

**Labour efficiency and multi-functionality on Irish dairy farms**

Bernadette O'Brien<sup>1</sup>, Kevin O'Donovan<sup>1,2</sup> and David Gleeson<sup>1</sup>

<sup>1</sup>Teagasc, Dairy Production Department,  
Moorepark Research Centre, Fermoy, Co.Cork, Ireland.

E-mail: bobrien@moorepark.teagasc.ie

<sup>2</sup>Department of Agribusiness, Extension and Rural Development, Agriculture and Food  
Building, National University of Ireland, Dublin, Belfield, Dublin 4, Ireland.

**Abstract**

*The current inflexibility of dairy systems in terms of labour requirement means that dairy operators cannot easily adopt a multi-functional approach, which may assist in maintaining family farm income. Education in time management is a key element in the promotion of multi-functionality. The purpose of this study was to investigate the labour invested on dairy farms and the feasibility of reducing that labour to provide opportunity for alternative enterprises. Ninety-four dairy farms participated in the study. Proportionally 0.32, 0.28, 0.21 and 0.19 of farms were within milk quota groups 135 x10<sup>3</sup> to 250 x10<sup>3</sup> litres (Group 1), >250 x10<sup>3</sup> to 320 x10<sup>3</sup> litres (Group 2), >320 x10<sup>3</sup> to 500 x10<sup>3</sup> litres (Group 3) and >500 x10<sup>3</sup> to 1,500 x10<sup>3</sup> litres (Group 4), respectively. Participant farmers recorded the time taken to perform farm tasks, on consecutive 3 or 5-day periods on one occasion per month. The average dairy labour input per day for farms in milk quota groups 1, 2, 3 and 4 over the 12-month period was 7.0 h, 7.9 h, 9.6 h and 13.3 h, respectively. A daily time saving of 3.0 h and 2.2. h at the milking process and calf care, respectively, was observed on the most efficient compared to the least efficient farms within quota group 1. The data indicated the possibility of reducing dairy labour input on these farms to 3.8 h per day or by 65 %. Well-designed infrastructure and well managed practices employed on farms should facilitate labour efficiency and feasibility of multi-functionality.*

**Introduction**

The contribution of agriculture to national wealth and viability of rural areas is significant. However, it is clear that the sector is in a state of flux. Structural change is continuing within the sector with declining farm numbers and declining employment on farms (Frawley and Phelan, 2002). Currently, the demand for labour on farms is high due to intensive labour-orientated systems of production. In addition, Hennessey *et al.* (2000) have indicated that an expansion of production, of between 60 and 140 % is required if Irish farmers are to maintain incomes. The ability to spread labour costs over a larger milk output can represent a crucial difference between high and low profitability on dairy farms.

However, Hennessy *et al.* (2000) also found that labour represented the binding constraint to expansion on 40% of Irish farms.

The increasing pressure on farm incomes leaves no doubt that the continued existence of many family farms cannot be maintained from farming alone. Part-time farming may offer a mechanism to retain farm families on an increasing number of non-viable farms. Part-time farming could represent a positive impact on the farm household through the contribution of off-farm income to the farm household economy. Part-time farming could also have a positive impact on rural development in that it may retain rural population, alleviate poverty and provide stability in rural areas. The adoption of off-farm work by farm households is an important, well-recognised and growing phenomenon in the EU (Kinsella *et al.* 2000). The proportion of households with at least one off-farm income source has increased from 36% in 1995 to 45% in 2000. Projections indicate that by 2010 some 60 % of farm households will be involved in some form of off-farm work (Frawley and Phelan, 2002). The proportion of farm operators involved in off-farm employment increased from 26% in 1995 to 32% in 2000. However, 69% of these farmers who had off-farm income were engaged in a dry cattle enterprise. But the current inflexibility of dairy systems in terms of labour requirement means that operators within this sector cannot easily take up off-farm employment or develop an alternative enterprise. This must be addressed for the future if a substantial number of dairy farm households are to be maintained.

There is currently a need to establish the patterns of labour utilisation, as well as the influences of facilities, layout and work procedures on labour allocation levels and patterns on farms, in order to elicit constraints and possibilities in relation to labour issues, in a future of potential multi-functionality on dairy enterprises.

### **Methodology and data sources**

The study was conducted with dairy farmers mainly in the Munster region of Ireland, since this area accounted for 65% of the total manufacturing milk supply in the country. Ninety-four spring-calving dairy farms participated in the study. The farms had spring-calving systems and ranged in milk quota size from  $135 \times 10^3$  to  $1,500 \times 10^3$  litres. Farms were grouped by milk produced into four milk quota groups; quota group 1 =  $135 \times 10^3$  to  $250 \times 10^3$  litres, quota group 2 =  $>250 \times 10^3$  to  $320 \times 10^3$  litres, quota group 3 =  $>320 \times 10^3$  to  $500 \times 10^3$  litres, quota group 4 =  $>500 \times 10^3$  to  $1,500 \times 10^3$  litres. Proportionally 0.32, 0.28, 0.21 and 0.19 of the farms used were within quota groups 1, 2, 3 and 4, respectively. Farms in milk quota groups 1, 2, 3 and 4 had an average milk quota of  $212 \times 10^3$ ,  $281 \times 10^3$ ,  $388 \times 10^3$  and  $764 \times 10^3$  litres, respectively. These farms had an average herd size of 47, 55, 74 and 149 cows, respectively, and an average farm size of 49, 53, 72 and 98 adjusted hectares, respectively.

Data was collected over a 12-month period between February, 2000 and January 2001. All farm operators (farmers and/or farm staff) recorded the duration of the different tasks that they performed throughout the day. Two data recording methods were used. The main method involved a timesheet that was designed to record the total time consumed by 29 different farm tasks for each of 3 consecutive days. The second method involved a Psion organiser, i.e. a hand-held, electronic data logger that incorporated the Observer behavioural package (Noldus Information Technology). On the farms using the Psion, each individual

worker recorded data for 5 consecutive days. Sixty-five and twenty-nine farms used data recording methods 1 and 2, respectively.

The 29 farm tasks were incorporated within 10 task categories. This study focused on two task categories, i.e. milking and calf care. ‘Milking’ was the term used to describe the milking process and incorporated herding cows for milking, milking (clusters on / clusters off), washing up and herding cows after milking. ‘Calf care’ described the tasks associated with feeding, cleaning and bedding of calves.

‘Once-off’ survey questionnaires were also completed for each farm participating in the study. The completed questionnaires provided information on facilities and layout and farm practices relating to the milking process, calf care, feeding and cleaning associated with winter housing and waste management on the farm.

Data was processed using the Microsoft Access database management system and analysed using the SAS statistical package (SAS, 1999). Analysis of variance across months was carried out using the GLM procedure. In the analysis carried out, the farm was considered to be the experimental unit from which repeated measures were taken on a monthly basis.

## Results

The average dairy labour input per day for farms in milk quota groups 1, 2, 3 and 4 over the 12-month period was 7.0 h, 7.9 h, 9.6 h and 13.3 h, respectively (Table 1). Dairy labour input per day increased with increasing milk quota group ( $p < 0.001$ ).

*Table 1. Dairy labour input per day (h) required by dairy task categories on farms of four different milk quota groups*

	Milk quota group					
	1 212 x10 <sup>3</sup>	2 281 x10 <sup>3</sup>	3 388 x10 <sup>3</sup>	4 764 x10 <sup>3</sup>	s.e.m.	Significance
Av. milk quota (litres)						
Total dairy labour (h)	7.0 <sup>a</sup>	7.9 <sup>b</sup>	9.6 <sup>c</sup>	13.3 <sup>d</sup>	0.50	***

<sup>abcd</sup> means on the same line without a common superscript are significantly different

\*\*\* =  $P < 0.001$

### *Labour input on milk quota group 1 farms*

It was assumed that milk quota size on dairy farms influences the threat to viability on such farms. Labour input on farms within the smallest milk quota category (milk quota group 1 farms) was examined, specifically, to quantify potential available time for involvement in other enterprises, in order to increase total family farm income. The average total labour input per day for milk quota group 1 farms peaked at 9.6 h in June and gradually declined to 5.4 h in December. When time associated with enterprises other than dairying was excluded, the average labour input per day associated with dairying decreased from 9.0 h in June to 4.4 h in December.

Considerable variation in dairy labour input per day was observed on farms within this quota range. The most efficient 20 % of herds (average quota =  $222 \times 10^3$  litres) had an average daily labour input of 4.7 h, whereas, the least efficient 20 % of herds (average quota =  $228 \times 10^3$  litres) had an average daily labour input of 10.1 h (Figure 1). The average production level in terms of daily milk yield per cow of the top 20 % labour efficient herds was 29.0, 25.4 and 21.8 kg/cow/day for the months of May, June and July, respectively. The comparable figures for the lowest 20 % labour efficient herds was 25.9, 23.6 and 21.4 kg/cow/day, respectively. Thus, milk production per cow was not adversely affected by the reduced dairy labour input by the top 20 % labour efficient herds. However, the relatively high dairy labour input of the 20 % least efficient herds may be due to carrying a greater cow number than should be necessary to fill the milk quota. It was observed that the top 20 % labour efficient herds had an average cow number of 42, while the lowest 20 % labour efficient herds had an average cow number of 53 during the month of June. Considerable additional dairy time could be associated with the management of these extra cow numbers at this level of scale.

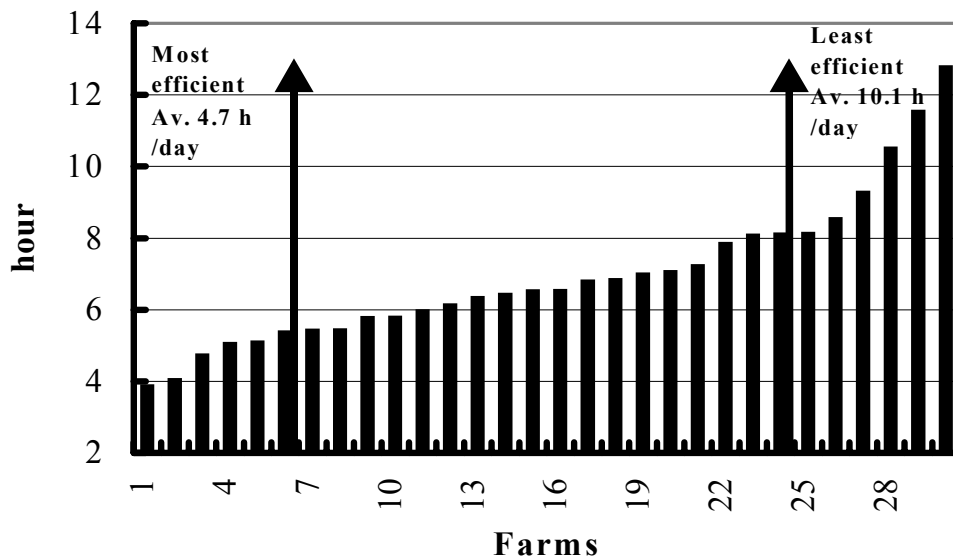


Figure 1: Variation in average dairy labour input per day over 12 months on milk quota group 1 farms

#### ***Benchmarking of milk quota group 1 farms on labour input to specific dairy tasks***

Proportionally 0.36, 0.16, 0.12, 0.10, 0.06, 0.11, 0.05, 0.03 and 0.01 of dairy labour time was associated with the task categories of milking process, maintenance (land and buildings), grassland, management, calving and calf care, feeding and checking dairy animals, fertility and miscellaneous over a 12-month period, respectively.

The dairy task requiring the greatest proportion of labour input was the milking process. The average daily labour input for the milking process over a 12-month period, for the 30 farms was plotted in order to establish the month in which labour input was at a

maximum. Labour input was highest for the milking process in May. The task of calving and calf care represented a labour demand peak during the month of March. Although calving and calf care accounted for just 6 % of dairy labour input over the 12-month period, calf care alone accounted for 13 % of dairy labour input during the month of March. Thus, the variation in labour input levels in the months of peak labour demand for the tasks of milking and calf care were observed, and potential factors, such as, facilities and practices were compared in order to establish reasons for such variation. The average daily labour input to the dairy tasks of the milking process (May) and calf care (March) for the most efficient (20 %) and least efficient (20 %) herds, together with quota size and cow/calf number for the respective groups are shown in Table 2. (The most and least efficient herd groupings may consist of different herds for the different tasks.)

*Table 2: Average daily labour input of most efficient (20 %) and least efficient (20 %) herds (within milk quota group 1 farms) to the dairy tasks of the milking process (May) and calf care (March) and quota size and cow/calf number for the respective groups*

	Most efficient 20 % of herds	Least efficient 20 % of herds
<b><i>Milking process (May)</i></b>		
Dairy labour input/day (h)	2.2	5.2
Quota (x10 <sup>3</sup> litres)	207	222
Average cow number	40	56
<b><i>Calf care (March)</i></b>		
Dairy labour input/day (h)	0.6	2.8
Quota (x10 <sup>3</sup> litres)	209	209
Average calf number	26	30

### ***The milking process***

Considerable variation in labour input per day for the milking process during the month of May was observed within this quota range. The most efficient 20 % and the least efficient 20 % of herds had an average daily labour input to the milking process of 2.2 h and 5.2 h, respectively (Table 2). In examining the facilities and practices associated with the milking process on the individual farms within the most and least efficient groups, there were a number of factors that could potentially account for the major differences in efficiency. The average number of cows milked per unit was 5 and 8 in the most and least efficient herds, respectively. The most efficient herds had pipeline systems with one operator in the pit. Two of the least efficient parlours had recorder plants and had two operators in the pit during milking, thus, doubling the time associated with milking. There was a greater degree of teat preparation carried out in the least efficient herds. A greater proportion of efficient herds had exit gates operated from any point in the pit. The majority of the most efficient farms had the grazing area in one block, which facilitated cows going to the paddock directly after milking, while the majority of farms in the least efficient group retained cows in the yard until completion of milking, when the cows were subsequently accompanied to the paddock by the drover. There were more instances of mechanized cleaning of yards within the most efficient group, e.g. tractor, pump, slats. The majority of farms in the least efficient group used some degree of hand cleaning which was generally done on a twice daily basis.

### *Calving and calf care*

Considerable variation in labour input per day for calf care during the month of March was observed. The most efficient 20 % and least efficient 20 % of herds had an average daily labour input to calf care of 0.6 h and 2.8 h, respectively, in March (Table 2). In examining the facilities and practices associated with calf care on the individual farms within the most and least efficient groups, there were a number of factors which could potentially account for the major differences in efficiency. The majority of farms in the most efficient group transferred milk to the calf house by a trolley type mechanism, whereas, bucket transfer was used on all of the inefficient farms. A minority and majority of farms fed calves individually by bucket on the most and least efficient farms, respectively. The majority of efficient farms cleaned calving houses mechanically and infrequently, while a majority of inefficient farms cleaned calf houses manually using a fork.

### *Theoretical dairy labour input*

The average for the 20 % of farmers having the highest and lowest dairy labour input per day, for each month of the year was calculated. (Any individual farmer may not have been in the most efficient group for all months or for all tasks within a month.) The theoretical profile of dairy labour input over a 12-month period, incorporating the 20 % least efficient and 20 % most efficient farms (in each month) is shown in Figure 2. The average dairy labour input per day over 12 months for the 20 % of farms with lowest dairy labour input per day and for the 20 % of farms with highest dairy labour input per day was 3.8 h and 10.8 h, respectively. Taking 6 full working days per week, the average dairy labour input for these two scenarios would be 22.8 h and 64.8 h per week or 1,186 h and 3,370 h per year, respectively. Thus, there is potential to reduce labour input by approximately 65 %.

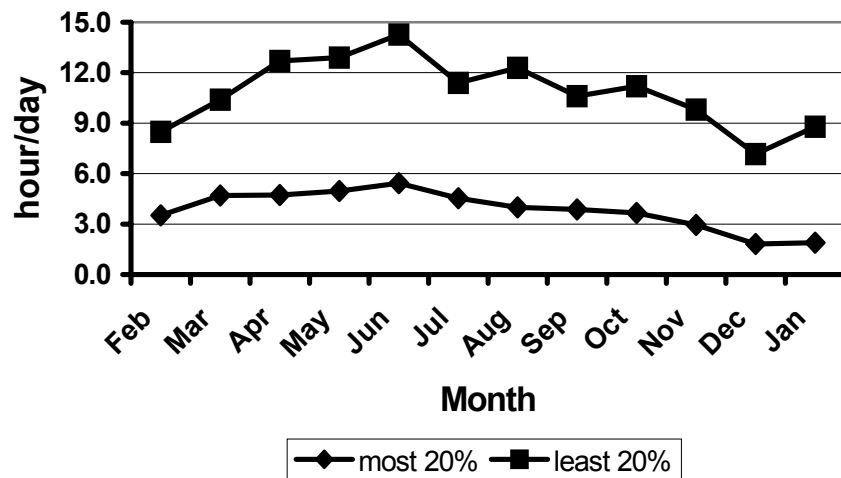


Figure 2: Simulated dairy labour input over 12 months on milk quota group 1 farms – average dairy labour input of 20 % highest and 20 % lowest dairy labour input farms in each month

## Discussion

The increase in labour demand with increasing milk quota group, in this study, was consistent with Adamczuk (1978), who also showed an increase in hours worked with an increase in farm size. Turner and Fogarty (1995) also indicated that an increase in the scale of the farm business on English dairy farms resulted in increased labour demand and annual hours worked per individual. Milking was recorded as the most time consuming task in this study, accounting for over one-third (0.36) of total dairy labour input. This was somewhat higher than the results of Jagtenberg (1999), who recorded that 0.29 of total labour was required by milking. Ordolff (1986) and Sonck (1993) both observed a proportion of 0.30 of labour input required by milking on dairy farms in The Netherlands. Seasonality of production had a large impact on labour requirements. The springtime calving season has traditionally been perceived by Irish farmers to be the period of peak labour input.

Dairy labour input per day for the quota category investigated ( $135 \times 10^3$  to  $250 \times 10^3$  l) was 7.0 h. However, a time saving of 3.0 h and 2.2. h per day at the milking process and calf care, respectively, was observed on the most efficient farms compared to the least efficient farms. The data indicated the possibility of reducing dairy labour input on farms to 3.8 h per day (or by 65 % compared to inefficient farms).

## Conclusion

In the foreseeable future the option of off-farm employment will most likely be the most effective method for many low-income farmers to supplement farm incomes. In order to accommodate pluriactivity and the operation of the dairy enterprise, labour input on the farm must be minimized without having an adverse effect on productivity or profitability. In this scenario, the number of hours required for satisfactory farm operation and the number of hours available for outside work must be established. The foregoing data gives an indication of minimum time required for farm operations, and mechanisms by which this can be achieved. Well-designed infrastructure and well-managed practices employed on farms should facilitate labour efficiency. Additionally, the use of contractors, casual labour and reserves of family labour for tasks, such as maintenance, calf rearing and winter-feeding of dry cows would further reduce the time commitment on dairy farms and increase the possibility of conducting off-farm employment or engaging in an alternative enterprise.

Education in time management is a key element in the preservation of farming as a core activity through its contribution in improving the quality of life of the operator. Education of dairy farmers as to the realistic possibility for such an operator to become involved in multi-functionality may assist in promoting the incidence of multi-functionality on dairy farms (particularly for lone operators and in instances where it is impractical for the spouse/partner to partake of off-farm employment). It could potentially allow an increase in family farm income while retaining ownership and management of the 'non-viable' farm. Farm incomes have been a major concern in agricultural policy, thus motivating transfers to the farm sector. More recently, off-farm income sources have entered the policy debate as an argument to curtail subsidies (Hill, 1996). Pluriactivity is increasingly seen as a relatively stable adjustment, and thus, there is a policy change towards promoting farm diversification and integrated rural development. Thus, information on the feasibility of pluriactivity /multifunctionality on dairy farms could have a positive impact on policy making.

## References

- Adamczuk, L. 1978. Research on time allocation amongst the rural population. II. *Wies-Wspolczesna* 22: 75-84.
- Frawley, J. and Phelan, G. 2002. Changing Agriculture: Impact on Rural Development. *Proceedings of Teagasc Rural Development Conference*, Dublin. pages 20-41.
- Hennessey, T., Fingleton, W., Frawley, J., Keeney, M. and O'Leary, E. 2000. Changing structure and production potential of Irish dairy farming in the context of quota abolition. *Proceedings of Teagasc Agri-Food Economics Conference*, Dublin. pages 41-56.
- Hill, B. ed., 1996. Income statistics for the agricultural household sector. *Proceedings of the Eurostat Seminar*, Luxembourg, 10/11 January.
- Jagttenberg, K. 1999. Labour input at low cost farm approaches the objective of 50 hours per week. *Praktijkonderzoek-Rundvee, Schapen-en-Paarden* 12: 2, 29-31.
- Kinsella, J., Wilson, S., de Jong, F. and Renting, H. 2000. Pluriactivity as a livelihood strategy in Irish farm households and its role in rural development. *Sociology Ruralis* 40: 481-496.
- Ordolff, D. 1986. Fully automatic milking: technical aspects and developments. *Landtechnik* 41: 227-229.
- SAS, Statistical Analysis Systems Institute. 1999. ® Proprietary Software Release 8.2 (TM2MO) SAS Institute, Inc., Cary, N.C.
- Sonck, B.R. 1993. The modern littered house for dairy cows: too much labour? *Labour planning. Labour and Conditions; Computers in agricultural management, Proceedings of the XXV CIOSTA-CIGR V Congress*, Wageningen, The Netherlands, 10-13 May. pages 260-269.
- Turner, M.M. and Fogerty, M.W. 1995. Aspects of change in the UK Farm Labour Force. *Farm Management* 9: (1), 13-24.