOFF per acre was £1181 and £1164 for the Conventional and Extended groups respectively in 1993. MOFF per acre is important where the land surplus to the dairy area is giving a good return or where land has to be rented for the dairy enterprise.

It must be the target of most expanding dairy farmers to produce their quota as cheaply as possible, and MOFF per 1000 gallons measures that. The Conventional Group allowed the MOFF per 1000 gallons decrease by £11 (1.2%) in 1993 while the Extended Group increased it by £27 (3%). In other words the Conventional Group depended on a milk price rise (7p per gallon) to increase the Margin from their quota but put no improved management efficiencies into operation. This has to be worrying if it is widespread. However, the Extended Group, who adopted new grassland management techniques reaped financial gain from those practices - an extra £1350 from a 50,000 quota, because of lower meal and fertiliser inputs plus increased price for milk because of higher protein levels.

Where extra quota is not available or where a farmer has leased a high proportion of his milk, MOFF per 1000 gallons (or gallon) is very important.

Changes in Milk Yield

Table 2

Changes in milk yield per cow (gallons) by Conventional and Extended Groups from 1992 to 1993

	Conventional	Extended
January-March	-20	-36
April-September	-18	-29
October-November	+13	-12
Total Change	**-25**	**-53**

It was a difficult year (1993) to manage grass and this was reflected in a drop in milk yield per cow by both groups of farmers, 25 and 53 gallons per cow by Conventional and Extended Groups respectively. Was it an over-reliance on the quality and quantity of grass early in the year by the Extended Grazing Group that caused 28 gallons extra to be lost? Or was it due to the fact that cows had a lower body score at calving resulting in a greater decrease in peak milk yield? Milk yield divided by peak milk yield per day (April in both groups) gave 256 and it indicates excellent management. The peak milk yield drop of 0.08 and 0.14 gallons would account for 20 and 30 gallons decrease per cow per year for the Conventional and Extended group respectively. Appendix 1 gives the changes in daily milk yield by month from 1992 to 1993.

Changes in milk quality

Butterfat levels did not change for either group while protein % increased by 0.03% and 0.06% for the Conventional and Extended groups respectively (Appendix 2).

Input costs

Table 3

Comparing meal and fertiliser cost per cow for two groups of farmers

Costs/Cow	Conventional			Extended		
	1992	1993	Change	1992	1993	Change
Meal	£95	£104	+£9	£70	£63	-£7
Fertiliser	£67	£55	-£12	£72	£63	-£9
Meal + Fertiliser	**£162**	**£159**	**-£3**	**£142**	**£126**	**-£16**

"The higher the milk price, the more is spent on inputs to produce that milk, whether such inputs are necessary or not". So said Dr. Terry Hughes, Lincoln University, New Zealand when putting some rationale to his suggestion that he hoped milk price would not increase beyond 55 pence per New Zealand gallon of milk. He said the higher their milk price the more uncompetitive would be their dairy produce for export. As long as our milk price remains high and the lower we keep our costs of production the higher will our profits be.

The Conventional Group achieved a 7% increase in milk price in 1993 but instead of holding on to it they spent £9 more (or 9.5%) on meal costs per cow - doing exactly what Terry Hughes said would happen. The recommended level of meal feeding is 0.7 to 0.8 lbs per gallon and these farmers are feeding in 1.23 lbs per gallon, nearly 50% above recommended levels. Even though, the Extended group were on low meals (now 0.88 lbs/gallon) they reduced them further by £7 per cow, maintaining meal costs of 6 pence per gallon. These farmers meal costs ranged from 2 pence per gallon to 9 pence per gallon, indicating the scope for cost savings even within this group. The Conventional Group's meal costs ranged from 6 pence per gallon to 12 pence per gallon.

Return on money invested

What is the return by the cow on each £1 spent on meals and fertiliser? Table 4 gives the return (MOFF per cow) for every £1 spent on meal and fertiliser. It is calculated by dividing the total meal and fertiliser costs per cow into the MOFF per cow. For example, the meal and fertiliser costs for the Extended Group in 1993 was £126 per cow and each of their cows gave a total MOFF of £1,006 for those inputs.

Table 4
Return (MOFF/cow) for every £1 spent on meal and fertiliser

	1992	1993	% Increase
Extended Grazing Group	£6.63	£8.00	20.7%
Conventional Grazing Group	£6.06	£6.55	8%

The Extended Group is getting a return of £7.98 MOFF per cow compared to £6.55 for the Conventional Group for each £1 spent on meal and fertiliser - a 22% difference. The difference was only 9% in 1992. Meal and fertiliser represent 80% (approx) of all variable costs associated with milk production.

Total cost savings

Some of the Extended Group have reduced total costs from 45 pence to 35 pence per gallon over the last 2 years. Because meal and fertiliser accounts for only 1.6 pence out of the 10 pence, this further confirms that Extended Grazing is more than just about grazing - it is an attitude.

With a yield of 1070 gallons per cow the savings in total costs would be £107 per cow but 28 gallons per cow in milk was lost leaving a net benefit of £79 per cow for the "hardship" of increasing the availability of grass to the cow both in the autumn and in the spring. The 28 gallons is the difference between what the Extended Group lost, 53 gallons, and that which the Conventional Group lost - 25 gallons per cow. I have no doubt that this 28 gallon decrease will not occur again because of the experience gained. In fact 30% of this group increased milk yield.

Of course these levels of efficiencies are now required by expanding dairy farmers. For instance, a farmer who has 60% of his milk leased at 25 pence per gallon (too much) ends up with a net price for all his milk of 85 pence per gallon when the creamery price is £1 per gallon. Are there many farmers in this position? Will there be many farmers in this position in 5 years time? How long can they survive? How long will they tolerate it?

Health / Fertility

Animal health, mastitis, lameness etc., appear to be good on farms practising extended grazing. Cow fertility improved greatly on those farms. See Appendix 4 where all fertility parameters for 1992 are compared with 1993. Apart from a concerted effort to improve fertility on these farms, had the fact that the cows were out to grass early and well climatised have any influence?

Questions

* How do we limit poaching damage?
* How soon will reseeding have to be done?
* Will subsoiling be necessary?
* Will animal type/size change?
* If winter is only 2-3 months long what type of housing or wintering facilities will become necessary?
* How much grass must the cow be fed and what quantity of meal does it replace?
* Can nitrogen be applied later and earlier in the year and what is the response?
* Is the grass growth curve different for extended grazing?
* Can the benefits accruing be achieved without a decrease in annual milk yield per cow?

Summary

I am convinced that the extended grazing concept and utilisation techniques can be recommended to each farmer no matter where he is on the management scale. The only proviso is his commitment to learn and apply the principles to his own individual situation. Of course, that goes for every new management concept that arises in farming.

Over the last 2-3 years this extended grazing concept has gone through much refinement and it, no doubt, will still need to be refined further. The promotion of Ireland's most valuable resource, grass, to produce better quality beef and milk (higher protein) must be the target of farmers and agricultural scientists.

Appendix 1

Changes in daily milk yield (gallons) from 1992 to 1993 by month for Conventional and Extended Groups

	Conventional	Extended
January	-0.24	-0.39
February	-0.38	-0.69
March	-0.05	-0.14
April	-0.08	-0.14
May	-0.18	+0.10
June	-0.27	-0.18
July	-0.08	–
August	+0.01	-0.10
September	+0.11	+0.01
October	+0.10	-0.03
November	+0.14	+0.23
December	+0.17	+0.19

Appendix 2

Changes in fat and protein percentages by month from 1992 to 1993

	Conventional		Extended	
	Fat	Protein	Fat	Protein
January	+0.03	+0.01	+0.07	+014
February	-0.01	-0.02	-0.07	+0.06
March	+0.02	+0.04	-0.03	+0.13
April	-0.01	-	-0.11	-0.01
May	-0.01	+0.06	-0.03	-0.02
June	+0.02	+0.02	+0.04	+0.05
July	-0.02	+0.02	-0.10	+0.06
August	-0.08	-0.01	-0.02	+0.01
September	-0.03	-0.04	-0.04	+0.01
October	-0.01	+0.03	+0.09	+0.08
November	-0.09	+0.02	+0.02	+0.11
December	-0.01	-0.01	+0.18	+0.18
Year	**Zero**	**+0.03**	**Zero**	**+0.06**

Appendix 3

Various efficiency factors (1993) for two groups of farmers and in brackets change from 1992

	Conventional 1993	Extended 1993
MilkYield per cow	1155 (-2.1%)	1070 (-4.7%)
% Fat	3.61 (N.C.)*	3.72 (N.C.)
% Protein	3.23 (+0.03)	3.30 (+0.06)
Average Calving Date	3 Feb (+4 days)	14 Feb (+5 days)
Meals per gallon	1.231b (+20%)	0.881b (-14%)
Meal Costs per gallon	9 pence (+1p)	6p (no change)
Meals per cow (bags)	12.9 (+1 bag)	8.6 (-1.6 bags)
Stocking Rate (LU/ac)	1.13 (+0.05)	1.15 (-0.03)
% 1st Cut	47.8% (-3.9)	46.6% (-6.3)
% 2nd Cut	22.8% (-9.8)	29.3% (-7.0)
Units per acre N	197 (+8)	275 (-9)
Units per acre P	15 (-2)	21 (+2)
Units per acre K	49 (-5)	61 (+2)
MOFF per cow	£1041 (+£59)	£1006 (+£62)
MOFF per acre	£1181 (+£122)	£1164 (+£53)
MOFF per 1000 gallons	£903 (+£71)	£940 (+£108)

*N.C. = No Change

Appendix 4

Comparing 1992 and 1993 fertility data for the Extended Grazing Group

	1992	1993	
Fertility Index	50	61	Improvement
Pregnancy Rate to 1st service (%)	62	58	Disimprovement
Service per Conception	1.67	1.67	—
Calving to Service (days)	73	71	Improvement
Calving to Conception (days)	88	83	Improvement
Submision Rate (%)	41	55	Improvement
Non Detected Oestrous (%)	47	34	Improvement
18-24 Day Returns (%)	48	60	Improvement
Infertility Rate (%)	8	8	—
Heat Detection Rate (%)	77	83	Improvement

Profitable Milk Production from Grass

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I started farming in 1983 when my father transferred the 75 acre family farm to my wife Ella and myself. We set about running this as our sole means of livelihood. We had 50 cows plus 30 followers and 8 acres of barley were grown each year for feeding. We found our involvement in Macra very beneficial because it kept us in touch with the outside world and also kept us in touch with what was happening politically. My wife and I set ourselves objectives and decided that in order to achieve them that we had to expand.

We kept extra stock and increased nitrogen level to cater for them. We also rented conacre. The following year a neighbour outbid us on the conacre and I vowed never again to get involved in the 11 month system as you cannot plan or farm properly on that. This forced me to look for a long term lease and I got one with a substantial quota attached.

When I finished my term as Macra President in 1989 a few friends in Macra and I decided to form a discussion group. This group has met about once a month since 1989 and it has been a terrific motivator for us ever since. We criticise one another constructively and we also have a forum to thrash out problems as they arise.

We are now farming 120 acres carrying 190 L.U.s at present and I expect average stocking rate to be less than 0.7 acre per L.U in the future. It was 0.75 L.U. in 1993.

We have increased our net worth by an average of over 10% per year since 1993 (valuing land and quota at £3,000 per acre) and in the 3 years up to April 1993 we have reduced overall farm costs by 7% while at the same time increasing our output by 25%. I never miss an opportunity to visit another farm as I believe that is how I learn most. Likewise I never refuse other farmers access to mine.

In order to achieve the goals that we have set for ourselves we need to maximise profitability on the farm and we believe the best way to do this is to concentrate on grass based production.

At the outset I would like to clarify that I do not believe that grass based production is the only way to dairy farm profitability - far from it, but nevertheless it is the most profitable way to produce milk in this country. Continuing research has shown this. Neither am I disappointed that milk prices are not lower, as has been said, but I do believe that organisations like the Grassland Association and others should show all farmers how to maximise their incomes.

To prove the point that grass is the most profitable way to produce milk I quote from recent Farmers' Journal and Teagasc surveys on costs of production.

The accepted Irish average cost is around 58p at the moment and if we match the costs of production graph to the percentage grazed grass as done by Con Hurley, we see that these farms have roughly 50% grazed grass in the diet of the cow (See Figure 1). The typical Moorepark recommended system of the

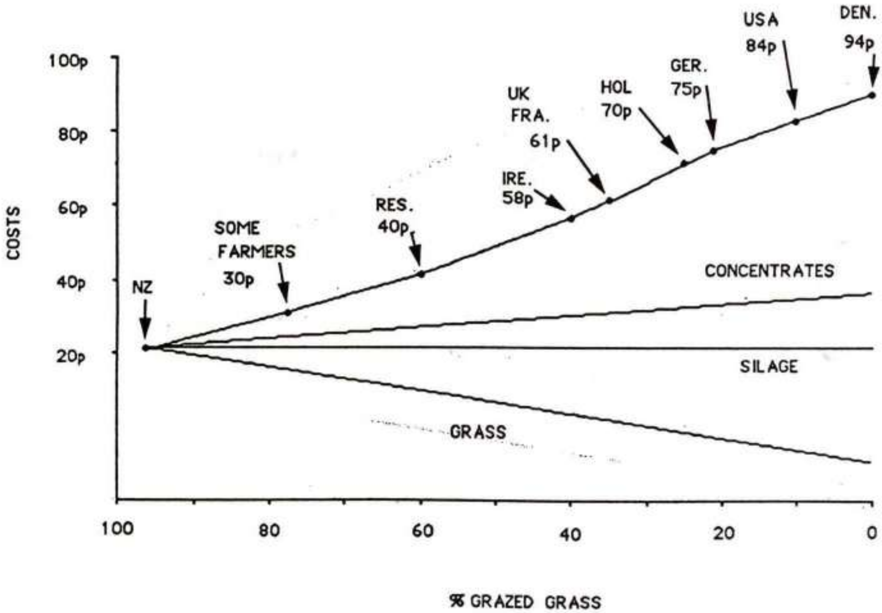

Fig. 1 – Impact of grazed grass on total production costs

past comes out at overall costs of 40p and 60% grass in the diet. The one point which the graph emphasises is that the more silage and concentrates and other feeds used the more the costs tend to rise.

I have calculated that over the last three years on my farm I have increased the percentage of grazed grass in the diet of the cow from 60% in 1991 to 77% in 1993 and that is in a winter milk situation. I have not reduced stocking rate to achieve this - in fact stocking rate has increased. I believe it is possible in a spring calving herd to increase this percentage to over 80%. In fact it is already being done in this country.

On wet farms there is less than 40% grazed grass in the total diet. These farmers can never hope to achieve what I am achieving on a dry farm but nevertheless they should be aiming for 60%. These figures are based on Table 1 which is derived from work conducted in Langhill in Scotland.

So, what are the factors that influence the percentage of grass in the diet of the dairy cow? In my opinion there are two major factors:

1. Calving date and pattern
2. Grazing management

Feed Demand - Feed Supply Patterns are shown in Figure 2.

If we look at feed supply versus feed demand patterns taken from work done at Moorepark, we see how calving date regulates demand. If we switch calving

Table 1

Typical cow		Feed Intake Tonnes DM
Milking 300 days @ 15 Kgs DM/day		4.5
Dry 65 days @ 8 Kgs DM/day		0.52
Total		5.02
Costs are based on:	Grass	£25/tonne DM
	Silage (2 cuts)	£70/ "
	Concentrates	£170/ "

date we can manipulate the cows peak demand for feed to match the peak growing season. It is seen from the graph that the late spring calving herd matches the supply pattern best of all.

The January calving herd has a large demand for feed before grass is available while the 50% autumn 50% spring calving herd has a large demand for feed all winter which leads to expensive milk production. This herd also has a low demand for feed in the August/September period which has resulted in third cut silage on a lot of farms including mine in the past.

I can meet my winter milk requirement with 30% of the herd calving in October/November and the rest calve now in February, March and early April. I have eliminated December and January calving from my herd and we finish calving by April 10 at the latest. I believe calving date to be the single most important decision a farmer can make to increase grass in the diet of the cow and therefore profitability.

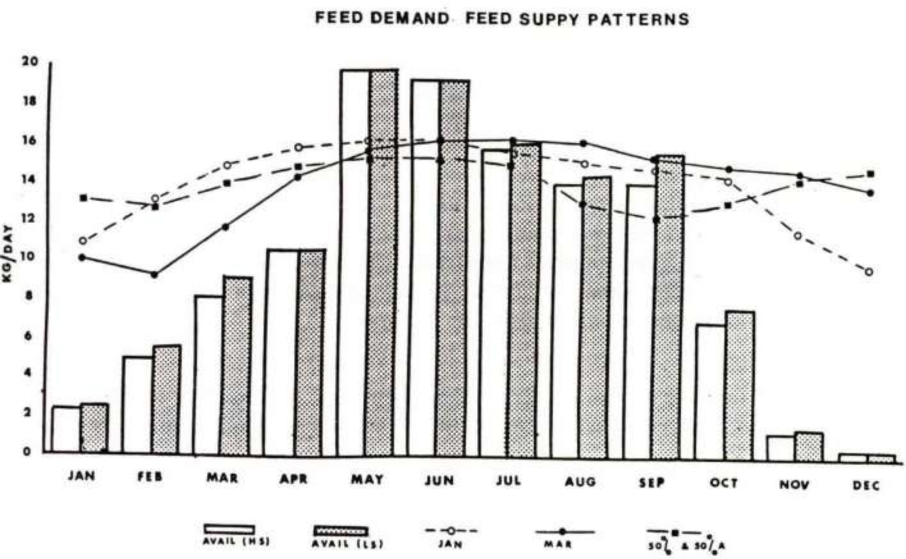

Fig. 2

Analysis of my own milk price on cows calving in different months in 1992 has shown the following:

Date cow calved	Average milk price for year (p)
Oct.	93.4
Nov.	93.5
Dec.	90.1
Jan.	91.1
Feb.	92.5
Mar.	98.9

This price does not take account of winter milk bonuses. If bonuses were included the difference would be greater as December or January calvers contribute very little to winter milk at either end of lactation.

Grassland management

In increasing the percentage of grass in the cows' diet through better grassland management, there are two main components:

1. Grass supply
2. Utilisation

1. Grass Supply:

Grass supply is affected by

a. Soil fertility: It is essential that P & K and lime levels are correct
b. Nitrogen: The level of N is totally dependent on stocking rate but I believe more strategic use of N - particularly early N - could improve grass supply dramatically.
c. Drainage: Research has shown that proper drainage is desirable and it can be maintained under good management.
d. Pasture quality: A high percentage of ryegrass is desirable and it can be maintained under good management.
e. Long rotation when grass is in its vegetative stage: Work done by E. O'Riordan at Grange over the last two autumns has shown an increase in DM available from a long rotation in autumn.
f. Protect regrowth: I and many other farmers are finding that when regrowth is protected, grass supply is improved. Research in New Zealand has shown a 30% difference measured after 40 days in a paddock grazed for one day and one grazed continuously for 5 days.

2. Utilisation

a. Stocking rate: Some poorly stocked farms use too much N for the level of stock carried and therefore there is grass wastage leading to poor utilisation.
b. Drainage: Again, proper draining will improve utilisation in poor conditions.
c. Farm structure: The investment in roadways and fencing is small compared to buildings and machinery and will give a much better return.

d. Techniques: Techniques developed in New Zealand like backfencing and small blocks for one grazing at a time and short periods in poor conditions are working well at farm level.

e. Long rotation: Many farmers are finding that a long rotation leaves the ground much better able to carry stock when required.

All of the above points are under the control of the farmer. By concentrating on getting them right he will automatically increase the percentage of grass in the cows' diet. In the past we have concentrated on grass growth and utilising it as it grew. But, if we manipulate grass supply and try to manipulate demand to match we will again increase profit.

Because we concentrated on growth in the past, we had an average winter of 1st November to 1st April (Figure 3).

But, if we lengthen the rotation in the autumn and the spring and close silage ground later than has been the norm in recent years, we can increase supply throughout the winter months and extend our grazing season by up to 2 months - one at each end of the winter. I have shortened the winter by this much for all the stock on my farm while at the same time increasing stocking rate from 0.83 acres/L.U. in 1991 to 0.75 acres/L.U. in 1993 (Figure 4).

At lower stocking rates than mine the potential for extending the grazing season is enormous, particularly on drystock farms where the need is more pressing than on dairy farms.

The benefits from increasing the percentage of grass in the diet of my herd are numerous.

1. Shorter indoor period - 2 months plus
2. Less slurry
3. Less P&K
4. Less silage - more than 2.5 tons/L.U.

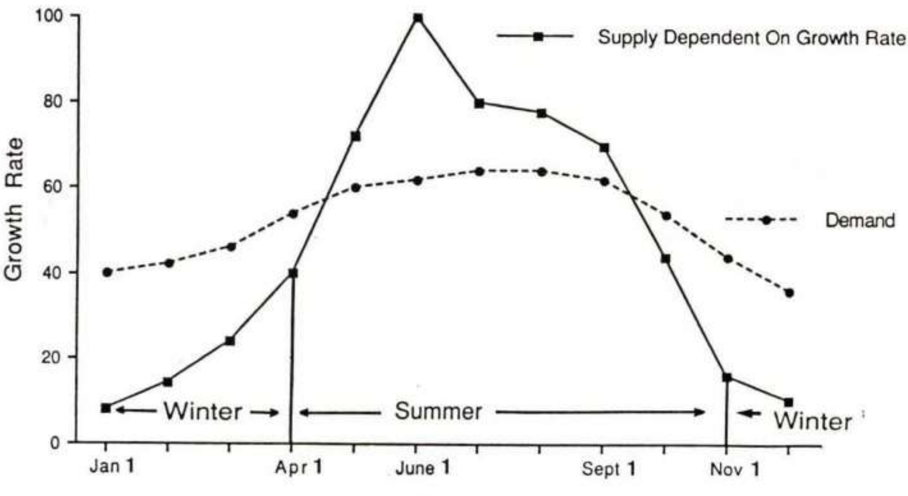

Fig. 3

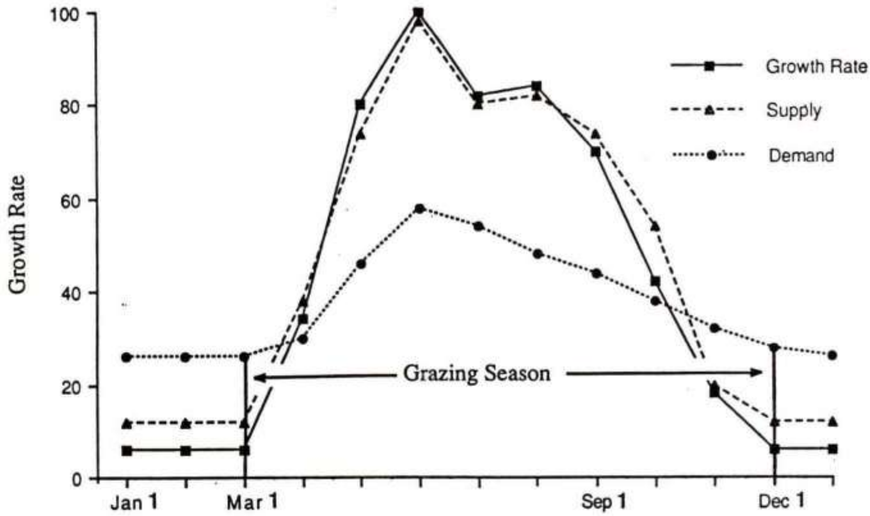

Fig. 4

5. Less reseeding - better pastures
6. Less machinery and building maintenance
7. Milk Protein + 0.2%
8. Better herd health
9. Better lifestyle - less labour.

Profit: + £100 per cow.

We can all increase the percentage of grass in the diet of our animals - whether it be from 40% to 60% on wet land or 60% to 80% on dry land, or even higher at low stocking rates. It is all within the control of the farmer but he/she needs to know how to manage the factors I have mentioned. The time spent educating yourself will give a good return.

In the ongoing debate on what I and other farmers are achieving - much is spoken in contradiction about the needs of the animals and how to achieve the maximum amount of early grass in spring, but both tend to be spoken by different commentators in isolation. What we are doing may be sacrificing a little bit in one area in order to maximise the gain in another - and increase overall profit.

P. Dillon's work in Moorepark has shown that it is desirable to have more grass in the diet of the cow. Farmers have felt for years now that grass silage is not a good enough supplement for the high yielding cow; hence the search for a substitute in maize, fodder beet etc. But unfortunately these alternatives, while good, tend to introduce other indirect costs. I believe that we should exploit grass to its full as a cheaper option.

Research has shown clearly over the years how to achieve early spring grass and I know that if I were to strip all my farm of stock in early November I would have plenty of early grass. But, if I strip the farm in November, I would need a lot of silage to do so. Therefore, I would need to conserve large amounts of silage. For years farmers and scientists have striven to increase the quality of silage and also to increase the bulk of first cut silage to reduce costs, so they closed silage ground earlier and earlier, thus reducing the amount of grass available for early grazing.

Because there was less ground available for early grass, stock were let out later, so more silage was needed - the vicious circle! We don't need early grass on all the farms - especially if we do not use it. The reason we have grass in the first place is to feed animals. The research on grass has been excellent, but unfortunately the needs of the animal have not been sufficiently matched to this research. The animal scientists and botanists must marry the two. If we sacrifice early grass on part of the farm we can feed the animals later in the autumn/winter thus reducing the need for supplements. If we close silage ground later we increase the supply of early grass. To do this a better system of on-farm measurement is needed to help the farmer make decisions and respond to situations as they happen. We now have a young, well educated, agricultural community, thanks to Teagasc.

Let us give the technology to farmers so that they can make their own decisions. The old blueprints were suitable for the 60's and 70's but not the 90's.

In summary I believe it is important for farmers to set their objectives and then set about achieving them. Every investment should be questioned in the context of achieving these goals.

In our case I believe that the farm will only give a living to one of our children so it would be foolish to invest everything in the farm. We must plan now to invest outside the farm. Too many farmers expect the next generation to do what they were never about to do themselves.

I believe the exploitation of grass based production is the key to Irish livestock farmers achieving their goals. In the past too much as been invested in expensive systems to cater for the least productive time of the year. This re-focusing on grass can only be good for Irish livestock producers. The investments which have given me the best return have been roadways and fencing.

The Impact of CAP Reform and GATT on Danish Milk Price

FINN A. CHRISTIANSEN

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Introduction

The Danish dairy industry hails the conclusion of the seven year long GATT negotiations as an important break-through that may give the stimulus to the world economy that is so badly needed at the present moment.

In the dairy industry, few would benefit more from a world without subsidies and without trade barriers than the Danes. We are a country that produces three times as much milk as we can consume ourselves, and the two remaining parts are being exported, one part to the EU and one part to the third country markets.

We feel that it was a mistake to reform the CAP before the result of the GATT negotiations was known. Inevitably, adjustments must now be made, and more uncertainty will be created, which will affect both farmers and the industry.

The present paper consists of three parts, where the first part deals with the CAP reform, the second part deals with the effect of the GATT agreement, and the final part proposes ways to implement the GATT agreement with minimum damage.

The Common Agricultural Policy

The reform of the Common Agricultural Policy introduced by Mr. MacSharry was kind to the milk sector, which of course should have made us suspicious!

Furthermore, Mr.MacSharry insisted that the CAP was compatible with the expected result of the GATT negotiations. Having seen what came out of the Blair House negotiations, we still believe that the CAP reform should have awaited the GATT result. Instead we are putting the cart before the horse.

We estimate that the reduction of milk quotas needs to be 4-5% instead of the 2% stipulated in the CAP reform. On top of that, milk prices within the Community must be cut by 8-10%. If not, the imbalance of the milk market will become dramatic and we may see a renationalisation of the farm subsidies. This will hit Danish farmers particularly hard, as we do not have any great tradition for farm subsidies in Denmark.

Ever since World War II, Denmark has invested in the development of markets for dairy products in North America, in the middle East, in Japan and, of course, also in Europe. Millions and millions of ECU have been shaved off the farmer's milk price to secure our strong position in those markets. The fact that we did not get into the EC when we first applied in 1963 made it even more necessary to intensify our efforts in those areas.

Since our entry into the EC in 1973, we have been subject to the EC export policy and have generally found it coherent. Not that we have always agreed, and not that we have not complained now and again, but not dramatically.

That picture has now changed completely. The budget for 1994 indicates a change of policy away from market orientation that will have dire consequences especially for our cheese exports.

Other measures introduced by the European Commission, notably the working group discussing nomenclature and protein standardisation, make us fear that the Commission is moving more and more away from reality and into a dream world where a computer can replace the Management Committee's discussions on market trends.

We fail to understand why the Community will voluntarily give up its share of the world market at a time when unemployment is running at an unacceptably high level. The EU faces hard competition from Japan and from the United States in many other fields, why not fight for what we have?

The impact of the GATT Agreement on the Danish and EU dairy industry

The following is an analysis of the impact of the GATT agreement on the dairy industry in the EU and Denmark.

The main elements of the part of the agreement on reduction of the agricultural subsidies imply that over the period 1995-2000 the countries are required to carry out the following:

- 21% reduction of the subsidised export volume and 36% reduction of the budgetary export subsidies. In both cases the reference period is 1986-90.
- Opening of minimum import access equal to 3% increasing to 5% of consumption in 1986-88.
- Tariffication of the import barriers and an average reduction of 36% on the figures of 1986-88.
- 20% reduction of the internal subsidies. However, premium schemes under the EU farm reform from 1992 and the US deficiency payments are exempt. The reference period is 1986-88.

The agreement will probably be implemented on 1 July 1995.

The final GATT agreement is thus mainly identical with the Blair House accord of November 1992. Thus, quotas as well as prices in the EU will be under strong pressure as a consequence of the requirements of the GATT agreement.

On the basis of an overall estimate, it is realistic to expect reductions in quotas of 4-5% and reductions in milk prices of 8-10% over the six-year implementation period.

The quota reduction is the result of the fact that in year 2000 the EU market will otherwise face a surplus of 4 billion kg because of the quantitative restrictions.

One of the consequences of increased access of imported dairy products at low tariffs is that the EU prices have to be reduced to be able to compete with imported dairy products.

Moreover, as a result of the reduction in the general import barriers prices will come under severe pressure.

Exports

The impact of quantitative export reductions on the EU:

As described in the introduction, up to year 2000 subsidized exports are to be cut by 21% with 1986-90 as the reference period.

Non-subsidized exports are not included in the GATT agreement.

In the final negotiation round the situation of the dairy industry was improved considerably compared to that of the Blair House accord of November last year as the gradual reduction in subsidized exports has been made more flexible.

Whereas the Blair House accord required exports in the first year to be reduced by 3.5% compared with exports of 1986-90 and in the subsequent years be subject to a linear reduction, the requirement has now been eased by changing the reference period for cheese and "other products" to 1991-92.

In year 1 exports are to be reduced by "only" 1/6 of the difference between the 1991/92 average and the year 6 target and in the balance of the period exports are to be reduced evenly.

In the EU the original model for skimmed milk powder is maintained being the most flexible.

In reality the change has the greatest impact on cheese exports as in 1995 the EU will be able to export 407,000 tonnes of cheese with subsidies whereas the Blair House accord required cheese exports to be reduced to 373,000 tonnes. Accumulated over all 6 years it means that the EU will be able to export 102,000 tonnes of cheese more than what was permitted by the Blair House accord. For "other products" the figure is 44,000 tonnes.

Tables 1 and 2 illustrate the consequences of the agreement. The figures are the Commission's official export figures. The two rightmost columns show the percentage reduction in EU exports in 1995 and 2000 compared with the 1992 level.

Table 1

EU permissible subsidized exports to third countries (1000 tonnes)

	1986-1990	1991-1992	1992	1995	2000	1995/1992	2000/1992
Cheese	386	427	421	407	305	-3%	-28%
Butter	463	273	236	447	366	+64%	+55%
SMP	308	264	335	297	243	-11%	-27%
Other products*	1,188	1,206	1,201	1,161	939	-3%	-22%

*whole milk powder, condensed milk and fresh milk/cream

Table 2

Annual permitted levels of EU subsidized exports over 6 years (1000 tons)

	1992	1995	1996	1997	1998	1999	2000
Cheese	421	407	386	366	346	325	305
SMP	335	297	286	276	265	254	243
Other products*	1,201	1,161	1,116	1,072	1.027	983	939

* whole milk powder, condensed milk and fresh milk/cream

The impact of the quantitative export reductions on Denmark

The quantitative export reduction is still distinctly a Danish problem.

It has not yet been decided how the EU obligations to reduce exports are to be administered. Thus, it is not possible to estimate how the reductions will affect the export potential of the Danish dairy industry in the years to come.

Being the largest cheese exporter in the EU and the third among exporters of whole milk powder to third countries, the Danish dairy industry will no doubt face a heavy burden.

In proportion to production Denmark is the largest EU exporter of dairy products to third countries.

Moreover, the products affected are growth products on the export markets, and these very products are the Danish flagships.

To illustrate the extent of the export reductions Table 3 assumes that Danish exports were to be reduced proportional to the EU exports in 1995 (cheese by 3%, other products by 3%) and in 2000 (cheese by 28%, other products by 22%). In Table 3 these figures are compared with exports in 1992.

Table 3

Denmark's obligations to reduce exports up to year 6 (1000 tonnes)

	Danish exports 1992	Danish exports 1995	Reduction 1992-95	Danish exports 2000	Reduction 1992-2000
Cheese	132	128	4	95	37
Other prod.	117	113	4	91	26

Denmark's share of EU exports of butter and skim-milk powder to third countries amounted in 1992 to 6.0 and 1.5% respectively.

Butter exports are not affected by the export reductions because of a quantitative decline in exports compared to the base period 1986-90 whereas, as it appears from the figures, SMP plays a minor part in the third-country exports of the Danish dairy industry.

Budgetary reduction in export subsidies

Besides the quantitative reduction in exports, the requirement of a 36% reduction in budgetary expenses for export subsidies has to be taken into account.

The figures in Table 4 show that cheese exports in particular may encounter difficulties.

If the requirements of the quantitative export reductions are met, the refund expenses will also automatically decline, but far from enough.

However, the scope of the problem depends on the development in the need for refunds after the fluctuations in the world market price and the internal EU prices which the GATT agreement may involve

As to the first year's reduction a solution parallel to that of the quantitative reductions has been found: In this way export subsidies may also be reduced at a slower pace than was originally proposed in the Blair House accord.

Table 4

EU permissible export refunds (million ECU)

	1986-90	1991/92	1992	1995	2000	Change 1992-Year 6
Total	3,142	2,151	2,056	3,032	2,011	-2%
Of this:						
Cheese	439	550	568	521	281	-51%
Butter	1,325	460	308	1,279	848	+175%
SMP	370	183	241	357	237	+2%
Others	1, 008	959	940	973	645	-31%

The considerable figure for butter in the reference period is due to the fact that the former East Germany is included.

In the commitment lists the Commission has tackled the problem of the unification of the two Germanies by including reference amounts and volumes of the former East Germany in the EU figures. However, it is uncertain whether it has been accepted in the agreement with the US.

Market access

The GATT agreement will mean a radical change in the conditions of importing dairy products into the EU.

As to imports, the GATT agreement thus includes a quantitative minimum market access and a requirement of a reduction of the general tariff rates.

Minimum import access - Impact on the EU

As a minimum import quotas shall be opened at "low" tariffs, in the first year equal to 3% of the average annual consumption in the base period 1986-88. The quota is to be increased to 5% during the six-year period.

According to the EU interpretation of the requirement, the minimum import access quota shall only secure low- tariff imports of the difference between on one hand the 3 and 5% of the 1986-88 consumption and on the other hand the actual imports in the base period.

Table 5
EU minimum import access obligation

	Base consumption 1986-88	3% of base-consumption	5% of base consumption	Import 1986-88	Low-quota 1995	Low-quota 2000
Cheese	4,300	129	215	111	18	104
Butter	1,800	60	90	80	0	10
SMP	1,430	43	71	2	41	69

(Exclusive of consumption in the former East Germany)

In the EU a tariff which constitutes 32% of a calculated average tariff for the base period 1986-88 has been imposed on the quotas under the minimum import access.

However, in the final negotiations concessions were granted for cheese, i.e. 15,000 tonnes of cheddar and 5,000 tonnes of mozzarella which could be imported at particularly low tariff rates.

As to butter a consequence of the GATT agreement will probably be that New Zealand's UK butter quota in 1995 can be brought back to the level of the base period which was 78,000 tonnes. New Zealand has proposed a voluntary reduction of this figure against a reduction of the import levy, but negotiations have not been concluded.

Tariffication

The second main requirement concerning imports is that all import barriers in the base period are tariffed (converted into tariffs) and subsequently reduced by 36% on an average over the six-year period.

The reduction of this theoretically calculated tariff cannot be expressed generally as a percentage of the present import duties as these are fixed according to the actual market situation.

Moreover, the impact of the new tariff rates cannot be predicted precisely either as it will be decisive how the market prices, which are often stated in USD, will develop .

However, the point is that a ceiling is now imposed on the EU import duties, which have been variable up till now, and that they cannot longer be adjusted freely.

The result may be that the EU is forced to reduce the internal price level to maintain a prohibitive tariff level.

At best the world market prices will increase as a consequence of a GATT agreement which will relieve the pressure.

But a decline in the world market prices will create a considerable problem. Combined with a low USD exchange rate such a decline may have serious consequences for the price level in the EU.

Internal Subsidies

Product specific subsidies

The requirement of a 20% reduction in internal subsidies with 1986-88 as reference year will hardly be of any significance for future subsidies to the dairy industry in the EU.

The agreement makes a distinction between product specific and non-product specific internal subsidies. Every category has a trifle limit of 5% of the production value which is not subject to restrictions. As regards non-product specific subsidies, the EU is below the trifle limit.

Thus, the reduction has to be made only as far as the product specific subsidies are concerned in terms of AMS (Aggregate Measurement of Support).

AMS is calculated as the difference between the internal administrative price (the intervention price in the case of EU) and an external reference price (EU has used IDA's minimum prices) for the base period which is then multiplied by the quantity produced .

To the EU this means the following AMS for the reference period 1986-88.

Table 6
Product specific AMS for EU 1986-88

	Interv. price 1986-88 ECU/tonnes	IDA price 1986-88 ECU/tonnes	Production 1986-88 1000 tonnes	AMS 1986-88 m ECU
Butter	3,549.90	943.30	2,220	5,773.80
SMP	1,972.60	684.70	1.810	2,328.70
Total				8,102.50

(EU's 1992 commitment list)

Consequently, the AMS of 8,102.5 m ECU is to be reduced by 20% to 6,482 m ECU.

The development from the base period 1986-88 to 1992 shows, however, that the EU is even now significantly below this requirement. The reason is that the production of both butter and skimmed milk powder has decreased strongly.

Table 7
Product specific AMS for EU 1992

	Interv. price 1992 ECU/tonnes	DA price 1986-88 ECU/tonnes	Production 1992 1000 tonnes	AMS 1992 m ECU
Butter	3,364	1,205	1,648	3,558
SMP	2,042	1,072	1,266	1,228
Total				4,786

(own calculations)

Tables 8 and 9 are two examples showing the maximum threshold prices which the EU will be able to operate with in year 2000 given the present world market prices but different USD exchange rates. In table 6 the USD rate is the present (0.89 ECU) and in table 7 the USD rate is lower 10.72 ECU).

Table 8

Threshold prices in year 2000 after tariffication in case of unchanged USD rate (all values stated in common ECU/ton)

	Internat. prices 1993	Threshold price 1993	Max. tariff year 2000	Max. threshold price year 2000	Threshold 1993/2000
Butter	1,268	3,775	1,896	3,164	119%
SMP	1,068	2,294	1,188	2,256	102%
WMP	1,157	2,891	1,304	2,461	117%
Cheddar	1,691	3,719	1,671	3,362	111%

USD/ Ecu = 0.89 (December 1993).

Table 9

Threshold prices in year 2000 after tariffication in case of a decline in the USD rate of approx. 20% (all values stated in common ECU/ton)

	Internat. prices 1993	Threshold price 1993	Max. tariff year 2000	Max. threshold price year 2000	Threshold 1993/2000
Butter	1,026	3,775	1,896	2,922	129%
SMP	864	2,294	1,188	2,052	112%
WMP	936	2,891	1, 304	2,240	129%
Cheddar	1,368	3,719	1,671	3,039	122%

USD/ECU = 0. 72, which under the present ECU rate is equal to 1 USD = 5.48 DKK.

It appears from the tables that with a stable USD/ECU exchange ratio the present threshold price level is up to 19% above the maximum permissible threshold prices in year 2000. With a lower USD rate the gap is even larger.

In addition the tariff rates of butter and SMP in year 2000 will be 33% and 18%, respectively, lower than the present import duties on these products.

Safety clauses

In case of drastic decline in the world market prices the agreement includes a possibility of imposing extra duties on imports.

The mechanism is triggered off when the price of goods imported into the

EU decreases by more than 10% compared with the level of the base period 1986-88.

It is immediately difficult to assess how efficiently this clause works as we do not know the exact contents of it. As the import price in this connection is stated in national currencies, there is a sort of protection against drop in the USD rate.

As to internal subsidies in general only subsidies defined as directly distorting trade are subject to the requirement of a 20% reduction.

In reality, this means that unlimited subsidies may be granted by way of direct income subsidies, if only the size of the subsidies does not depend on the extent of production or performance of factors of production. In the GATT jargon these kinds of subsidies are called green subsidies.

Both the EU hectare and animal premiums of the common agricultural reform and the US deficiency payments are regarded as green subsidies in the Blair House accord.

Conclusion: The impact of the GATT Agreement on EU milk quotas and prices

The quantitative restrictions in exports and the minimum import access requirement mean that, everything else being equal, the EU market will be provided with extra milk quantities equal to approx. 4% of the present quota.

Below, a calculation of milk equivalents has been made on the basis of the conversion factors previously applied by the Commission in connection with GATT feasibility studies:

Table 10
Milk equivalent coefficients (Commission)

Cheese	10.00
Butter	21.00
Skimmed milk powder	0.15
Other products	4.85

This translates into the following increase in milk quantities on the EU market:

Table 11

	ME coefficients	Export reduction	Import increase	1000 t ME
Cheese	10.00	166	104	2, 200
Butter	21.00	0	30	630
SMP	0.15	0	62	9
Others	4.85	262	0	1271
Total				4,110

As indicated, the GATT agreement means that considerable quantities of dairy products will be given access to the EU market at tariff rates that are significantly lower than the present. Partly as a result of the minimum import access requirement and partly because of the generally lower tariff rates.

Thus, prices of products manufactured in the EU will undoubtedly be squeezed, especially the price of cheese and butter as EU imports of these products may increase by 80% and 50% respectively as compared with the 1991 level. At the same time, the price gap between the EU and the world market is largest in relation to these products.

As mentioned, the future import protection with fixed tariff rates depends to a high degree on the development in world market prices and especially on the USD rate.

However, on the basis of an overall estimate, a reduction of the milk price in the EU of 8-10% over the six-year implementation period is to be expected.

Implementation of the GATT-Agreement

The present position of EU dairy products on third country markets is the result of many years of hard labour, sizeable investments in technology, manufacturing and marketing expenditure, several acquisitions of distribution facilities and the accumulation of a wealth of know-how and market intelligence by EU dairy companies and exporters.

Whilst the GATT-agreement will have very little effect on commodities like skim milk powder and butter and whilst it will not endanger the exports of butter in retail packs, the negative consequences for the group "other products", but especially for cheese, will be completely unsustainable, unless orderly marketing can be maintained.

The purpose of this part of the report is to discuss ways and means that can safeguard the equity of the EU dairy industry under a GATT regime, where export quantities for cheese have to be cut by 40% and subsidies by 50% from the 1993 levels. For the group "other products" the reductions will be 20% and 30% respectively, based on the totals, but aggregation within this group may alleviate the problems somewhat.

Today the EU dairy industry is a world player, and its future, also after the turn of the century, must be planned now. For Denmark's cheese industry planning is absolutely vital, as Denmark is the largest supplier to the world market.

The basis of orderly marketing

Anyone dealing in perishable goods will recognise the importance of production planning, proper stock rotation, continuation of supply, seasonal variations in turnover as the basis for orderly marketing. A future EU system for allocation of export subsidies must necessarily make allowance for these requirements. Any system that prevents the EU dairy industry from using its normal regular service as a parameter must be rejected.

Production planning

The basis for the continued development of the EU dairy industry must be a sound planning background. Long term planning of capacity is a condition for the utilisation and profitable running of plants. An EU export system must make allowance for this, or the EU dairy industry will be unable to compete on the world markets.

Securing the income of the dairy farmer

The EU dairy farmers depend upon their industry, be they privately owned or cooperatives, to convert their milk into saleable products and to find markets for them. The GATT-agreement prevents the maintenance of the export markets under present conditions, and unless suitable systems are found, the excess milk will find its way into the EU markets and depress the internal prices to the detriment of the dairy farmers. Whilst this in the short term might be appreciated by the consumers, they will in the long term as taxpayers have to foot the bill for the costs of intervention and the ultimate disposal of stockpiles of dairy products, as we have seen it at the end of the seventies and at the beginning of the eighties.

The former commissioner for agriculture, Mr. MacSharry, maintained that the result of the GATT-agreement could be contained within the reform of the CAP and that no further cuts than the 2% milk quota cut already agreed would be necessary.

The previous calculations made by the Danish Dairy Board in association with the advisory services of the Danish farmers' organisation show that the reductions of the export quantities and subsidies will necessitate a quota cut of 4-5% and a price cut of 8-10%. This calculation was based on an organic growth of the cheese market within the EU of 2% p.a. Recent forecasts indicate that the annual growth rate has dropped to 1% only. Therefore milk quotas will need to be cut by more than the 4-5% to maintain an equilibrium.

Just as much as the industry needs economies of scale to compete internationally, so does the dairy farmer. A quota cut must therefore be accompanied by a comprehensive cessation scheme that will help rationalise the primary production, possibly combined with a pension scheme for older farmers and with other social measures.

Changes of the quota system

In order to secure the dynamism of the industry, changes must be made in the quota system to allow the EU to capture new markets and obtain their share of the growth of the emerging markets, especially in Asia. Whilst these markets are characterised by rapidly growing economies, it is unrealistic to expect them to cover their demands for dairy products from the EU when alternatives are available much more cheaply from Oceania. South America likewise is a growing market.

World market prices for dairy products are expected to rise as a result of the GATT-agreement, but only slowly and probably not until 1998 at the earliest. To enable the EU dairy industry to participate in new market access, it will be necessary to sell part of the production at world market prices without benefitting from the EU export aids.

The solution to this problem will be to introduce two different types of milk quotas, "A" milk and "B" milk.

The "A" quota comprises all milk consumed on the internal market, aided or not, plus the milk equivalents of the exports permitted under the GATT-agreement.

The "B" quota is agreed between the milk farmer and his milk buyer as a quantity produced at marginal costs and being paid at marginal prices to enable the processor to compete on the world markets without subsidies.

A system must be set up to regulate the amount of milk that can be produced under this scheme to secure that "B" milk is not being used to squeeze the price for "A" milk. The Farm Council will fix the annual ceilings.

A scheme of the above nature will secure the livelihood of the remaining dairy farmers and will enable the EU dairy industry not only to maintain their present world market positions, but also to participate in the market access that has been one of the positive results of the GATT-agreement. But these opportunities do not come automatically, they must be planned for and fought for.

In connection with the introduction of "B" milk, it should be examined whether certain countries with a high price level and a correspondingly high import protection would be prepared to enter into bilateral agreements with the EU. The purpose would be to eliminate export subsidies and import levies, but it would have to be a commitment on the EU to maintain minimum export prices that would not undercut the importing country's price level. The WTO could be used to police such agreements.

Allocation of export licences

The administration of the export licence system will necessarily have to take into account the present market positions of the EU dairy industry. At the same time, it must be dynamic and make room for structural changes in the industry.

It is therefore proposed to allocate the greater part of the export quantities and subsidies to the individual countries on the basis of their actual production of each of the four groups, cheese, SMP, WMP, and other products, during 1993. A reserve must be kept for new-comers. The individual countries must then allocate the export rights to the producers also on the basis of their 1993 third country export production.

This will immediately lead to complaints from the exporters that they are the rightful owners of the export quotas. The argument, however, is that there can be no exports if there is no production, and since milk quotas are national, so must production quotas be.

Exporters, on the other hand, may be located in a different country or may choose to export from yet another country. Therefore, the "birth certificate" of the product must be the deciding factor. We must make sure that trade will be in products, not in licences.

Furthermore, it is the producers who will carry the burden of capacity costs and securing the farmers an outlet for their milk production.

A producer who does not possess his own sales force or who cannot sell his entire production relies on an exporter, and the exporters in turn rely as much on the producers. This will be just as true in the future as it has been in the past, so there can be no grounds for complaints, apart from exporters who have been used to shop around for their supplies.

An annual review must take place to reflect changes in the structure, both on a national level and among the EU countries. Likewise, a country may surrender its export quota for the last quarter of a GATT-year for reallocation among other countries without losing it, whereas unused quotas would be forfeited. The system must be so flexible that no opportunities are lost.

Naturally, the Commission must be prepared to spend the money on export subsidies that are allowed under the GATT-agreement and which is necessary to fulfil the target quantities and not just use the agreement as an excuse for budget cuts.

Conclusion

It is by no means an easy task to introduce measures that will, on the one hand, safeguard that the international commitments are being respected, and on the other hand, secure the dynamic development of a competitive EU dairy industry.

That means that neither the European Commission nor the national governments may be allowed to shy away from it by introducing "non-bureaucratic" solutions like fixing export subsidies through a tender system or similar "easy" solutions. This will disrupt trade, farm incomes and employment within the shortest possible time frame.

Likewise, a system based on a first come, first served basis would make orderly marketing impossible and make a mockery of production planning.

The basic principles of the Treaty of Rome must still be respected and defended:

- to ensure stability on the EU market for dairy products
- to secure farmers/producers against drastic income losses
- to ensure development in productivity and industry structures.

In an era of unemployment and recession in Europe, the EU must fight for its rightful share of the world market and not give up markets that have been developed through generations. We must remain aggressive and fight for our positions, others are out there to grab what we have if we are not being bold.

A Stocktaking of the Beef Market Policy and its Medium Term Prospects

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As a starting point, let us recall the main features of CAP reform for the beef regime which were operational from July 1 1993. First, intervention prices were programmed to be reduced by 5% in each of the three marketing years 1993/94, 1994/95, and 1995/96. The ceiling on intervention intake was to be reduced from 750,000 tonnes to 350,000 tonnes over the period, and the buying-in or safety net threshold was also to be reduced, to 60% of the intervention price. Subsequent to the reform, the Commission decided to reduce progressively the carcase slaughter weights of animals eligible for intervention and from last July that stands at 340kg.

On the positive side, existing premia were to be progressively increased and new premia introduced. However support provided under the existing premia was restricted to a maximum stocking density per hectare of forage.

The maximum densities are:

- 1993: 3.5 LU/ha (*) of forage area
- 1994: 3 LU/ha of forage area
- 1995: 2.5 LU/ha of forage area
- 1996 onwards: 2 LU/ha of forage area

(*) LU = livestock unit.

The maximum stocking density does not apply to small holdings with less than 15 livestock units.

Producers can now benefit from four different premia:

1 The existing Special Beef Premium (for not more than 90 animals per holding) was maintained and scheduled to rise from 60 ECU in 1993 to 90 ECU in 1995. The premium is payable twice in the life of each animal at 10 months and 22 months; the premium is not subject to individual limits but subject to a maximum national limit for a given reference year. Ireland chose 1992 and returned 1,540,000 animals for that year, but this was reduced to 1,286,521 in the July 1994 price agreement.

2 In order to deseasonalise slaughterings of steers, an additional premium of 60 ECU per head for animals slaughtered from January 1 to April 30 was introduced where the number of animals slaughtered during the period September to November exceeds 40% of annual slaughterings.

3 Entitlement to the Suckler Cow Premium is restricted to the number of premiums paid in 1990, 1991 or 1992 and again Ireland chose 1992. The premium payments were agreed to rise from 60 ECU in 1993 to 120 ECU

in 1995. An additional premium of 20 ECU, financed by FEOGA, was agreed for certain parts of the EU including Ireland.

4 With a view to encouraging environmentally-friendly production, the special beef and suckler premia were increased by 30 ECU, where the stocking density on holdings is less than 1.4 LU per hectare of forage.

Finally, Member States could introduce a processing premium for calves or special intervention for lightweight carcases. These options have however not been taken up by Member States.

The present situation

Even though CAP reform only took place about 18 months ago, the situation to date has turned out very differently to what was anticipated. The main factor in the new equation was the devaluation of the Green Punt in January 1993 and the subsequent adjustment of July 1993. This boosted farm prices including beef prices significantly, but the beef market remained stronger also due to lower than anticipated supplies.

Table 1
Rates of premium

	(1992)	1995
	IR£	
Suckler cow	68.54	136.70
Special beef	35.15	87.88 (x 2)
Extensification	—	29.28
Deseasonalisation	—	58.58

The rates of premium for the base year 1992 and the final year of the reform are shown in Table 1. The increase in the levels of payment for the existing premia are very significant, and especially in the case of the Special Beef Premium when the double payment is taken into consideration.

Table 2
Premium payments 1995 ('000)

Suckler cow	920
Special beef	1,950
Extensification	
– Suckler cow	750
– Special beef	1,100
Deseasonalisation	220

Table 2 shows the estimated number of premium payments in respect of 1995. The numbers qualifying for the suckler premium seem to be less than the numbers estimated in official statistics but it does not appear as if significant numbers are excluded by the stocking density restriction. About two-thirds of the animals in the appropriate categories will qualify for the extensification premium and about 220,000 animals for the deseasonalisation premium.

Table 3
Returns to the cattle sector IR£m

	1992	1995
Market	1,265	1,328
Headage	98	103
Premia	117	363
TOTAL	1,480	1,794
Direct Payments (%)	14	26

The aggregate returns in the beef sector, inclusive of market revenue and direct payments, are shown in Table 3 for 1992 with an estimate in respect of 1995. As indicated earlier, the outturn in 1995 will probably be considerably greater than expected, with total returns over 20% greater than in 1992. This largely follows from an expected higher price in 1995 than in 1992, when most estimates at the time of CAP reform were budgeting for a 15% decline. Even if the same cattle prices are realised in 1995 as in 1992, total revenue would still be up by over 15%.

The changed situation in the cattle market over the past two years is no better illustrated than in the developments with respect to intervention. As shown in Table 4, there were no intervention purchases in 1994, in contrast with the very high levels in the preceding years.

Table 4
Intervention trends ('000t)

	Purchases		Stocks	
	IRL	EU	IRL	EU
1991	267	1,027	247	950
1992	246	890	251	1,090
1993	58	165	166	474
1994	—	—	30	100

This dramatic reversal in the situation has greatly eased the pressure on the beef market and with export prices remaining reasonably firm there have been significant savings in the budget for the beef regime in 1994.

Table 5
Supply situation in EU (M. Tonnes)

1991	1992	1993	1994	1995
8.723	8.396	7.850	7.850	8.050

The level of supplies in recent years is shown in Table 5. After the peak in 1991, production has fallen off sharply and only a small expansion is envisaged for 1995. The surge in supply is somewhat less than expected with a cyclical high expected in 1996 and reducing somewhat thereafter.

Table 6
GATT and exports ('000 Tonnes)

	Actual	Allowable
1992	1,325	–
1993	1,225	–
1994	1,000	–
1995	–	1,119
1996	–	1,058
1997	–	998
1998	–	936
1999	–	877
2000	–	817

The beef situation and GATT

As for CAP reform, the impact of GATT on the beef sector may not be as severe as feared earlier. As shown in Table 6, beef exports from the EU were reduced to about 1 million tonnes in 1994 and allowable exports under GATT are of this magnitude for the next two years. We further do not have the massive overhang of intervention stocks which existed during the end of the GATT discussions and the supply situation looks somewhat easier also as indicated in Table 7 for the next three years. Much depends however on the trend in

Table 7
EU (12) beef balance sheet ('000t)

	1995	1996	1997
Consumption	7,500	7,500	7,500
Imports	500	500	510
Exports	1,119	1,058	998
Production	8,050	8,150	8,100
Surplus/Deficit	- 69	92	112

consumption. Perhaps I am showing an optimistic trend for this parameter in the Table but with that assumption, the balance sheet would show only a small surplus. To the extent that consumption could weaken from that shown, then the surplus would be greater. In any event we would appear to be facing a market situation less threatening than we thought only a year ago.

Output trends in Ireland

Cattle output in Ireland declined somewhat in 1994 and on the assumption of some increase in stocks, as indicated in Table 8, output will fall by about 5%. However we have the lowest level of total disposals and export slaughterings in 1994 in a decade.

The lower disposals is due to some extent to export of calves and weanlings in the two preceding years while the steer kill, the lowest also since 1983, has been severely affected by the increase in live exports.

Table 8
Output of cattle in Ireland ('000)

	1992	1993	1994
Live exports	187	384	390
Export slaughterings	1,512	1,417	1,260
Domestic consumption	202	190	190
Disposals	1,901	1,991	1,840
Imports	5	10	5
Stock changes	99	39	90
TOTAL	1,995	2, 020	1,925

Arising from the fluctuations in the level and components of cattle output, it is instructive to examine the productivity of the national cow herd over recent years. As shown in Table 9, while total cow numbers has increased by 17%

Table 9
Trend in cow numbers ('000t)

	Dairy	Beef	Total	Productivity*
1988	1,481	482	1,963	89
1989	1,478	558	2,036	88
1990	1,463	624	2,087	91
1991	1,331	817	2,148	89
1992	1,288	886	2,174	92
1993	1,281	979	2,261	89
1994	1,292	1,010	2,032	84
1988 = 100	87	210	117	

* = Output/cow numbers (%)

since 1988, there has been a small decline in dairy cows, but beef cow numbers have more than doubled. However, productivity of the total cow herd has oscillated to some extent, but peaked at 92% in 1992. Given our estimates of output shown in Table 8, it seems as if productivity declined sharply in 1994, which might suggest that official beef cow numbers are somewhat exaggerated or some cows are being retained without producing calves in the interests of keeping up numbers for premium purposes. Having said that, statistics on the cattle sector can be quite volatile, and in predicting supplies, cohort coefficients can be very unstable and thereby unsuitable as predictors. Nevertheless we expect disposals to be somewhat greater in the next two years than in 1994.

Conclusion

While the beef situation, and particularly supply and prices, have turned out somewhat differently than expected and in consequence eased our fears about the future, the situation can alter quickly, as we know only too well from the past. Factors such as the Gulf War, oil induced depressions or BSE can wreak havoc on predictions relating to price levels and supply/demand balances. But for the moment there is optimism. Intervention stocks have been eliminated, having been off-loaded at a rate of over 0.5 million tonnes per year for the last two years, and this should ease the pressure on the market situation somewhat. We also have scope for expanding steer numbers towards the permitted ceiling of 1,286,000 while the stocking density measure gives an advantage to Ireland against intensive Continental production.

But there are threats also. The increasing tendency towards super veal production could enhance supplies at a rate somewhat faster than projected, while further concessions towards Eastern Europe in the form of increased access could reinforce the process and ultimately pose more of a threat than GATT.

We also have the issue of what will happen at the end of CAP reform. We are in the second of the three-year CAP reform phase and the final adjustment will be effected for the 1995/96 marketing year. While provision is made for the budgetary cost of the reforms, it is not clear what will evolve in policy terms when the 1992 reforms expire in less than two years from now. Will the policy and budgetary framework in place at the end of the reforms be rolled-over, or will any significant adjustments be made in the light of prevailing market or institutional circumstances?

From the point of view of supporting consumption, it probably would be better to reduce institutional beef prices further, provided there would be offsetting compensation in the form of increased premia. But it is unlikely that full compensation will be conceded, and with growing pressure towards further trade liberalisation some further decoupling of support from production cannot be ruled out. We cannot however allow the price competitiveness of beef against that of white meats to deteriorate further, otherwise consumption could be seriously affected. Finally, while the outlook is less foreboding than one would have thought a year ago, when it comes to the beef industry the word caution should not be exorcised from the vocabulary.

Options for Beef Production on Dairy Farms

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Since the introduction of milk quotas in 1983 dairy farmers have been restricted in expanding milk output. Individual farmers have increased milk output through the purchase of additional quota under restructuring schemes, temporary leasing, leasing land and quota, purchase of land and quota and/or by just producing over quota and hoping to avoid superlevy.

Expanding milk output has generally been the most profitable farming option for efficient dairy farmers where the farm business was able to carry the extra investment costs associated with expansion. The benefits from expanding milk output were lost in some cases where significant extra capital investment in buildings, quota and stock had to be funded totally with extra borrowing. Problems with repayment difficulties were compounded in such cases due to high borrowing levels before expansion combined with increasing income tax liabilities as capital allowance and stock relief claims decreased.

The advantage of the relative profitability of dairying compared with cattle/ sheep since 1983 is largely responsible for the benefits gained from expanding milk output despite having to lease or purchase the extra quota.

Objective

Presently, many dairy farmers may ask: will dairying continue to maintain or increase its relative advantage over beef production after the effects of CAP reform and the GATT agreement on both enterprises?

In this paper the options of continuing with beef production with progeny from the dairy herd or replacing the beef enterprise with milk produced on leased quota are examined. The exercise is based on a case study for an efficient dairy and beef farmer that rears all the progeny to 2 years for own replacements, with surplus cattle sold as beef. In this exercise, the Teagasc computerised farm planning system - FINPACK – was used.

CASE STUDY DETAILS

Farm	140 acres (very good) with 81,000 gallons usable owned quota. Fully developed with slatted accommodation for all stock.
Stock	72 Dairy cows @ 1125 gallons per cow. 14 Replacement heifers. 20 Beef heifers for sale @ 20/24 months @ 520 kg. 34 Beef bullocks for sale @ 24/25 months @ 600 kg.
Existing borrowings	£50,000 Term loan over 7 years @ 12%. £35,000 Average working captial/stocking loan.

Annual interest costs	(£70/acre)
Other fixed costs excluding depreciation	£20,500 (146/Acre)
Depreciation	£5,600 (£40/Acre)

Production costs

	Grazing	Silage
Fertilizer	£60/Acre	£72/acre
Herbicides	£2/Acre	£3/acre
Silage cutting	—	£45/acre
Additive	—	£1.20/tonne
Polythene	—	£0.35/tonne

First cut silage 57% of farm
Second cut silage 50% of farm

LIVESTOCK INPUTS

	Dairy Cows	**Replacement Heifers**	**Beef Heifers**	**Beef Bullocks**
Purchased Feed (kg)				
Milk replacer	—	30	30	30
Calf ration	—	150	130	130
Weanling ration	—	200	150	150
Beef ration	—	—	350	600
Dairy ration	750	—	—	—
Silage (tonne/unit)	8	9	9	10
Vet (@ AI) Costs	£45	£40	£20	£20
Marketing/Other	£7	—	£15	£20

Farm income in 1992 is established for the case study farm, based on a milk price of 92p per gallon nett of levies and transport and a beef price of £2.20 per kg as used by M. Barlow in his paper in this Journal.

Effect of CAP reform

In order to determine the most profitable enterprise mix in future, assumptions on the impact of CAP reform and the GATT agreement on both dairying and beef are required. In his paper M. Barlow concludes that spring beef prices will suffer a reduction from 1992 levels of between 10 and 20%. For the purpose of this exercise we have assumed a spring price fall of 10% compared with 1992 levels i.e. spring beef at 198p per kg after impact of GATT.

The effects of GATT on dairying is based on a report from the Production Economics Unit, Teagasc, published in March 1994 and also personal communication with W. Fingleton in that Unit.

Assumptions on a combination of quota and price cuts were made for the purpose of this exercise. A milk quota cut 4% is assumed so that EU milk output will comply with GATT reductions in "surplus" export volumes and allow for increased access to imports into the EU. In addition, a price cut of 8% on average '92, '93 and '94 milk prices (approx. 5.5% on '92 price) is assumed to cope with conditions on the world market. On the cost side the only change assumed is a reduction in concentrate prices of 15%.

Replacing beef enterprise with extra cows

In the examination of profit projection for all-dairying compared with the existing dairy/cattle combination, the following assumptions were made:

Capital costs

Livestock	-	No nett financial cost or saving as cows replace cattle on a livestock unit basis.	
Buildings	-	Winter Housing -	£100 per extra cow for modifications to the cattle housing. Total £5000 (72 to 117 cows)
		Milking Parlour -	No new investment required or £30,000 on new parlour.
Equipment	-	Extra bulk tank capacity £8000	

All extra investment costs bear interest at 11/12%.

Quota leasing costs

Leased quota @ 25p per gallon.

Cost of land leased with quota assumed to be recovered with alternative enterprise as this land will not be required for milk production.

Sale of surplus calves from "All-Dairy" enterprise

90% calving with 20% replacement rate and surplus calves sold at an average of £135 per head.

Extra fixed costs with All-Dairying

Assumed @ £3500 (i.e. £25 per acre)

PROFITABILITY OF OPTIONS

Taking the 140 acre dairying and cattle farm and using the assumptions set out above, the output, costs and profit margin are shown in Table 1 for the pre GATT situation (1992), and with two options in the post GATT situation:

(i) continuing the present farming system of dairying plus finishing progeny to beef and

(ii) concentration on total dairying by leasing extra quota and selling all calves not needed for replacements. The systems are operated at a high level of efficiency.

Where there is no change in system or level of efficiency, the changes in market conditions as a consequence of GATT results in a 5% fall in income on dairy and cattle farms. If the finishing cattle system is discontinued and replaced by more dairying the income is improved by 5% from the 1992 base year.

In the post GATT situation the income from all-dairying is 11% or £3,922 better than the dairying and cattle finishing system.

Table 1

Output, costs and profit from "milk and cattle" or "all milk" pre and post GATT (£)

System	1992 Milk & Cattle	Post GATT Milk & Cattle	All Milk
Output			
Milk sales	74,520	70,470	114,514
Cattle sales including			
Culls	42,058	37,852	9,903
Calf sales	—	—	11,768
Premiums	1,190	5,976	—
Total Output (A)	**117,768**	**114,298**	**136,185**
Costs			
Variable costs	43,888	41,533	39,912
Quota leasing	—	810	13,466
Interest	9,850	9,850	11,280
Other fixed	20,500	20,500	24,000
Depreciation	5,600	5,600	7,600
Total costs (B)	**79,838**	**78,293**	**96,258**
Farm profit (A-B)	**37,930**	**36,005**	**39,927**

Efficiency

Both the dairying and cattle systems are operated at a high level of efficiency. It is likely that only a small proportion of livestock farmers operate their farms at this level. Relatively small changes in efficiency can have substantial effects on profits. (Table 2)

Table 2

Effect on farm profit of 5% lower milk yield and cattle finishing weight post GATT

	Higher Efficiency	Lower Efficiency	Difference
Farm profit (£)	36005	30693	5312
Relative %	100	85	15

A 5% lower milk yield and 5% lower cattle finishing weight reduces farm profit by 15% when other factors are kept constant. Not for the first time it indicates that greater improvement in income can be obtained from raising efficiency rather than changing systems.

Premiums

The slaughter premium has not been included in the calculation of farm profits in Table 1 and 2. In the dairying and cattle system the 10 month and

22 month premium is included on all male animals sold at finished weights. The stocking rate (0.8 LU/acre) allows the payment of these premiums provided the farmer operates official milk recording. If milk recording is not carried out there will be a loss of £3188 in cattle premiums.

Investments for extra milk

Since stocking rate is being held the same in the change from dairying plus cattle to all-dairying the disposal of cattle will fund the investment in extra dairy cows. In Table 1 only minimum investment in facilities was envisaged to handle the extra milk, i.e. £13,000 to provide extra cubicles and bulk tank storage. Where a farmer must build a new parlour and provide a new bulk tank an extra investment costing about £30,000 would be required. This reduces the attractiveness of moving to all-dairying compared to staying with the present system. Table 3 shows the relative farm profits for various situations of premium payments and investments required to handle extra milk.

Table 3

Income post GATT relative to 1992 income for milk and cattle at £37929 (100)

System	Milk & Cattle		Milk Only		
	No Slaughter Premium		Slaughter Premium	Minimum Investment	New Parlour & Bulk Tank
	Milk Recording	No Recording	Milk Recording	13,000	43,000
Relative Income	95	87	100	105	84

Sensitivity

The above analysis is based on conditions obtaining in 1992 and estimated market conditions post GATT implementation. Possible changes in the relative profitability of dairying and cattle will have a large influence on which path to follow. The effects of the main factors that could alter farm profits are shown below.

Sensitivity Factor	Change +\-	Dairying & Cattle	Dairying Only
Milk price	5p/gal	4050	6581
Milk yield	50 gals/cow	3132	5090
Quota leasing cost	5p/gal	162	2693
Cattle selling price	£5/100kg	1565	555
Cattle sale weight	25kg/head	1408	–
Calf price	£20/head	–	1740

Milk price change has the greatest effect on profitability for both dairying plus cattle and dairying only systems, followed by milk yield.

Where farmers have higher milk yields at similar costs there is considerable income advantage from moving towards extra milk production. The cost of leased quota is an important factor. In the 'dairying only' system a 5p change in quota leasing cost results in a change in profit of £2,693. In the event of quota leasing increasing from 25p/gal to 33p/gal all the extra income of changing to dairying would be lost in paying for the extra quota required.

Not all farmers will operate dairying and beef at comparable levels of efficiency. In situations where the cattle enterprise is the 'poor relation' there would be a bigger advantage in changing to dairying.

Conclusions

1. On a well stocked efficiently operated dairying and beef farm, profit post GATT is implemented is envisaged to fall by 5% from the base year of 1992.
2. Efficiency is vital to good incomes and is the priority on raising income on cattle/dairy farms.
3. Changing to "dairying only" provides 11% better income than the current system when extra quota is leased at 25p/gal i.e. an extra £3923 can be earned on a 140 acre farm.
4. If the leasing cost rises to 33p/gal there is no extra income from moving to all-dairying.
5. Major investment in facilities for extra milk will make switching to all-milk less attractive.
6. If the slaughter premium remains in place, incomes can be maintained at 1992 levels.

Other factors which influence the direction to follow are the preference of the farmer and the layout of the farm.

Given the small differences between systems, the improvements that can be obtained from raising efficiency and the large influence of the sensitivity factors, individual farmers should examine the scope for income improvement with their present system before contemplating any change.

The benefits of changing to dairying will depend on:

1. The relative profitability of dairying and beef.
2. Farmers' management efficiency of both enterprises.
3. Cost of leased quota.
4. Extra investment required and method of funding.

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Systems of Beef Production and CAP Reform

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Introduction

The last ten years have seen massive changes in the cattle industry in Ireland. These include:

- increase in total cow numbers to record levels.
- development of the suckler herd to be numerically almost on a par with the dairy herd.
- restriction on cow numbers for both milk and beef as a result of CAP changes.
- 'Holsteinisation' of the dairy herd and increased 'continental' genes in the 'suckler' herd.
- replacement of Herefords by Continentals for crossing in both dairy and suckler herds.
- move from 'Intervention' to market place as the main outlet for steers.
- recognition that the 'Green' image should be a marketable commodity;
- the introduction of the Rural Environment Protection Scheme (REPS) should enhance profitability on participating beef farms.
- the substantial premia now available means that premia now make a major contribution to the incomes from beef production.
- All of the above, with the exception of 'Holsteinisation' might be considered positive developments for the Irish beef producer. Some of the changes in production practices which the authors feel are appropriate are considered in this paper.

Current position

Cattle slaughterings in the EU are summarised in Appendix 1. The breed composition of animals available in Ireland is given in Appendix 2, and carcass data for steers, heifers and cows for 1992 and 1993 are given in Appendix 3.

From the data in Appendix 1 it is obvious that Ireland deviates from the overall EU situation in the following aspects:

- lower replacement rates in Ireland and thus relatively more heifers slaughtered.
- virtual absence of veal and bull production in Ireland.
- steer (bullock) beef relatively more important in Ireland than elsewhere.

The returns from different systems in Ireland and how these are likely to change in the coming decade are reported by M. Barlow in this Journal. We will consider:

i) production practices appropriate for new or altered production systems
ii) biological efficiency and implications
iii) input/output targets for a variety of production options. **There may or may not be a reliable market for the options considered.**

i) Production practices

Many of the good husbandry practices essential for efficient "Grass to Beef" systems are well documented and will not be discussed here. However, it is felt that the following considerations must be addressed as a matter of urgency if we are to remain competitive in the short term.

* high growth potential and relatively low forage intake capacity of continentals. The implications for indoor feeding are obvious but implications for grazing are not defined.
* Should be possible to maintain high performance throughout the grazing season with a minimum of supplementary feeding. The specific management strategies which will achieve high performance particularly towards the end of the grazing season requires further research.
* In theory parasite control should be simple in the spring calving suckler herd -in practice no information is available on critical management factors. In particular, there is an absence of information on the parasite control measures required during their second grazing season for both suckled and artificially reared animals.
* What is "quality beef' to the consumer and what premium will it command at the farm gate?

ii) Biological efficiency

* In biological terms beef is costly to produce. The unique role of the ruminant allows the utilisation of fibrous foods by virtue of its large fermentation chamber - the rumen. However, feeds such as concentrates (which can be digested by Mammalian enzymes in the monogastric) are "downgraded" by at least 30% relative to the monogastric. This "downgrading" is mainly due to:
    - maintenance costs of microbial population;
    - methane losses;
    - the fact that products of fermentation such as volatile fatty acids are used less efficiently at tissue level than the corresponding sugar from which they are derived.
* White veal production which accounts for some six million calves in the EU is also costly to produce (despite the fact that the calf is maintained in a pre-ruminant state on a milk-type diet), due mainly to the high cost of milk and milk replacers. White veal is the term used for calves raised on high milk levels. Milk is deficient in iron and as a result when calves are fed for extended periods with milk as the total diet the myoglobin content of the muscles is reduced - thus the pale meat colour. Traditionally, the "best" veal came from suckled calves slaughtered at 3-4 months of age but since the 1950's the pre-dominant source of veal in Europe has been bull calves from the dairy herd.

Table 1
Input/output targets for a number of systems

A. Traditional Systems

Breed	1. HxF	2. CxF	3. HxF	4. CxF	5. F	6. CxF
Sex	Steer	Steer	Steer	Steer	Steer	Heifer
Age at Slaughter (M)	29	29	24	25	24	24
Carcase (Kg)	340	430	300	380	320	310
INPUTS						
Milk Replacer (Kg)	25	25	25	25	25	25
Concentrates (Kg)	300	400	700	1000	800	800
Silage (Kg DM)	2200	2200	1800	2000	1800	1800
Forage Acres	1.5	1.8	1.0	1.2	1.1	1.1

B. Young Bull and Veal

Breed	7. CxF	8. CxF	9. CxF	10. CxF	11. F	12. F
Sex	Bull	Bull	Bull	Bull	Bull	Bull
Diet	All silage	Grass/ Silage	Barley Beef	Barley Beef	Veal (white)	Veal (pink)
Age at Slaughter (M)	17	17	12.5	11.5	6	7
Carcase (Kg)	320	330	290	250	150	150
INPUTS						
Milk Replacer (Kg)	25	25	25	25	410	50
Concentrates (Kg)	1400	1300	2150	1950	None	850
Silage (Kg DM)	1800	1000	[1]None	[1]None	None	[1]None
Forage Acres	0.4	0.5	None	None	None	None

[1]Source of roughage needed

C. Suckler Systems (L x F cows; Charolais sires)

Breed	13		14		15	
Sex	Bull	Heifer	Steer	Heifer	Steer	Heifer
Age at slaughter (M)	16	20	24	20	29	20
Carcase (Kg)	360	300	400	300	450	300
Inputs per cow unit						
Concentrates (Kg)	800		600		350	
Silage (Kg DM)	2600		3000		3100	
Forage acres	1.6		1.9		2.2	

"Pink Veal", "Alternate Veal", "Baby Beef" are terms which have come to describe veal produced on solid diets. Intensive research on these systems is currently underway in many European countries and a system has also been developed in Australia (Moran *et al.,* 1991). As it is evolving in Europe, calves are fed high concentrate diet post-weaning until slaughter at about 7 months of age. The feed costs for "White Veal", "Pink Veal" and "Barley Beef" relative to the pig per kg carcase are given below. The input/output assumptions for "Veal" and "Barley Beef' are given in Table 1 with milk powder costed at £1.20/kg, "Pink Veal" concentrate is charged at £0.20/kg and "Barley Beef" concentrate at £0.15/kg. In the pig it is assumed that it takes 3.7 kg concentrates per kg carcase.

	Feed (including animal replacement) Costs - £/Kg Carcase
White Veal	4.30*
Pink Veal	2.50*
Barley Beef	1.90*
Pig	0.70

* See Table 1

** Calf included at £150; Breeding stock feed included for pig.

iii) Input/Output targets

The input/output targets for a variety of beef production systems are shown in Table 1.

CONCLUSIONS AND RECOMMENDATIONS

Sucklers - suggested framework and targets

1. * **Calving** : Spring
   * **Cow** : Continental Cross (Milky)
   * **Sire** : Third Breed, Continental
2. * **Output** : Calf/cow/year
   * **Calving interval** : 365 day
   * **Calving spread** : 90 percent in 10 weeks for early spring calving and 8 weeks for April/May calving
   * **Replacement rate:**
     {Replacement costs are low when planned)
   * Cull cow : 330 kg carcass when finished
3. * **Parasite control**
   - no reliable information for suckled calf but not a major problem.
   - absence of information on parasite control during second grazing season
4. * **Grazing management for autumn finishing**
   - inadequate information

Continental breeding - Implications

* High growth potential
* Low forage intake capacity relative to Friesians

The high growth potential and low forage intake capacity of continentals relative to Friesians dictate that finishing continentals should receive higher levels of concentrate supplementation than Friesian. In the grazing situation it would appear that high quality herbage should be capable of sustaining high performance in continentals without supplementation. There is however, an urgent need to quantify appropriate strategies for continentals at grass.

Live exports to continental EU - Serious questions raised

1993: 70,000 calves; 33,000 stores

* Calves/weanlings

  are we less efficient than competitors?

  The calf supplies in Western Europe have decreased due to the absence of Eastern European sources of calves in recent years and reduced cow numbers. This may partly explain the increased export of calves from Ireland. However, the possibility that we are less efficient than our competitors should not be overlooked.

* Finished animals

  Do our factories need competition from the live trade to provide an equitable price to the producer? This is a question that will continue to arise.

Production costs

Beef biologically inefficient

Because of high costs of production (documented in paper) beef must command a premium price, relative say to pig meat. Thus, the marketing side of the industry must legitimately exploit the "green" image of Irish beef.

SUMMARY

* In terms of production practices Ireland is very much out of step with most EU countries. This does not imply that we should or must change our systems. A number of options are considered.

* Steer beef production is biologically less efficient than bull-beef production and would need to command a premium price to make it equally profitable.
* Producers in Ireland should not change to bull beef production or other novel systems unless a market is assured.
* Changes in the breed composition in the national herd in the recent past are mainly positive from a beef production point of view.

* There is insufficient information in the area of grassland management for finishing continental cross steers off pasture in autumn.
* There is a serious deficit of information in the area of parasite control of suckled calves and animals during their second grazing season.
* Compact calving is a necessary prerequisite for an efficiently run spring-calving suckler herd. Ninety percent of the herd should calve in 10 weeks with a calving interval of 365 days for early spring calving. For later calving (April/May) herds the calving period should be reduced from 10 to 8 weeks.
* High replacement rates should not be a consequence of the need to maintain compact calving.
* Cow maintenance requirements should not be considered in isolation but rather in the context of product output, e.g. value of weaned calf or of finished animal per unit cost.
* Upsurge in the export of calves and weanlings in recent years is an ominous development. This is probably due to reduced calf supplies in Western Europe resulting from an absence of Eastern European sources of calves in recent years and reduced cow numbers. Animal welfare issues, both with respect to transportation and subsequent production systems imposed on exported calves, imply that we should seriously consider systems such as "cereal beef" and "pink veal" in Ireland.

References

Caffrey, P. J. and P. O. Brophy (1975): Beef Production from spring born calves using an intensive grassland system. Irish Grassland and Animal Production Assoc. J. 10: 45-59.

C.B.F. (1987): A Market Assessment of Bull Beef. Irish Livestock and Meat Board, Lr. Mount St., Dublin 2.

Connolly, J. A. and P. J. Caffrey (1994): Relative Profitability of beef production Systems (Unpublished University College, Belfield, Dublin 4).

Drennan, M. J. (1993): Systems of Beef Production using Continental Cross Cattle from the Suckler Herd. Irish Grassland and Animal Production J. 27: 41-49.

Jarrige, R.(1989) [French (INRA) System]: Recommended allowances and feed tables. John Libbey Eurotext

Moran, J., Hopkins, A. & Warner, R. (1991): The Production of Pink Veal from Dairy Calves in Australia. Outlook on Agriculture, 20: 183-190.

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APPENDIX 1

Cattle slaughterings in EU 12, 1993

	Total Cattle			Steers			Bulls			Cows			Heifers			Calves		
	'000	'000 hd	kg	'000	'000 hd	kg	'000	'000 hd	kg	'000	'000 hd	kg	'000	'000 hd	kg	'000	'000 hd	kg
EU12	7757	28225	275	865	2468	350	2782	8484	328	2102	7004	300	1189	4339	274	811	5980	136
Belgium	367	1101	333	14	37	378	125	284	440	128	308	416	39	93	419	61	379	161
Denmark	203	801	253	1	5	200	99	395	251	86	307	280	16	66	242	1	28	36
Germany	1604	5327	301	14	40	350	811	2286	355	487	1656	294	227	817	278	66	527	125
Greece	76	343	222	2	6	333	46	181	254	9	39	231	8	35	229	12	82	146
Spain	492	1995	247	–	–	–	261	1024	255	79	297	266	136	603	226	9	72	125
France	1704	6262	272	157	388	405	428	1095	391	628	1932	325	219	642	341	272	2205	123
Ireland	528	1607	329	304	812	374	6	15	400	87	307	283	130	472	275	–	–	–
Italy	1188	4813	247	3	12	250	678	2183	311	173	693	250	140	556	252	194	1419	137
Luxembourg	7	21	333	1	3	333	2	6	333	2	6	333	2	6	333	–	1	–
Netherlands	611	2487	246	–	–	–	161	434	371	242	801	302	21	78	269	187	1174	159
Portugal	115	496	232	3	8	375	63	238	265	22	88	250	19	89	213	8	74	108
U.K.	863	2973	290	366	1158	316	103	344	299	160	571	280	232	881	263	1	19	53

Source: Eurostat, Animal Production, 1994.

APPENDIX 2

1. Numbers and Disposition

Cows:	2,300.000<	1,300,000 dairy (Holstein/Friesian)
		1,000,000 suckler (increasingly continental)
Annual calf crop:	2,000,000	
Friesian	600,000 <	300,000 Heifers (replacements/cull cow)
		300,000 Males (steer beef)
Early maturing beef X	440,000 <	220,000 Heifers (domestic consumption, replacements)
		220,000 Males (steer beef)
Continental x	960,000 <	480,000 Heifers (exports/replacements)
		480,000 Males (steer beef)

APPENDIX 3

Carcase weights and classification data at beef export premises

		Steers		Heifers		Cows	
		1992	**1993**	**1992**	**1993**	**1992**	**1993**
Carcase (Kg)		356	359	292	291	280	276
% Fat	Class 1	0.2	0.2	0.6	0.4	7.1	8.8
	Class 2	1.0	1.1	1.3	1.6	10.1	12.0
	Class 3	24.1	19.0	15.6	14.9	18.0	18.0
	Class 4	72.3	75.6	75.1	74.7	52.0	48.7
	Class 5	2.3	3.7	7.3	8.1	12.8	12.5
% Conformation	E	0.1	0.2	0	0	0	0
	U	20.7	18.0	12.3	10.5	0.3	0.3
	R	58.5	56.3	60.9	53.2	7.4	4.2
	O	19.8	26.5	25.1	33.2	55.5	42.0
	P	0.9	1.4	1.6	1.8	36.8	52.0

Likely Impact of CAP Reform and GATT Agreement on the Income from Beef Production

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The broad objective of CAP Reform is to control the expansion of the Community agriculture budget by reducing the level of price support with direct payments to farmers. The GATT agreement relates to the freeing up of world trade. Either reform on its own would have a substantial impact on the future of cattle producers in Ireland but the combined impact may well be radical.

The details of the CAP reform package which came into operation in January 1993 are well understood and its principal elements relating to beef are summarised in Table 1. They comprise (i) reduced beef price support through intervention (ii) increased premium on male bovines (S.M.P.) (iii) increased suckler cow premium (S.C.P.) (iv) S.M.P. and S.C.P. are linked to stocking density limits (v) the introduction of a deseasonalisation or winter slaughter premium (Sl. P.).

Table 1

Principal elements of CAP Reform (Beef)

* Intervention
  - Price reduced by 15% from 1993 to 1995
  - Volume reduced by 53% from 1993 to 1997
  - Safety net price at 60% of intervention price from 1993
* Special male premium (SMP) at £87.88 x 2 from 1995
* Suckler cow premium (SCP) at £136.70 from 1995
* Stocking density for S.M.P. and S.C.P. = 2.0 L.U./ha from 1996
* Deseasonalisation (winter slaughter) premium - £58.58 from 1993

A summary of the main features of the GATT agreement are set down in Table 2. The expectation is that the agreement will come into operation on January 1, 1995 and run for a period of 6 years. The main features which affect beef producers relate to a 36% reduction of export support and a 21% reduction in the volume of subsidised exports, maximum of 817,000 tonnes by 2000 A.D.

The EU commmunity beef exports have ranged between 1100,000 and 1300,000 tonnes annually over the past 4 years. EU cow numbers have remained almost static at 31.7 million during the past 3 years. If these cow numbers are sustained and if consumption and imports remain at about the levels of recent years then annual exports of between 1100,000 tonnes and 1200,000 tonnes can be expected over the immediate years ahead. The level of subsidised exports

Table 2
Summary of GATT Agreement
Phased over 6 years (1995 - 2000?)

EXPORTS

* Subsidies reduced by 36%
* Volume of subsidised exports reduced by 21% (817,000 tones from year 6)

IMPORTS

* Import tarriffs reduced by 36%
* Minimum access 5% of domestic production

Table 3
EU subsidised beef exports under GATT ('000 tonnes)

Year	GATT	Exports surplus to GATT *
1995	1,119	31
1996	1,058	92
1997	998	152
1998	938	212
1999	877	273
2000	817	333

*Assuming 1,150,000 tonnes of exports annually

under the GATT agreement are shown in Table 3. From this table it can be also seen that a significant and increasing level of unsubsidised exports can be expected in the years leading up to 2000. How the European Commission deals with this problem of oversupply is an open question. Perhaps a reduction in cow quota or special male premium quota are the most likely areas for Commission action. Against this background of over supply and the downward pressure on other meats it seems inevitable that beef prices will decline. In this paper prices are asssumed to decline between 10% and 25% from the 1992 levels.

The estimate of the likely impact of CAP and GATT presented here compares the incomes on a 54 hectare farm in 1992 with the income forecast for the year 2000 when it is assumed that the full impact will be in place. Fifty four hectares is the minimum size farm required to be eligible for the maximum amount (£15,818) from the S.M.P. Four distinct systems of steer beef production are examined, namely, one from purchased bucket reared Friesian calves and the other from single suckled continental type calves; the remaining two systems are winter finishing and summer grazing using continental animals. All systems are operated at a high level of efficiency.

The beef prices used to draw up the 1992 base line budget are as follows:

Table 4
Calf to beef - bucket reared

Purchase	:	Friesian calves in spring
Sell	:	333 kg carcase at 24/25 months of age
Concentrates	:	800 kg per unit
Silage	:	10.3 tonnes per unit
90 Units	:	54 Hectares

£2.20 per kg of carcase and £2.30 per kg of carcase for Friesian and Continental steers respectively. Given that the normal imbalance in the seasonal supply of beef brings with it a lower beef price in autumn relative to spring. The ranges in reduced prices assumed for the year 2000 are set as follows: 10% and 20% for the three systems which sell in spring and 15% and 20% for the summer grazing system which sells beef in the autumn. The 25% level of reduction corresponds approximately to the safety net price for continental type steers.

The intervention price of cereals is being reduced by 29% under CAP reform and as a consequence of this, concentrate prices in 2000 are assumed to reduce by 15% from the £135 per tonne used in the construction of the 1992 budget.

Overhead costs less interest of £196 per hectare are derived from the 1992 set of Teagasc F.M.S. data. They remain at the same level throughout 1992 - 2000. In all systems interest is charged on half the livestock and variable costs at 13% throughout the period 1992 - 2000.

System 1 Calf to Beef (Bucket Reared)

Details of the system are set out in Tables 4 to 8. To ensure that all animals are eligible for the S.M.P. under CAP reform stock numbers are reduced by

Table 5
Gross margin per animal in 1992 and forecast for 2,000

Year		1992	2000	2000
Beef Price Reduction		–	10%	20%
Sale: Price p/kg		220	198	176
£/Head		733	659	586
Calf Purchase + Mortality		154	154	154
Gross Output	(A)	579	505	432
Total Variable Costs	(B)	320	303	303
Gross Margin Excl. Premia (A-B)		259	202	129
S.M.P.*		30	175	175
Gross Margin incl. S.M.P.		289	377	304
Slaughter Premium		0	58	58
Gross Margin+S.M.P.+S.L.P.		289	435	362
*Maximum of 90 Animals				

Table 6
Overhead costs less interest*

	1992	2000
Total farm	10,584	10,584
No. of animals	105	90
Per animal	101	118

* Based on: NFS 1992

14%, from 105 units in 1992 to 90 units in 2000. The figures in Table 8 show two sets of total farm income in 1992 and in 2000 at a beef price reduction of 10% and 20% relative to 1992, both with and without the slaughter premium. In each case the full S.M.P. and half the borrowings apply.

These data show that in 2000 at the 10% reduction total farm income increases by £4,399 or 31%. By contrast, however at the 20% reduction, farm income declined by £2,185 or 15% to £12,176. This cannot be regarded as an acceptable level of income from 54 hectares operated at a high level of technical/ management efficiency.

Table 7
Overdraft borrowing on half of livestock and variable costs, interest rate 13%

	1992	2000
Total farm borrowing	41,500	35,000
Borrowing per animal	395	389
Total interest	5,400	4,600

At the 10% level of reduction if the slaughter premium applies in 2000 the forecasted income shows a very substantial increase of 9,657 or 67%. Even at the 20% reduction in beef price the income increase on 1992 is £3,057 or 21% thus leaving an income of £17,448. The likely availability of the slaughter premium being in place in 2000 is very dubious.

This system is very sensitive to changes in beef price. This is clear from Table 8, every 5% reduction in beef price reduces total farm income by £3,300.

Table 8
Total farm income 1992 and 2000 (forecast)

	1992	2000	2000
Beef Price Reduction	–	10%	20%
Assumptions			
1. S.M.P. only + Half Borrowings	14,361	18,760	12,176
2. S.M.P. + SL.P. + Half Borrowings	14,361	24,018	17,448

Table 9
System 2 Calf to beef - single suckled

Spring Calving Herd		
Sell	:	Males at 399 kg at 24/25 Months
		Females at 302 kg at 21/22 months
Concentrates	:	630 kg per unit
Silage	:	15 tonnes per unit
63 Units	:	54 hectares

The system is also sensitive to changes in calf price, for instance a £20 change in calf price alters farm income by over £1,800. It seems that any change in calf price in the foreseeable future will be upward and thus have a negative effect on farm income. A change of £10 per tonne in concentrate price will affect farm income by just over £700. Fortunately this effect is likely to be in the direction of having a positive effect in income.

Table 10
Gross margin per cow in 1992 and forecast for 2000

Year	1992	2000	2000
Beef Price Reduction	–	10%	20%
Sale: p/kg; (Male)	230	207.0	184.0
p/kg; (Female)	215	193.5	172.0
£ per Cow	744	670	595
Repl. + Mort.	40	40	40
Output/Cow	704	630	555
Variable Costs	355	342	342
Gross Margin excl. Pr.	349	288	213
S.C.P. + S.M.P.	69	220	220
Gross Margin Incl. Pr.	418	508	433

If the stocking density that existed in 1992 is fully maintained by continuing to finish l05 steers annually total farm income is only marginally increased by about £500. Alternatively, if the 15 non premium earning steers are replaced by heifers farm income may increase by about £800.

Table 11
Overhead costs less interest

	1992	2000
Total farm	10,584	10,584
No. suckler cows	63	63
Costs per cow	168	168

Table 12
Overdraft borrowing on half the livestock and variable costs

	1992	2000
Total farm borrowing	39,000	39, 000
Per suckler cow	619	619
Total interest	5.922	5.922

Against this background of falling beef prices it seems well nigh impossible to see how a viable calf to beef system as outlined here can be sustained in the absence of S.M.P. This presents a major challenge for the future.

System 2 Calf to Beef (Suckled)

Details of the systems are outlined in Tables 9 and 13. These tables are presented in essentially the same format as for System 1. The figures in Table 13 show that at the 10% price reduction farm income in 2000 is forecast to increase by £5,670 or 55%. The £5,670 is quite substantial but the very large percentage increase reflects the very low base-line income of less than 10,000 in 1992. At the 20% price reduction the increase is very modest, only £945, thus yielding a total increase of only £10,773.

The inclusion of the slaughter premium increases farm income by between £1,700 and £1,800. Thus, the impact of the slaughter premium is much more modest than in the case of System l.

The system is much less sensitive than System 1 to beef price changes - a 5% reduction in beef price reduces farm income by approximately £2,300. A change in calf price obviously has no effect on income while a change of £10 per tonne in concentrate price alters farm income by just under £400. Unlike System 1 this system can continue yielding levels of income indicated in Table 13 on very large farms - up to 145 hectares.

Trading systems - Store to Beef

It is not possible to predict with any acceptable degree of reliability the future

Table 13
Income in 1992 and 2000 (forecast)

	1992	2000	2000
Beef Price Reduction	–	10%	20%
Gross Margin/Cow	418	508	433
Overheads/Cow	168	168	168
Interest (1/2)	94	94	94
Income/Cow	156	246	171
Farm Income	9,828	15,498	10,773
Income + Sl. P.	9,828	17,251	12,526

Table 14
Store to beef production – winter finishing

The System:	*	Purchase Continental Steers in Autumn
	*	Sell Finished Beef Following Spring
	*	Two Silage Cuts

Details per Animal

Purchase Weight	550 kg
Feeding Period	140 days
Concentrates per Day	4.0 kg
A.D.G.	1.00 kg
Finishing Liveweight	690 kg
K.O.	54.5%
Carcass Weight	376 kg
Stocking Rate	5.70 Blks/Ha
Total Silage	7.14 tonnes

price of non premium carrying steers. The use of models based on historical relationship to predict prices are of little or no value. Accordingly, the approach with the two trading systems examined in this paper is to establish the purchase price payable for stores in both systems that will yield the same level of income per hectare as the single suckled calf to beef systems which has already been outlined at No. 2. This purchase price payable is derived from the following equation:

Purchase price = Total sales less total costs + income

Table 15
Costs and profit margin per animal - winter finishing

Variable		
	Concentrates	64
	Silage	76
	Other	30
	Total Variables	170
	Overhead	37
	Interest*	20
	Total Costs	227
	Profit Margin**	53
	Total Cost + Profit	280

* On Half Stock + Variable Costs

** This margin varies from about £37 to £60 depending on sale price reduction and whether the slaughter premium is or is not available.

Table 16
Sales: winter finishing

Beef Price	(i) 10% Reduction	(ii) 20% Reduction
P/kg	207	184
£/animal	778	692

System 3 Store to Beef - Winter Finishing

Details of the system are set down in Tables 14 to 17. The data in Table 17 show that if the profitability of winter finishing is to be approximately the same as the levels already described for System No. 2, the purchase price of stores in the autumn will have to be reduced considerably from the prices obtaining in recent years, namely, approximately £120 per 100 kg liveweight.

When the slaughter premium is not available and the price of beef in spring declines by 10% and 20% the figures in Table 17 show that the live price payable for autumn stores is £91 per 100kg and £78 per 100 kg respectively. This represents a massive reduction of £29 to £42 per 100 kg on the prices obtaining in recent years.

At this point it is important to consider the implications of the autumn prices payable for stores as seen in Table 17. Traditionally the autumn price of beef has had a major effect on the price of stores for winter finishing. In recent years both of these prices have been practically the same on a liveweight basis. If autumn beef prices in the future declined to its lowest level namely, safety net price (£1.725 per kg of carcase) this would be the equivalent to about £93 per 100 kg live. This is £12 per 100 kg higher than the £81 per 100 kg identified as the price payable for stores in Table 17. In such circumstances farmers selling

Table 17
Price payable for steers in autumn - *winter finishing

Purchase Price (P)	=	Total Sales less Total Costs and Profit Margin	
Sale Price Rel. to 1992		(i) 10% Reduction	(ii) 20% Reduction
		Excluding Slaughter Premium	
(P)	=	778 - 280	692 - 264
£ per Animal	=	498	428
£ per 100 kg	=	91	78
		Including Slaughter Premium	
(P)	=	836 - 286	750 - 273
£ per Animal	=	550	477
£ per 100 kg.	=	100	87

* This price assumes that winter finishing yields the same total farm income as the fully integrated calf to beef system (suckling).

Table 18

Store to beef production - summer grazing

The System:	Purchase Continental Steers in April Sell Half in July and Half in October/November	
Details:		
Purchase Weight	=	500 kg
Sale Weight: July	=	630 kg Live, 340 kg carcase
Oct.	=	690 kg Live, 373 kg. carcase
St. Rate at Turn Out/Ha	=	2470 kg = 4.94 animals

store in the autumn will carry them on to beef rather than take the very much lower store price. The competitiveness of autumn store price is, of course, even worse if the beef price declined by only 15% rather than 25% or safety net price. Even in the more favourable circumstances when the slaughter premium is available for winter finishing the price payable for autumn stores by farmers engaged in winter finishing vis a vis autumn beef prices is still not competitive. Against the background it is difficult to see the continuation of winter finishing as a specialised system of production. This would have serious implications for balancing seasonal supply.

System 4 Store to Beef - Summer Grazing

Details of the system are specified in Table 18 to 21. The data in Table 21 show the prices payable in April for continental store bullocks so that the same level of income per hectare is obtainable from summer grazing as that from the suckled calf to beef system which has been described earlier in this paper (System 2),

It can be seen from Table 17 that when beef prices decline by 15% and 25%

Table 19

Costs and profit margin per animal - summer grazing

Variable	52
Overhead	30
Interest*	25
Total Costs	107
Profit Margin**	62
Total Cost + Profit	169

Interest on Half Stock + Variable Costs

** This margin is set at the same level as the average of calf to beef (suckling) (£304/ha) at the 15% reduction in beef price. The comparable margin per animal at the 25% reduction in beef price is £43.

Table 20.
Sales - summer grazing

Sale Price	(i) 15% Reduction	(ii) 25% Reduction
P/kg Car.	195.5	172.5
£/animal	665 July	587 July
£/animal	729 Oct.	643 Oct
£/animal (Average)	697	615

from the levels obtaining in 1992 the price payable for stores in April is £106 per 100 kg and £93 per 100 kg respectively. The liveweight price of beef in spring as estimated earlier for Systems 2 and 3 is £112 and £100 per 100 kg respectively at the 10% and 20% levels of reduction. These are not that much higher than the prices payable in Table 17. Against this background it would seem that summer grazing will continue in the future to remain a competitive system of production.

Table 21
Price payable for steers in spring* - summer grazing

Purchase Price (P) = Total Sales less Total Costs + Profit		
Beef Price Reduction	15%	25%
(P)	697 - 169	615 - 150
£ per animal	528	465
£/100 kg	106	93

* This price assumes that summer grazing yields the same total farm income as the Calf to Beef System (Suckling).

Summary

It is clear that beef price reductions below about £2.00 per kg of carcase will cause severe income problems for cattle producers even with the continuation of premia at their present level.

The continuation of winter finishing may have difficulty in remaining viable in future if there is not a substantial break with the historical beef/store price relationship.

It appears that summer grazing even in the absence of premia may continue to be a competitive system of production.

The contribution of premia to total farm income is enormous – ranging from about 85% to 125% depending on the level of beef price reduction in the systems examined in this paper.

The need to improve efficiency and reduce costs are paramount and present a major challenge for the future.

REPS for Cattle Farmers

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In this paper the relevance of REPS for cattle farmers is assessed. Firstly, the criteria that must be complied with by all REPS participants are outlined, then some relevant statistics are examined and thirdly, the grassland management undertakings that must be followed are set out.

The Scheme is open to all farmers with more than 3 hectares who undertake a REPS environmental plan for at least 5 years. The farmer will receive payment of approximately £50 per acre on up to a maximum of 99 acres each year for five years. Total payments over the five years to an individual farmer for a 40 ha farm would be 25,000 ECU or approx £24,400.

The strategy followed in REPS is one of seeking harmonisation between agriculture and the environment based on the voluntary actions of farmers. Financing of the undertakings is 75% from the EU FEOGA Guarantee budget and 25% from the National Exchequer.

This programme encourages farmers to serve society as a whole by offering incentives to them, to follow farming practices compatible with the increasing demands for protection of the environment and natural resources, for their work as guardians of the countryside and for farming in an extensive and environmentally friendly manner.

Problems to be resolved

The following are some of the main issues that must be attended to in this programme if Ireland's rural environment is to be protected:

- the continuing deterioration in water quality
- lack of maintenance of the landscape and the deteriorating appearance of the countryside
- loss of wildlife habitats and endangered species of flora and fauna.

A farmer in the Scheme must undertake the following measures in respect of the areas farmed.

(i) follow an appropriate waste management, timing and fertiliser plan prepared for the total area of the farm;

(ii) adopt a grassland management plan for the farm which avoids over-grazing and poaching;

(iii) retain features such as wetlands, wildlife habitats, hedgerows, stone walls;

(iv) maintain field boundaries in the interests of stock control, wildlife and the scenic appearance of the area;

(v) protect features of historical or archaeological interest;

(vi) maintain farmyards in a tidy fashion by among other things: –
– retaining quality farm buildings, including traditional stone buildings in a good state of repair

- use of appropriate roof and wall colours
- removing worn out and unsightly equipment;

(vii) cease using herbicides or pesticides and fertilisers on hedgerows, fringe vegetation of ponds and streams;

(viii) fence watercourses to exclude bovines;

(ix) produce tillage crops, apart from oats, without the use of plant growth regulators, without burning straw and maintain uncultivated field margins and ensure no nutrients or sprays are applied to such margins;

(x) become familiar with environmentally friendly farming practices;

(xi) keep prescribed farm records.

Nutrient management plan and fertiliser nitrogen limits

The maximum permitted level of total N for grassland may not exceed 260 kg/ha. The permitted level of organic N may not exceed 170 kg/ha. The planner is also required to identify areas within the farm where chemical and organic N use must be further restricted in accordance with the environmental sensitivity and the marginal nature of these areas.

The level of N produced by the range of livestock types are set out in the REPS Agri-Environmental Specifications. Some absolute maximum stocking rates, assuming all the organic N is applied to the applicants grassland, are as follows:

- 2 dairy cows per hectare
- 2.6 suckler cows per hectare
- 11.3 lowland ewes per hectare

Phosphorus limits

The permitted upper limits of P application for a range of soil fertility levels/indices for grazing and silage/hay are set out in Table 1.

Table 1
Phosphorus for grazing, silage/hay (kg/ha)

Soil Index	P Level	P Grazed	P Cut once	P 2nd or 3rd cut
1	0-3 mgs/kg	40	50	20
2	4-6 mgs/kg	30	40	15
3	7-10 mgs/kg	10	25	10
4	10-15 mgs/kg	0	15	5
	> 15 mgs/kg	0	0	0

It is evident from the REPS plans submitted to date and also from the feedback received in the context of REPS training courses that the specifications which must be followed is proving to be a very useful learning experience for the REPS planners. The P content of applied animal waste has often been ignored. Too much P is being used by many of our intensive farmers.

Complying with nitrogen limits

Table 2 shows that based on 1993 data 77% of all farms could comply with the nitrogen restrictions with a further 6% who could comply if minor adjustments were adopted.

Over 90% of cattle farms could comply while only 50% of farms with dairy cows could meet the required specifications for total N. Table 3 indicates that 86% of all farms could comply with the organic nitrogen limit of 170 kgs/ha with 94% of cattle farms and 73% of farms with dairy cows meeting the organic nitrogen restrictions.

Table 2
Distribution of farms by total Nitrogen usage levels per hectare (kg/ha) (%)

System	<80 kg	80 to 200	200 to 260	260 to 300	>300 kg
Farms with dairy cows	3	28	19	11	39
Cattle farms	27	56	10	3	4
All farms excluding tillage	18	46	13	6	17

Source: Unpublished data from Teagasc Farm Management Survey, 1993

Table 3
Distribution of farms by organic Nitrogen levels per hectare (kg/ha) (%)

	<60	60 to 140	140 to 170	170 to 190	>190
All farms excl. tillage	19	53	14	5	9
Farms with dairy cows	4	46	23	10	17
Cattle farms	28	60	7	2	4

Source: Unpublished Data from Teagasc Farm Management Survey, 1993

Table 4
Family farm income per hectare by total Nitrogen usage levels per hectare (kgs/ha) (%)

	< 80	80 to 200	200 to 260	260 to 300	> 300	All
Cattle FFI/ha	£70	£176	£278	£243	£277	£167
Farms with dairy cows	£118	£278	£392	£434	£610	£466

Source: Unpublished data from Teagasc Farm Management Survey, 1993

Table 4 shows that average income per hectare for all cattle farms in 1993 was only about one third of the average income of farms with dairy cows. The

REPS incentive payments should be more attractive to the low income cattle farmers than their more prosperous dairy farmer colleagues. It is recommended that farmers contemplating joining REPS should have a financial assessment carried out by an approved REPS planner before deciding to participate. For some cattle farmers, in particular those involved in summer grazing, or those with satisfactory pollution control facilities, the cost of complying with REPS would be small. For others it may pay them to make adjustments to their current farming system in order to qualify. Overall, the rewards for most cattle farmers from joining REPS are very good.

Grassland management undertakings

The objective of this measure is to promote a sustainable grassland management regime that avoids poaching (in particular wetland habitats), overgrazing and soil erosion, with consequential siltation and nutrient enrichment of surface waters and the protection of habitats.

In assessing the requirement to achieve this objective the Planner shall take account of the following:

- The extent or otherwise of damage to grassland by poaching and overgrazing.
- Overgrazing leading to the damage of heather or other natural vegetation.
- Areas of the farm which are sensitive to degradation.
- Extent of outwintering of livestock and its environmental consequences.
- The extent, or otherwise, of soil erosion and its consequential effects.

Where, on any part of the farm, there are areas sensitive to degradation or where damage under the above headings is evident the Planner shall prepare a sustainable Grassland Management Plan which outlines the necessary changes to the current farming practices.

In the preparation of the Grassland Management Plan the principal points to be considered are as follows:

1. The stock carrying capacity of the farm calculated by reference to the environmental sensitivity of areas within the farm.
2. The period for the year during which specific stock must be housed.
3. The period(s) of the year during which grazing on specific areas of the farm, and by specific animals is permitted.
4. The livestock housing, feed storage and waste facilities required.
5. The grazing/conservation/feed purchase plan for the farm in order to provide adequate feed during the year.
6. The land maintenance required to ensure the sustainability of the system.
7. The stocking intensity of share/s in a commonage shall be restricted to that appropriate for that commonage.

Pollution control

Pollution control is a crucial area in REPS. All work which has to be carried out must be completed during the first year of the plan. The detailed rules relating to the collection, storage and disposal of farm wastes are set out in the REPS specifications. Grant aid for necessary investments under the CFP scheme when combined with an up-front REPS payment will go a long way towards bringing most cattle farmyards up to required standards.

Extending the Grazing Season for Sheep

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The increasing costs of grass silage conservation relative to grazed grass, together with the cost of labour, have stimulated interest in extending the grazing season into the winter in order to reduce feeding and housing expenses. Grazed grass costs about 4p per kg DM compared with 8p for grass silage and 9p for baled silage.

In spring lambing flocks December and January coincide with mid-pregnancy when feeding can be restricted to a level which is sufficient to maintain ewe bodyweight. Winter feed can be provided by allowing a supply of grass to accumulate in autumn and by reserving it for winter grazing. By using the technique of grass budgeting the flock manager can match the supply of grass to the requirements of the flock.

In order to demonstrate this technique under Irish conditions and to examine whether any unforeseen management problems arise, extended grazing was practised at the Knockbeg Sheep Unit, Carlow during the two winters 1993/94 and 1994/95. In the context of substituting grazed grass for silage the following questions were addressed.

1. Can grass be utilised in December/January by using a grass budgeting technique?
2. What is the feed value of winter grass?
3. What are the effects of winter grazing on subsequent grass growth?

The mid season farmlet consists of 14.5 ha of pasture stocked with 220 ewes in a paddock grazing/silage conservation system. In early September 2.8 ha (1993) and 2.5 ha (1994) of pasture, predominantly perennial ryegrass, were closed and dressed with 45 kg N per ha following tight grazing in August by weaned ewes. The pasture was allowed to accumulate until grazing commenced in early December. Grass yield was measured in early December by taking grass clips at ground level using a 0.2 sq.metre quadrat (average of 5 quadrats) and samples were analysed for dry matter, digestibility and crude protein content.

Pasture allowance

Commencing on December 8 in both years, ewes in good condition (1993 n=150; 1994 n=200) and due to lamb in March were block grazed using portable electric fencing. The number of ewes grazed was determined by the supply of grass, as discussed later. The remainder of the flock was housed in early December and fed silage. Pasture allowance for grazing was fixed at 1 kg DM per ewe per day. A backfence was used to prevent access to the ground already grazed and thereby to protect recovery. The flock was moved daily with the exception of one block in December 1993 on which the ewes were offered a pasture allowance of 7 kg per head for 1 week. This allowance proved unsatisfactory as explained later. After grazing was completed the ewes were housed for the final 6 weeks before

Table 1
Pasture sample analyses

Date sampled	16/12/93	6/12/94
Dry matter, g/kgDM	195	117
DMD, g/kgDM	775	804
Crude protein, g/kgDM	295	281
Ash, g/kgDM	138	120
Estimated ME, MJ/kgDM	11.0	11.2

lambing and offered silage *ad libitum* plus concentrate supplements. The pasture was dressed in early February with 45 kg fertiliser N per ha in order to promote regrowth.

To estimate the influences of winter grazing on supply of grass in spring, cumulative grass yields were measured by taking grass clips in March and April on the areas which were grazed at the start, in the middle and at the end of the winter grazing period, namely, December 13, January 1 and January 21.

Results:

(1) Pasture quality

Results on pasture sample analyses are shown in Table 1. The quality of the pasture was high. As already stated, the pasture consisted mainly of perennial ryegrass and the regrowth after intensive grazing in August contained very little stem. The sward was green and leafy down to the base.

Crude protein content was very high, indicating a high content of N. A possible explanation may lie in the system of management. The winter grazing area is part of a 15 ewes per ha grazing/silage conservation system and was dressed with N fertiliser on three occasions earlier in the season: for early grass, silage conservation and silage aftermaths, amounting to 175 kg N per ha. The dense stocking during August probably produced a high return rate of dung and urine, resulting in considerable N recycling. Moreover, a further 45 kg N per ha were applied in early September. The combined effects of these N inputs, together with the leafiness of the sward and the slower rate of grass accumulation in autumn relative to spring and summer, were the likely factors contributing to the high crude protein content.

(2) Grazing capacity

Results on ewe grazing capacity and ewe liveweights pre- and post-grazing are shown in Table 2. In 1993 the supply of pasture was estimated at 2160 kg DM per ha and to provide a daily ration of 1 kg DM per ewe, the pasture was block grazed at a stocking rate of 1 ewe per 5 sq. metres per day. It was estimated that the supply of grass on offer would feed 150 ewes for 6 weeks. This estimate was confirmed in practice; 2.8 ha carried 150 ewes for 44 days from 8/12/93 to 21/1/94.

Table 2
Ewe grazing capacity of winter pasture

	1993/94	1994/95
Area of pasture, ha	2.8	2.5
Grazing commenced	8/12/93	8/12/94
Grazing completed	21/1/94	23/1/95
Yield, kg DM/ha	2160 (7/12/93)	4274 (6/12/94)
Pasture allowance, kg DM/ewe/day	1.0	1.0
Pasture allowance, sq.m/ewe/day	5.0	2.5
No. ewes grazed	150	200
No. ewes grazed/ha	53	80
Ewe liveweight, kg – 8/12/93	67.1	60.6
– 21/1/94	66.4	60.9

Pasture supply in December 1994 was twice that of 1993. Thus, ewe carrying capacity was estimated at about 100 ewes per ha for 6 weeks. It was therefore decided to graze the whole flock except ewes with condition scores under 2.5, i.e. 20 ewes which were housed and offered silage *ad libitum.* To repeat the daily pasture allowance of 1 kg DM per ewe, the stocking rate in 1994/95 was increased to 2 ewes per 5 sq. metres per day. In very wet spells, e.g. 20mm rainfall per day, this level of stocking intensity resulted in poaching. Increasing the daily allowance to 1.5kg DM per ewe, that is, reducing the stocking rate to 1.3 ewes per 5 sq.metres per day alleviated the problem. Ewe carrying capacity was 80 ewes per ha for 46 days. Results on grass recovery in spring are awaited.

The feeding value of the pasture and the adequacy of the daily allowance may be assessed from ewe liveweight recorded before and after winter grazing. Table 2 shows that the changes in liveweight were neglible. These results relate to ewes that were in good condition post-mating and show that high quality autumn saved pasture grazed at an allowance of 1 kg DM per ewe was adequate for maintaining liveweight.

(3) Grass recovery in spring

Grass yields in spring 1994 are shown in Table 3. Yields in March were significantly lower on January grazed pastures than on that grazed in December. Although there were no ungrazed plots in this trial, the results are consistent with previous findings at Belclare.

In contrast to March, grass yields in April were high indicating good responses to the additional month's rest. Although the yields of January grazed pasture were again lower than that grazed in December, yields of 1967 to 2672 kg DM per ha were considered to be very satisfactory for April, relative to the feed requirements of lactating ewes when stocked at 15 per ha.

Table 3
Grass yield in spring (kg/DM/ha)

	March 7	April 5
Grazed on December 13	1163	2672
Grazed on January 1	598	1967
Grazed on January 21	767	2101

The relatively low yield of grass in March on the January grazed areas was not a major constraint because it constituted less than 20% of the farm and the full stocking rate was not achieved until lambing was completed in early April.

As stated earlier, the system of grazing in this trial was based on daily shifts, with a back fence to prevent access to pasture already grazed and thereby to protect recovery. Thus, plant defoliation was for one day only. In contrast, the conventional system of continuous grazing is likely to result in the depletion of plant root reserves and in poaching, thus delaying grass growth.

High rainfall

Rainfall levels (mm) recorded nearby at Oakpark Research Centre were:

	December	January
1993/94	141	121
1994/95	98	209
1968/90 Average	75	86

Although the months of December and January were exceptionally wet, no flock management or health problems arose. Pasture damage was caused on one occasion in December 1993 when it was decided to extend the duration of the shift to 1 week by increasing the pasture allowance to 7 kg per head. The reason for this change was to give the flock a larger area during a spell of wet weather. However, most of the allowance was consumed within 5 days and the area was severely poached over the remaining 2 days.

Silage and housing costs reduced

In order to facilitate grass growth for spring lambing ewes it is necessary to vacate pastures in early to mid-December. Unless forage crops or roots are available, the ewes must be housed or confined and fed silage or hay until lambing in March, a period of about 12 weeks. The results reported here show that this housing period was reduced to 6 weeks by the provision of autumn saved pasture for winter grazing.

Estimates of the financial savings gained by extending the grazing season and reducing the housing period from 12 weeks to 6 weeks for a flock of 200 ewes are summarised in Table 4. For a 12 week housing period, the inputs per ewe are: 0.5 tonne silage @ £7; 25 kg concentrates @ £167 per tonne, 5 bales of straw @ 75p per bale. In the case of hired labour, experience at Knockbeg shows that about 1.5 man hours per day are required for feeding, bedding and

Table 4
Estimated costs of wintering 200 March lambing ewes (£)

(1) Housed for 12 weeks		(2) Grazed for 6 weeks Housed for 6 weeks	
		300 m Electric fencing @ £50 depreciated over 5 years	60
100 Tonnes silage	1400	14 Man hours, wage	80
1000 Bales of straw	750	50 Tonnes silage	700
5 Tonnes of concentrates	835	Bales of straw	375
	2985	5 Tonnes of concentrates	835
			2050
Per ewe	14.92	Per ewe	10.25
Labour:		Labour:	
126 Man hours	716	65 Man hours	369
Per ewe	3.58	Per ewe	1.84

supervising 200 ewes, amounting to 126 man hours for a 12-week period and charged at the wage rate of £4.75 per hour plus overtime at week-ends. However, on many sheep farms the opportunity cost of the farmers own labour may be considerably lower than that shown here. If so, the value for man hours should be adjusted accordingly.

For the management of extended grazing the primary inputs are portable electric fencing for allocating grass on a daily basis and labour for moving the fences. In addition to the front and back fences for allocating grass on a given day, managing the daily shifts is easier if a second front fence is installed in advance of the shift. Thus, for convenience three fences are recommended, e.g. for a field that is 100 m wide, 300 m of fencing are required for block grazing 200 ewes; the cost is about £1 per m. The time required for moving fences and inspecting the flock was 0.3 man hours per day, equivalent to 14 man hours for the 6 week period.

The figures in Table 4 show that extended grazing offers the opportunity for considerable savings in the costs of sheep flock management during winter, a total of £6.41 per ewe in the example shown. These values should be interpreted in the light of conditions on individual farms.

How is the build up of autumn grass achieved?

The closure of autumn pastures for winter grazing coincides with the need to provide adequate supplies of grass for ewes during mating. To reconcile these requirements, a management plan should be drawn up on a whole farm basis.

At Knockbeg, extended grazing resulted in a 50% reduction in silage requirements for ewes that were winter grazed i.e. from 0.5 to 0.25 tonne per ewe. This has removed the need for closing 2.5 ha of pasture for 8 weeks in

July/August for late cut silage. Instead, this extra grass is carried forward for grazing during the breeding season when the winter grazing area is closed.

The silage feed budget for the 220 ewe flock is now conserved in one early cut off 3 ha (20% of farm) in late May, about 75 tonnes of silage.

How many hectares of autumn pasture should be closed? The answer depends on the competing demands for grass in the autumn, the overall stocking rate on the farm and the expected yield of grass in early December. The priorities must be ranked and if grass is required for finishing lambs or for other livestock in the September to November period, the opportunity for closing up and accumulating a bank of grass for extended grazing may be limited.

When the annual stocking rate is high, e.g. 15 ewes per ha, it is difficult to accumulate sufficient supplies of autumn grass for extended grazing on a whole flock basis.

At lower stocking rates, e.g. 10 ewes per ha, there is considerable scope for extended grazing. Thus, on a 40 ha farm stocked with 400 ewes, 8 ha of autumn saved pasture with a DM yield similar to that of 1993/94 in Table 2 will provide maintenance feeding for 6 weeks in December/January. By planning a system, a flock of 400 ewes can be readily managed in autumn on 32 ha, i.e. 12.5 ewes per ha, thus releasing 8 ha for winter grazing.

Less farmyard waste

Less silage and a shorter housing period have implications for the environment. Reductions in silage effluent and in the amount of manure from housed animals result in easier control and disposal of farmyard wastes.

What Irish Farmers Need from EU Sheep Policy

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At the IFA Annual General Meeting the Minister for Agriculture, Food and Forestry, Mr. Ivan Yates said: "The EU average method of calculating the ewe premium is unfair to Ireland. There are a number of options that we can pursue and I want to discuss these options, select those that are most favourable for Ireland and pursue them in Brussels". The Minister's recognition that there are problems in the sheep sector and his commitment to take action is a good starting point.

The reality of a £12 million cut in ewe premium payment to sheep farmers and the prospect of an extra 20,000 tonnes of New Zealand lamb imports are two of the problems to be confronted. The shortcomings in EU policy have adversely affected Irish sheep farmers over the last two years; ewe numbers have declined; 3,300 flock owners have ceased production; incomes on sheep farms are down 35% since 1988.

Fundamental changes in the EU Sheepmeat policy are necessary if sheep farmers' incomes are to be restored. Major challenges on lamb price, flock productivity and production costs also have to be tackled if the competitive position of Irish sheep farming is to be maintained.

Inequitable system

The underlying principle which paved the way in 1989 for Farm Ministers agreement on the Single European method of Ewe Premium calculation was the prediction by the Commission that lamb prices throughout Europe would converge by 1992. In such circumstances, the Commission argued that it would be fair to pay all EU sheep producers the same level of Ewe Premium compensation. In theory the Commission was right; in fact history has proven them to be wrong. Lamb prices have not converged as anticipated. In addition, UK lambs prices have not improved sufficiently since the abolition of the Variable Premium and are unlikely to close the gap with Europe in the foreseeable future.

Meanwhile, Irish sheep producers are receiving up to 66p/kg less for lamb than their colleagues in France & Belgium, yet this system pays the same level of Ewe Premium compensation. Clearly this is an inequitable policy.

A return to the Single country method of calculating income loss is the only sure method that can guarantee Irish sheep farmers full and fair Ewe Premium compensation. In money terms, this year, if we were operating on the Single country method, we could look forward to a Ewe Premium payment of £25.11/head as opposed to £17.88/head under the present system. Based on our national quota of 4.97 million ewes, this would put an extra £36 million into the pockets of Irish sheep farmers.

Other flaws

Any sound method of long term income protection for sheep farmers must be inflation proof. Again the current policy is flawed in this respect. The basic price which is used to calculate the Ewe Premium has been reduced by 14 ECU/100 kgs (13p/kg) since 1990. Meanwhile sheep farmers must contend with general inflation and rising production costs. To adequately protect compensation in the longer term, IFA is proposing that the basic price be linked to an EU inflationary index and adjusted automatically each year.

Stabilisers were introduced in May 1988 in an attempt by the Commission to stop the rapid expansion taking place in sheep flocks throughout the Community, particularly in Ireland, UK and France. In the 1992 CAP Reform, individual production quotas put an end to any further expansion in sheep numbers. IFA is now proposing that the stabiliser mechanism be abolished. This move would increase the 1994 Ewe Premium by £4.57/head.

IFA proposals

The exodus from sheep farming in the lowland areas is evidence of income difficulties on these farms. Clearly, there is a sound case for additional premium compensation here. IFA is proposing that the Rural World Premium worth £5.37/ewe be paid on all sheep in Objective I regions in the EU, so that all Irish producers would qualify.

In view of the fact that ewes are included in the calculation of stocking density for Extensification Premium, there is no good reason why sheep should not receive this premium. IFA is proposing that the Extensification Premium be extended to sheep and paid on a livestock unit basis to producers who conform to the necessary stocking rate requirements. This would be worth £4.39/ewe to eligible producers.

In the GATT Agreement EU Farm Ministers agreed to allow an additional 20,000 tonnes of New Zealand imports. It appears that Europe raised no real opposition to increased imports in these negotiations. It is surprising how European Agriculture Ministers could on the one hand sanction strict production quotas to limit their own producers, while on the other hand agree huge increases in imports from outside the Community.

In order to minimise the negative price impact of these increased imports, IFA is proposing that the 12,500 tonne limit on chilled product from New Zealand be reinstated. In addition the EU should insist that imports are evenly spread throughout the year, and restricted to whole carcasses as opposed to primal cuts.

With a fourteen fold variation in lamb consumption among EU Member States, the potential for further growth is enormous. Sheepmeat promotion deserves proper funding.

Quality can be measured by classification and a premium price is available for quality lamb. The absence of a national classification scheme is not in the best interest of Irish sheep producers. All concerned must re-double the efforts to have a properly structured scheme introduced without delay.

Definition of eligible ewes

When the change in definition of 'eligible ewes' was negotiated in 1992, the benefit of removing the confusion at Ewe Premium inspections was obvious. However, this change was never intended to encourage dry sheep farming. This is a negative development with serious implications for national sheep output, farm productivity and farm incomes. I am convinced that a solution which retains the present eligible ewe definition and discourages dry sheep farming can be found. In the interests of the Irish sheep sector a solution to the problem must be worked out sooner rather than later.

In summary, these are the EU policy changes which IFA believe are necessary to protect the incomes of Irish sheep farmers in the years ahead. Negotiating a change in the method of Ewe Premium calculation is the priority issue. The Minister for Agriculture has already displayed a real willingness to tackle the problems in the sheep sector. Delivery of tangible results in the months ahead will be the real measure of success.

On behalf of the IFA National Sheep Committee I wish to thank the Irish Grassland Association for their tremendous efforts over the years on behalf of sheep farmers. Your Association has proven itself to be a real catalyst for change in the management of Ireland's greatest national resource, green grass.

Evaluation of Crossbred Ewe Types

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Ewe productivity has always been an important determinant of economic performance of sheep production systems. With the introduction of quotas and support systems designed to limit stocking rates, individual animal productivity assumes an added importance. A major objective of Teagasc's sheep breeding research programme, over the years, has been to identify and develop genetic resources which can be exploited to increase ewe productivity. It is sobering to note that when the weaning percentages for mid-season flocks are examined, at national level, there is no evidence for any improvement over the past 15 years.

Production efficiency

The basic objective of the lowland sheep industry should be to produce carcasses of good quality as efficiently as possible. Efficiency is a function of output relative to inputs; in this context biological efficiency can be defined as the liveweight of lamb produced per unit of food input to the combined "ewe + lamb(s)" unit. Using results at Belclare on herbage intake by ewes and lambs, the annual food intakes by ewes and their lambs have been calculated for various conditions. The following conclusions can be made:

(i) Herbage intake by ewes depends on body size, stage of lactation and the number of lambs being suckled. Large ewes consume more than smaller ewes; intake peaks at weeks 6 to 7 of lactation. Ewes suckling twins consume more feed than ewes suckling singles and dry ewes consume the least.

(ii) Herbage intake by lambs increases from near zero at 4 weeks of age. Twins consume more than singles pre-weaning and differences between singles and twins are not detectable post-weaning.

The foregoing information provides the basis for calculating the annual efficiency of a ewe as a function of litter size (Table 1). The results clearly show the biological advantage of prolific ewes and this is reflected in results on the economic impact of prolificacy on income per ewe. Information from two sources is summarised in Table 2. Firstly, analysis of information from the Farm Management Survey for the years 1988 to 1992 for lowland mid-season flocks provides an estimate of the impact of increasing the number of lambs reared per ewe by 0.1, on gross margin per ewe. This estimate is based on comparison of the middle third of flocks (ranked on number of lambs reared per ewe joined) with the corresponding top third.

The FMS data yielded an estimate of gain in gross margin which is very close to that produced a few years ago using a farm management accounting analysis approach. Similar estimates of response to increases in prolificacy have been routinely reported for UK lowland flocks by the Meat and Livestock

Commission. There can be little argument, based on the foregoing evidence, that increasing the number of lambs reared per ewe can make a major contribution to profitability of the sheep enterprise.

Table 1
Estimates of total annual organic matter intake (kg) by ewes and lambs

	Ewe with single	Ewe with twins
(a) Intake by ewe (kg)	540	571
(b) Total intake by lamb(s) (kg)	41	112
(c) Total weight of lamb at 18 weeks (kg)	39.4	65.4
Efficiency = c/(a+b)	0.068	0.096
Twin ÷ Single	1.41	

Table 2
Estimates of the impact of ewe productivity change on economic performance

Source	Measure of performance	Response to an increase of 0.1 in lambs reared per ewe joined (£/ewe)
Farm Management[1] survey (1988 to 1991)	Gross margin per ewe	+3.08
P. Mahon[2], Teagasc, Athenry	Farm Income from sheep enterprise	+3.01

[1]FMS data on flocks grouped according to weaning percentage and comparing middle and top one-third groups. No evidence for differences between these groups with respect to stocking rate, lamb sale price or the proportion sold as stores although the high weaning percentage group sold a larger proportion as stores in 3 out of 4 years (average 3%).
[2]Unpublished report

Crossbred ewes from hill breeds

Crossbred ewes from hill-breed mothers represent a potentially important source of replacements for lowland flocks. A study was initiated in the 1980's with the objective of evaluating the productivity of ewes sired by various breeds out of Scottish Blackface and Cheviot mothers. This report concerns the reproductive performance and bodyweight of the various crossbred ewe types evaluated.

A flock of Scottish Blackface ewes, originally maintained at the Maam Hill Farm and subsequently maintained at Creagh Research Station, was used to produce crossbred ewes. The breeds of ram used were Belclare, Blue Leicester, Border Leicester, Cheviot, Galway, Suffolk and Texel. In addition contemporary

Table 3
Summary of number of records per ewe breed and average mating weight

Sire of ewe	Ewes joined (no.)	Ewes lambed (no.)	Ovulation rate (no.)	Mating wt (kg)
Belclare	492	464	282	61
Blue Leicester	357	325	214	70
Border Leicester	332	315	197	66
Cheviot	118	102	62	59
Galway	117	97	61	61
Suffolk	197	181	120	68
Texel	289	271	167	65
S. Blackface	211	186	141	61

purebred S. Blackfaces were produced in the first 3 years. Rams from the Belclare breed were used each year while the representation of the remaining breeds varied. Thus, Galway and Cheviot rams were used for the first two years only whereas Suffolk and Texel were only involved in later years. All female progeny were retained for evaluation and were reared together in a single flock. Evaluation involved a minimum of three joinings, to yield lambing performance data at 2, 3 and 4 years of age. In addition to lambing data, ovulation rate was determined by laparoscopy for all ewes prior to joining at 1.5 and 2.5 years of age and again after the first mating of the joining period. During the evaluation phase all the ewes in the flock were joined with terminal sires in a mid-season lamb production system. The flock was located at Creagh from 1983 to 1989 and at Blindwell until 1993.

The potential of the Cheviot as a source of crossbred ewes for prime lamb production has been examined at the Knockbeg Sheep Unit, Carlow. A flock of Cheviot ewes was established in 1985 and mated with Belclare, Blue Leicester and Suffolk rams. Again, all the female progeny were retained for evaluation and were managed together in a single flock, originally at Knockbeg and in recent years contract reared on a private farm (Belclare and Suffolk only).

Results and Discussion

S. Blackface crosses. The number of records for the principal traits and the mean liveweight at mating are given in Table 3 for each breed type. Blue Leicester cross ewes were heaviest, Cheviot cross was lightest and, surprisingly, Galway cross ewes were only 2 kg heavier than the Cheviot cross and equal to the Belclare cross type. The relatively low bodyweight of the Galway cross and Cheviot crosses many be partly due to the fact that these were all produced in the first 2 years of the study when the S. Blackface flock was maintained in a hill environment and ewe lambs were removed to lowland in August/ September.

Table 4
Ewe age effects on bodyweight and reproductive performance

Ewe age at lambing	No. of ewes	Bodyweight (kg)	Fertility	Ovulation rate	Litter size	Lambs reared per ewe joined
2	750	53	0.87	1.48	1.21	1.02
3	672	63	0.92	1.75	1.54	1.38
4	716	68	0.91	—	1.66	1.43
Overall[1]	**2309**	**62**	**0.91**	**—**	**1.68**	**1.35**

[1]Includes ewes older than 4 years

The effects of age on performance are summarised in Table 4 and show that 2-year old ewes were considerably lighter and had lower reproductive performance than the two older categories while 4-year old ewes had the best performance. The least squares means for reproductive performance of the various crossbred types are given in Table 3. The results show that the Belclare cross yielded significantly better reproductive performance than any other breed for all traits with the exception of fertility. For the latter trait the levels were equal for Belclare cross, Border Leicester cross and the purebred S. Blackface, with the Cheviot and Galway crosses being significantly lower. The number of lambs reared per ewe joined provides an overall index of reproductive performance. The Belclare cross ewes yielded the best performance while Cheviot, Galway crosses and S. Blackface were poorest and the other types were intermediate. The Blue Leicester cross group was the closest to the Belclare cross but was still significantly lower ($P<0.05$). When this is taken in conjunction with the difference of 9 kg in liveweight it is concluded that the Belclare cross is substantially more efficient in overall production.

The breed differences in litter size reflect the differences in ovulation rate (see Table 5) and when litter size (at 2 and 3 years of age) was adjusted for

Table 5
Reproductive performance of crossbred ewe types produced from S. Blackface mothers

Sire of ewe	Ovulation rate	Fertility	Litter size	No. lambs reared per ewe Joined	Lambing
Belclare	1.90	0.94	1.89	1.54	1.63
Blue Leicester	1.62	0.91	1.71	1.38	1.52
Border	1.51	0.94	1.60	1.36	1.43
Leicester	1.57	0.86	1.51	1.11	1.27
Cheviot	1.62	0.83	1.63	1.20	1.44
Galway	1.50	0.91	1.65	1.33	1.45
Suffolk	1.52	0.93	1.58	1.33	1.43
Texel	1.53	0.94	1.48	1.18	1.34
S. Blackface					

ovulation rate at mating, breed differences were no longer significant. This indicates that there are unlikely to be any important differences among these breed types with respect to embryo survival. The analysis also showed that the differences in litter size between 2- and 3-year old ewes could not be fully explained by associated differences in ovulation rate. Consequently it is likely that fertilisation rate and/or embryo survival may be impaired in these young ewes.

The results of this study show that the Belclare sires produced crossbred ewes out of S. Blackface dams which were significantly more productive than any of the other crosses examined. The difference relative to Blue Leicester crosses, which had the second highest reproductive performance, was 16 extra lambs per 100 ewes joined. When compared with crossbred ewes sired by rams from breeds commonly used as terminal sires (Suffolk, Texel) the advantage of the Belclare cross was 21 extra lambs per 100 ewes joined. These differences represent large potential increases in income per ewe. Thus, using estimates from the Farm Management Survey for the effect of number reared on gross margin, the Belclare crossbreds should yield an extra gross margin of £4 to £6 per ewe.

Cheviot Crosses: Results on the comparative performance of the Cheviot-cross ewe types at Knockbeg are shown in Table 6. Again, it is evident that crosses sired by the Belclare out-performed all others with respect of ewe productivity. This result is consistent with those given above for crosses out of S. Blackface dams.

Table 6

Performance of crossbred ewes at Knockbeg (1990 to 1993)

Sire of ewe	No. joined	Mating wt (kg)	Fertility (%)	Litter size	Lambs reared per ewe joined
Belclare	476	61	94	1.87	1.62
Blue Leicester	277	67	92	1.78	1.47
Suffolk	461	68	91	1.72	1.42

Suffolk-x-Cheviot ewe types are commonly used on lowland farms and the results in Table 4 show that output can be significantly increased by replacing them with the Belclare cross (20 extra lambs per 100 ewes joined). Moreover, many of the Suffolk-cross ewes on lowland farms in Leinster are not first cross types and, consequently, benefit less from heterosis (hybrid vigour) in reproductive performance than the maximum achieved when first crosses are used.

Crosses with French breeds: We have no direct information on the performance of crossbred ewes sired by French breeds such as Vendeen, Charollais, Rouge de l'Ouest. At present a small sample of Bleu du Maine crossbreds is being evaluated and preliminary results suggest that they are only marginally better than Suffolk-crosses. Information (unpublished) from reasonably large scale trials in the U.K., involving Bleu du Maine and Rouge de l'Ouest crossbreds, have shown that the prolificacy of Rouge-crosses is just about equivalent to Blue Leicester crossbreds while Bleu du Maine crosses are somewhat lower. This pattern is consistent with what we know about the prolificacy of the French breeds, as purebreds, in France (Bodin and Elsen, 1989). This information is summarised in Table 7.

Table 7
Estimates of natural prolificacy of sheep breeds in France: mature ewes only (i.e. excluding 2 y.o. and yearlings)

Breed	No. of records	Litter size	Deviation from (Suffolk + Texel)
Charollais	19109	1.77	0.14
Bleu du Maine	11350	1.86	0.23
Vendeen	70822	1.69	0.06
Berrichon du Cher	13756	1.42	-0.21
Suffolk	19207	1.62	-0.01
Texel	34632	1.64	+0.01
Rouge de l'Ouest	26671	1.81	0.18
Ile de France	94247	1.56	-0.07

It should be noted that these values have been obtained under French conditions and are on-farm data so that breed differences must be treated with caution. However, the observations cover a 3-year period with at least 10,000 lambing records per breed and excluded ewes treated with PMSG. A different set of data, based on 1987 flock recording in France, gave similar mean values. These data suggest that relative to the Suffolk, the Bleu du Maine and Rouge de l'Ouest have most potential as prolific sires although their advantage over the Charollais is quite small. The performance data on Vendeen puts the breed ahead of the Suffolk but slightly behind the Charollais.

Purebred flocks of Belclare, Suffolk and Texel are managed together at Belclare Research Centre and litter size information can be used to put the Belclare performance into the same context as the French results by comparing it with the mean for Suffolk and Texel ewes. The average litter size for adult ewes in our Belclare flock (1991 to 1993) was 2.13 compared with 1.56 for the mean of Suffolk and Texel (Hanrahan, 1994). The superiority of Belclare (+0.57) is more than twice that exhibited by any French breed (Table 7).

Of course it must be noted that breed rankings as purebreds do not necessarily hold for their crossbred daughters and indeed breed ranking may depend on the other component of the cross. However, a reasonable generalisation is that heterotic effects are unlikely to have a major impact on prolificacy ranking since ovulation rate accounts for the major proportion of any breed differences in litter size and it has a mainly additive genetic determination.

Table 8
Estimated productivity of crossbred ewes sired by different breeds.

Sire breed	Litter size	Lambs reared per ewe joined
Belclare	1.88	1.60
Bleu du Maine**	1.77	1.45
Blue Leicester	1.75	1.44
Border Leicester	1.65	1.36
Charollais*	1.74	1.43
Rouge de l'Ouest*	1.77	1.45
Suffolk	1.69	1.39
Texel	1.62	1.34
Vendeen*	1.72	1.41

*Based on information from France on purebred performance
**Based on limited information from Ireland and U.K.on crossbred performance and information from France on purebred performance.

With this assumption the available information, from our own trials and from the UK and France, can be used to predict the likely differences among crossbred ewes sired by different breeds. The results are summarised in Table 8 as a guide when considering options in relation to the production of flock replacements. The differences between the breed-types shown are those to be expected if rams of these breeds were used to sire flock replacements.

Growth rate of replacement lambs: Concern has often been expressed about consequences for lamb growth rate when rams of the Belclare breed are used to sire flock replacements. Information from the production phases of the ewes involved in the crossbred trials discussed above is summarised in Table 9 (crossbred lambs from S. Blackface ewes) and Table 10 (crossbred lambs

Table 9
Crossbred lambs from S. Blackface ewes: effect of sire breed on lamb growth

Breed of sire	No. of progeny	Birth wt (kg)	Weaning wt (kg)	Growth rate (g/day)	
				0-5 weeks	0-14 weeks
Suffolk	126	4.2	29.5	324	253
Texel	92	4.2	29.4	328	249
Belclare	210	3.9	28.0	300	238
Blue Leicester	225	4.3	30.2	322	256
Border Leicester	204	4.1	28.4	305	241
s.e. (approx)	—	0.07	0.45	6.6	4.2

Table 10
Sire breed effects on weaning weight (kg) of crossbred ewe lambs out of Cheviot ewes

Year	Bred of sire		s.e.d.
	Suffolk	Belclare	
1990	41.0 (37)	40.0 (37)	0.95
1991	36.2 (35)	36.3 (39)	1.52
1992	42.3 (44)	41.5 (48)	1.32
1993	39.6 (59)	38.9 (49)	0.83

( ) = number of lambs

from Cheviot ewes). The results show that lambs sired by the Belclare are lighter at birth (0.3 kg) and at weaning (1 to 1.5 kg) than lambs sired by the Suffolk, Texel or Blue Leicester breeds. These differences are a natural consequence of the smaller mature size of the Belclare breed and are likely to have a small negative impact on the value of the wether lambs. However this is likely to be outweighed by the lower annual maintenance requirements of a smaller ewe.

Flock replacement policy: A feature of the lowland sheep industry is the general absence of a deliberate policy. In relation to the production of flock replacements in general, replacements for the ewe flock emerge as a by-production of prime lamb product and so replacements are sired by breeds whose primary role is as a terminal sire. Effective progress on genetic improvement in the reproductive potential of lowland flocks requires deliberate choice of breed to sire flock replacements and 30 to 40 percent of the ewe flock must be joined to produce sufficient replacements for a prolific self-contained flock. There is also considerable scope for the production of first-cross ewes from draft hill ewes. The results of the studies summarised herein show the merits of the various breeds as sires of ewes and clearly underline the gains in productivity which can be obtained from exploiting high genetic merit for prolificacy.

References

Bodin, L. and Elsen, J. M. 1989. Anim. Prod. 48: 535-541.

Hanrahan, J .P. 1994. Ewe productivity. In Proc. Sheep Conference for Advisers 9 pages.