

**Project number:** 6015  
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## An investigation of alternate expansive pasture-based milk production systems for the Border Midlands West regions post EU milk quotas.



### Key external stakeholders:

Irish dairy farmers, Milk processors, Consultancy agencies

### Practical implications for stakeholders:

- While increasing SR beyond the growth capability of the farm greatly increases overall milk productivity and can be used as a short term strategy to increase animal numbers in advance of expanding on to a larger land block, in the longer term, SRs that largely exceed the growth capability of the farm contribute little in terms of additional grass utilisation and consequently result in significant increases in purchased feed and overall milk production costs.
- The optimum stocking rate for the milking platform is highly dependent on milk price and the grass growth capacity of the farm.

### Main results:

- Average annual net herbage production was 13,225 kg DM per hectare during the 4 year study period and was unaffected by GPSR. There was no significant difference in the total herbage utilized or in the component of total herbage utilized as grazed pasture between treatments
- Concentrate and silage supplementation also varied significantly between GPSR treatments during lactation. The HI FS received more concentrate and silage during lactation compared with HG FS
- The HI FS produced more milk and milk solids per cow and per hectare compared to HG FS while the persistency of lactation was similar for both treatments. Milk fat and lactose content was unaffected by GPSR however milk protein content was significantly higher for HG FS
- Grazing Platform SR had no significant effect on body weight (BW) and body condition score (BCS) during lactation and there was no significant effect of GPSR on any of the reproductive variables measured over the 4 year study period.

### Opportunity / Benefit:

The improved performance associated with increased grazed grass utilisation is estimated to improve overall farm profitability by €160 per ton of DM utilised per hectare per year

### Collaborating Institutions:

UCD

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### 1. Project background:

Milk production in pastoral dairy systems is limited by the amount of pasture that can be grown within a season. Although dairy farms differ in their capacity to produce and utilise pasture, previous studies have indicated that pasture production and utilisation is one of the most important drivers of operating profit and, therefore, return on capital, on grazing farms (Shalloo et al., 2004; Dillon et al., 2008). While new developments in agronomic management practices will contribute to increased pasture land productivity over time (McCarthy et al., 2013), the availability of new grazable land adjacent to the milking platform will increasingly constrain production on Irish dairy farms post EU milk quotas (Hennessy et al., 2005; O'Donnell et al., 2008). Stocking rate (SR) has been acknowledged as the key factor influencing productivity per hectare on pasture based dairy farms for many years (McMeekan and Walshe, 1963; Hoden et al., 1991; Macdonald et al., 2008; McCarthy et al., 2011). The aforementioned studies have shown that higher SRs result in a reduction in milk production per cow, but an increase in milk production per ha (Journet and Demarquilly, 1979; Macdonald et al., 2008; McCarthy et al., 2011). As SR increases and eventually exceeds the growth potential of the farm, pasture availability is reduced and imported feeds will be required. Milksolids per ha is the product of SR, expressed as cows per hectare, and MS per cow, and increasing either or both will increase MS per hectare (Jensen et al., 2005), provided that sufficient feed per hectare is provided (McMeekan 1961). Consequently, the use of imported supplementary feeds to sustain high animal productivity at high stocking rates has recently received more attention (Fales et al., 1995; Jensen et al., 2005; Coleman et al., 2010; Farina et al., 2011). Baudracco et al., (2010) recently reviewed the efficacy of increased supplementation at higher SR where pasture availability is restricted and suggested that synergistic benefits can be obtained allowing high pasture utilisation and increased milk production per cow and per hectare compared to unsupplemented high SR treatments. Supplement brought onto the farm will support high MS production per cow and per ha at the high SRs needed to achieve high levels of pasture utilisation (Stockdale 1995) and can potentially extend lactation length thereby achieving high MS responses (Deane 1999).

### 2. Questions addressed by the project:

- What is the effect of an increase in SR on individual animal and per hectare milk production performance?
- What effect would intensified systems of grass based milk production, based on increased stocking rates on the milking platform in conjunction with increased imported feed, have on grass utilisation and the total feed budget of the dairy herd?

### 3. The experimental studies:

The objective of this study was to evaluate the effect of differing grazing platform stocking rates (GPSR) on milk production, BW and BCS and grass production, utilisation and quality on a wetland soil type post European Union milk quotas over a four year period. Animals were randomly allocated to 1 of 2 GPSR treatments, High-closed (HC; 3.1 cows/hectare (ha) and High-open (HO; 4.5 cows/ha) which were designed to represent alternative GPSR in a post-European Union milk quota, spring calving, grass-based milk production system. A total of 124 spring-calving dairy cows were used during 2008, 2009, 2010 and 2011, respectively. The effects of GPSR on milk production per cow and per ha, body weight and body condition score and reproductive performance were analysed.

### 4. Main results:

- Average annual net herbage production was 13,225 kg DM per hectare during the 4 year study period and was unaffected by GPSR. Year had a significant effect on annual herbage production and was least in 2008 and greatest in 2011 (11,647 and 15,472 kg DM per hectare, respectively).
- Over the entire grazing season, pre-grazing herbage mass and herbage disappearance was higher for HG FS (1,390 and 1,324 kg DM/ha, respectively) compared to HI FS (1,246 and 1,254 kg DM/ha, respectively) while post-grazing residual sward height and grazing efficiency were similar for both

GPSR treatments (38.2mm and 0.97, respectively).

- There was no significant difference in the total herbage utilized (9,972kg DM/ha) or in the component of total herbage utilized as grazed pasture (8,792kg DM/ha) between treatments however more herbage was harvested as silage within the HG FS farmlet (1,704 kg DM/ha/yr vs. 644 kg DM/ha/yr for HI FS). Consequently, and although the HG FS was designed as an enclosed FS where all winter forage requirements would be harvested within the farmlet area, lower than anticipated average pasture growth during the four years of the study necessitated that 618 kg DM/cow were imported as winter feed from outside the HG FS farmlet to meet the feed requirements of this treatment. In comparison, 1,288 kg DM/cow of winter forage was imported from outside the HI FS treatment area.
- Concentrate and silage supplementation also varied significantly between GPSR treatments during lactation. The HI FS received more concentrate (872kg DM/cow) and silage (634kg DM/cow) during lactation compared with HG FS (551 and 360kg DM/cow, respectively) and as silage fed to dry cows was similar for both treatments (802 kg DM /cow), total silage requirements were also higher for HI FS compared with HG FS (1,431 vs. 1,168 kg DM/cow).
- Average lactation length was similar for both GPSR treatments (270 days). The HI FS produced more milk (4,865 kg) and milk solids (390 kg) per cow compared to HG FS (4648 and 377 kg, respectively) while the persistency of lactation was similar for both treatments. Milk fat and lactose content was unaffected by GPSR (45.7 and 47.4 g/kg, respectively), however milk protein content was significantly higher for HG FS (35.7g/kg) compared with HI FS (35.0g/kg).
- At the system level, due to increased milk production per cow and a higher GPSR, milk and milk solids yield per hectare of milking platform was significantly higher for HI FS (22,229 and 1,786 kg, respectively) compared to HG FS (14,190 and 1,153kg, respectively).
- Grazing Platform SR had no significant effect on body weight (BW) and body condition score (BCS) during lactation and there was no significant effect of GPSR on any of the reproductive variables measured over the 4 year study period.

## 5. Opportunity/Benefit:

The current study has demonstrated that large quantities of high quality pasture can be grown and efficiently utilized within the BMW region of Ireland with minor adjustments to grazing management practices. Increasing stocking rate and imported feed inputs simultaneously will lead to increased productivity per ha on a wetland drumlin soil in Ireland.

## 6. Dissemination:

During the life time of this project 2 open day events were held at Ballyhaise that provided key findings from this research to Irish dairy farmers and industry representatives. The objective of these events was to highlight research technologies that will increase farm profitability post milk quotas by instigating management practices that grow and utilise higher quantities of superior quality grass and achieve high animal performance over a long grazing season.

In addition to scientific, popular press articles and open day events, individual discussion groups frequently visited the experiment during the project. Topics covered at these events by research and advisory staff included grassland management best practice advice, animal breeding and the economic implications of research results. The research results were also disseminated via in-service training to Teagasc Advisory staff annually.

## Main publications:

Patton, D., L. Shalloo, K.M. Pierce and B. Horan. 2012. A biological and economic comparison of 2 pasture-based production systems on a wetland drumlin soil in the northern region of Ireland. J. Dairy Sci. 95:484-495.

## Popular publications:

Horan, B., L. Shalloo and D. Patton, 2012. 'What stocking rate for my farm? Maximising milk production from pasture' in National Dairy Conference 2012, Tralee, Co. Kerry.

## 7. Compiled by: Dr Brendan Horan