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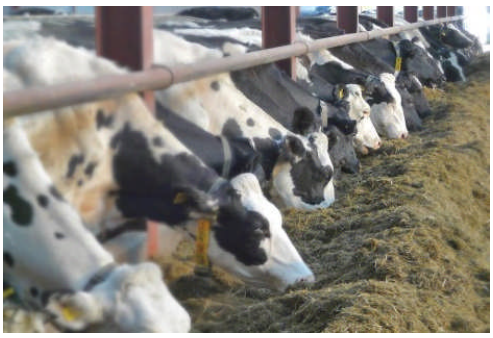
Evaluation of feed system and calving pattern effects on performance of winter milk herds



Key external stakeholders:

Dairy farmers - national, feed and nutrition companies; consultancy agencies

Practical implications for stakeholders:

High stocking rate winter milk systems, incorporating purchased forages, byproducts and concentrates in the feed budget, can significantly increase milk solids output per grazing ha compared to closed forage systems operating at lower stocking rates. Efficiency of grass utilisation can be maintained in such systems where grazing decision rules are implemented correctly. Nonetheless, base production costs will be markedly increased resulting in much greater exposure to fluctuations in milk price and feed cost. The priority for winter milk herds should be to maximise forage utilised per grazing ha before any move to more intensive feeding systems is considered.

Control of calving pattern is an important element of profitable winter milk production. The optimum pattern for liquid milk production is farm-specific, but the general guidelines are for calving to be concentrated in confined blocks around February and October, with minimal calving from April to mid-September. High fertility EBI genetics and excellent management of submission rates are essential to achieve this.

Within the winter milk sector, farms with higher feed costs tend to incur the bulk of additional cost during spring and autumn periods, not during the housing period. This is primarily caused by failure to link grazing management and supplement feeding decisions.

Although some tailoring of targets is needed, pasture technologies such as the spring rotation planner, summer wedge, and autumn grass budget are valuable management tools for winter milk systems. Used correctly they provide an excellent means of increasing forage utilised and reducing annual feed costs.

Main results:

- Optimum calving pattern for winter milk systems varies with supply contract conditions. Across a range of scenarios however, compact calving blocks centered on February and October are most favourable; proportion calving in each block is dictated by winter supply requirements.
- The profitability of high input/high stocking rate winter milk systems compared to lower input/closed systems is highly dependent on milk price and feed input cost. High input systems are more sensitive to price/cost fluctuations.
- There is significant potential to reduce annual feed costs for winter milk herds by improved utilization of grazed grass. Grazing technologies (spring rotation plan, wedge, autumn budget) are appropriate for use in a winter milk scenario with some tailoring of specific targets

Opportunity / Benefit:

This project has generated new information on optimum calving pattern, annual feed budgets and grazing management protocols for winter milk production systems.

Collaborating Institutions:

None

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External Collaborators:

1. Project background:

Winter milk production inevitably involves greater feed budget costs due to the requirement for high quality lactation diets during the winter housing period. Nonetheless, there may be scope to moderate annual feed costs within the sector through improved forage quality, simplification of diets and better use of grazed pasture. In addition, calving pattern exerts a major influence on cost structure for winter milk herds through its effect on milk supply pattern, feed budgets and labour demand. Optimum calving pattern tends to be farm-specific due to differences in milk supply contracts and other factors, however clear guidelines are required to demonstrate its importance to profitability.

2. Questions addressed by the project:

- How does performance and profitability of a grass silage-based winter milk system compare to a maize silage system or an intensive TMR system run at a high grazing stocking rate?
- What is the optimum calving pattern for split autumn/spring herd producing contract winter milk?
- What are the principal grazing management targets for autumn calving herds during spring, summer and autumn?
- How are supplement feeding decisions made on commercial winter milk farms, and how does this impact on annual feed cost?

3. The experimental studies:

Four areas of work were carried out under this project:

- **Comparing grass silage, maize silage, and total mixed ration winter feeding systems for autumn calving cows.** 72 autumn-calving Holstein Friesian cows were assigned equally to one of three treatments; i) a closed forage system stocked at 2.75 livestock units (LU) per ha using grass silage as sole winter forage; ii) a system stocked at 2.75 LU per ha using 18% of area to grow maize silage for winter forage production or iii) an open system stocked at 4.0 LU per ha, incorporating imported winter forages and other feeds by means of a TMR diet. All treatments aimed to maximise use of available grazed pasture from early spring through late autumn. Measures included milk yield, feed intake patterns, body condition score, grass sward parameters, and annual feed budgets.
- **Review grazing protocols for winter milk herds:** Coincident with the larger systems study, guidelines were developed to address specific grazing management issues arising for winter milk herds. These include options to balance high feed demand at turnout, validation of the mid-season grazing practices, and revision of autumn grazing budget targets.
- **Development of a model to optimise calving pattern for winter milk herds:** An Excel-based model was constructed to facilitate calculation of optimum calving pattern across a range of farm scenarios. Optimum calving pattern is defined in the model as the number of calvings per month that ensures winter supply contracts are met, for the largest milk revenue margin over annual feed budget cost. Monthly milk volume and solids matrices per month of calving plus maintenance curves are included to define milk supply and feed energy (UFL) requirements. Annual grass growth patterns and quality, grazing platform ha, silage ha and quality, grazing season duration and concentrate cost are used to define forage supply and supplement requirements.
- **Benchmarking feed inputs and management on commercial winter milk farms:** Over a 24-month period, monthly milk yield, concentrate and conserved forage feeding levels, stocking rates and pasture measures (average farm cover, pre-grazing yield), were collected from 15 winter milk farms distributed nationally. Breeding and financial data were also collected on these farms and data were analysed to identify key drivers of cost and performance.

4. Main results:

Comparing grass silage, maize silage, and total mixed ration winter feeding systems for autumn calving cows

- Compared to the grass silage system, TMR-fed cows had greater daily milk volume (27.0kg versus 24.3kg) and solids yield (2.03kg versus 1.78kg) during the winter period. There were no significant system effects on winter milk solids content or production per cow during the grazing period.
- Due to the combined effects of higher individual yield and stocking rate, milk solids output per

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grazing ha was greater for the TMR compared to the grass silage system (2157kg versus 1376kg).

- Purchased feed cost per cow was approximately 85% higher for TMR compared to the grass silage system. Whole system cost analysis showed that while some fixed costs were diluted due to higher milk output, the more intensive TMR system had greater machinery, labour and depreciation charges resulting in a 66% increase in total costs per ha.
- Relative profitability was highly dependent on milk and feed input prices. Based on a 40ha scale, the grass silage (109 cow herd size) and TMR (158 cow herd size) systems returned comparable farm profit at a base milk price of 27-28 cpl. Rate of change in profit per ha, per unit change in milk price, was 54% greater for the TMR system.
- Milk volume and solids output per cow were similar for the TMR and maize systems. Compared to the grass silage system, net margin was reduced by approximately €200 per ha when maize silage was included as part of a closed system due to increased forage and concentrate costs.
- No consistent differences in fertility were observed between feeding systems

Review of grazing protocols for winter milk systems

- Spring grazing rotation targets of 33% area grazed by March 1st, 66% by March 17th, and 100% by early April, are appropriate for winter milk herds. High feed demand can be managed by allocating extra forage and/or concentrate in tandem with daily grass allowance. A minimum allowance per grazing bout of 5kg DM per cow is required. This can be achieved by limiting grazing to 4-5 days per week, or partial turnout of the milking herd, during early spring.
- Summer grazing targets of 1400kg DM per ha pre-grazing mass, 4cm post grazing height and average cover per cow of 160 to 170kg DM per cow, are suitable for winter milk systems.
- Grazing swards for winter milk herds should not exceed 1700kg DM pre-grazing mass in autumn. The target for peak grass cover is 850-900kg DM per ha in mid-September. Final rotation should commence in early November with 70% area grazed by November 1st.

Development of a model to optimise calving pattern for winter milk herds

- The model showed that calving during months May-August led to a reduction in margin over feed costs across a range of feed supply and milk contract scenarios.
- The model identified February-March calving as having the highest margin over feed cost in the absence of winter supply contracts. To meet winter milk contract volumes however, a compact calving block in October-November was identified as optimum for a range of farm scenarios.
- Optimum percentage of autumn calving varied with milk supply contracts and stocking rate. Assuming a grazing stocking rate of <3.0 cows per ha, the optimum percentage of autumn calving required to meet flat-rate annual liquid milk contract volumes of 25%, 50% and 75%, was calculated as approximately 15%, 25% and 45% respectively. The relative cost advantage of calving in the spring block reduced as stocking rate increased.
- Increasing annual forage utilised per ha significantly improved margins across a spectrum of calving pattern, herd milk yield, supply contract, and stocking rate combinations tested in the model.

Benchmarking feed inputs and management factors on commercial winter milk farms

- Winter forage and concentrate feeding levels did not differ significantly between herds with high annual feed costs (8.5 cpl) versus herds with lower annual feed cost (4.5 cpl).
- The largest differentials in supplement feeding between high and low cost herds were observed during the spring grazing and early autumn periods. These were not explained by differences in stocking rate, milk output or land type. Low feed cost herds made supplement feeding decisions in tandem with grass measurement, while high cost herds tended to focus on target milk yield per cow.
- Across the benchmarks herds, higher EBI (€120) cows had higher 305-d milk solids yield (+10kg per lactation), increased milk protein (+0.18%) and shorter calving interval (-52 days) compared to low EBI (€5) herd-mates.

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5. Technology Transfer:

Johnstown Castle hosted national liquid milk events in 2010 and 2012 where the systems study provided the basis for technology transfer messages. Findings were presented at liquid milk conferences in 2009, 2011 and 2013, and also under winter milk and dairy cow nutrition sections for Moorepark Open Days. Experimental work has been presented at other Teagasc seminars and invited industry events, as well as through popular publications (Today's farm, IFJ, Farmer's Monthly etc). The calving pattern costing model has been used to compile technical reports for industry stakeholders (e.g. National Milk Agency 2012, Fresh Milk Producers 2010-11, Lakeland Dairies 2013) where requested. A series of on-farm events focusing on project outcomes was carried out on the benchmark farms during 2010 and 2011.
Results of the project have been discussed with Teagasc dairy advisory staff through in-service training on an on-going basis. In addition to open day events, numerous discussion groups have visited Johnstown Castle over the course of the project. Project outcomes have also been used to develop regional winter milk workshops for Teagasc dairy clients, organised at the area unit level.

6. Main publications:

- Patton, J. 2011. A calving pattern model for liquid milk herds. Proceedings of Teagasc National Liquid Milk Conference p8-12
- Patton, J., and A. Lawless. 2011. Milk production performance of autumn-calving Holstein Friesian cows managed under grass silage or total mixed ration feeding systems In: Agricultural Research Forum, The Tullamore Court Hotel, p48
- Patton J., and A. Lawless. 2011. Grassland Guidelines for Winter Milk Herds. In 'Planning for 2015' Moorepark Open Day 2011 p78.

7. Compiled by: Dr. Joe Patton