PROFILE OF LABOUR DEMAND, RESOURCES AND CONTRIBUTION ON IRISH DAIRY FARMS

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Abstract

The aim of this study was to quantify the labour requirement, available labour sources and actual labour contributed by those sources on Irish dairy farms. The data was generated on 36 medium (50 – 80 cows) and large (>80 cows) spring calving dairy farms over a 12-m period. A questionnaire survey recorded the levels of available labour on the farms, i.e. family or hired, full-time or part-time. Additionally, all farm operators recorded their labour input to different tasks. Herd-size group had a significant effect (P<0.001) on total dairy labour input (8.5 and 14.2 h/day on medium and large farms, respectively). Full-time family labour sources contributed less, on a proportionate basis, (P<0.05) on large farms (0.58 of total farm labour) than on medium size farms (0.87). On the large farms, the contribution of full-time hired labour sources was highest for the tasks of cleaning (0.34), maintenance (0.29) and milking (0.34), while full-time family labour sources were mainly concerned with the role of management (0.72). Also, observations indicated that the contribution of part-time family was mainly utilised during peak labour demand in spring-time.

Keywords: dairy farms, labour demand, labour efficiency, labour resources

Introduction

Dairy production is the main enterprise for 23,000 farm households and continues to represent the most profitable farm business. However, there is concern at present about the future viability of dairy farming. The sector is currently experiencing increasing costs together with static or falling milk prices. Given the decrease in milk prices projected from 2007 onwards, Irish dairy farmers will have to increase both efficiency and scale of production in order to maintain incomes (Dillon et al., 2003). However, expansion in scale of enterprise would have a direct and significant effect on farm labour as a component input requirement of production. Maximising labour efficiency would mean the use of reduced levels of labour in a more productive manner. Hennessey and Thorne (2006) have indicated that an expansion of production of 100 % would be required if Irish farmers were to maintain incomes in the context of WTO reform and a milk price cut of 20%, but they also showed that labour represented the binding constraint to expansion on 40% of Irish farms.

Difficulties are also being encountered in attracting sufficient numbers of young farmers into the sector. An international trend of fewer young people entering farming has been facilitated in Ireland by the recent positive economy which has provided career opportunities for many farm family members outside of the farm. The wage rate differential between industrial and agricultural work is prompting a review of the roles of full and part-time, hired and family labour sources on Irish farms. In the absence of large increases in efficiency, increases in scale and the decreasing availability of supplementary labour sources

will increase the demands on the principal farm operator. This shortage of skilled, trained labour is likely to have a negative impact on the development of the commercial farming sector in Ireland. Ultimately a high dependency on family labour, particularly on the principal farm operator, will lead to a further barrier to potential labour sources due to the negative image of agriculture as an attractive career option. Therefore, a requirement exists to establish current daily labour input levels and the sources from which they are comprised as well as the dependency of certain tasks on particular labour sources and how these factors are influenced by scale of production.

Materials and Methods

The study reported here was part of a large scale labour study conducted with dairy farmers mainly in the Munster region of Ireland (O'Brien et al., 2003). The labour study involved the recording of labour input data for various defined farm duties across a range of different task categories.

Farm selection: Individual letters were sent to 360 farmers outlining the purpose of the study and inviting their co-operation. Of these, 143 farmers agreed to participate in the study. Proportionally 0.80, 0.18, and 0.02 of these farms had spring, mixed (spring and autumn) and autumn calving herds, respectively. The farms ranged in herd-size from 26 to 300 cows and in milk quota size from 139 x10^3 to 1,409 x10^3 litres. The herds were grouped as follows; small (<50 cows) medium (50-80 cows) and large (>80 cows), and had average herd sizes of 42, 59 and 141, respectively.

Labour input data: Two data recording methods were used. The main recording method involved a timesheet on which the total time consumed by each of 29 different farm tasks was recorded for each of 3 consecutive days on one occasion per month, for 12 months. One sheet was completed for each farm. The second method involved an electronic data logger that incorporated the Observer behavioural package (Noldus Information Technology). This method allowed a greater level of detailed recording on a subset of farms. All operators on individual farms (using this method) recorded on the data logger, the total time consumed by the 29 different farm tasks for each of 5 consecutive days on one occasion per month, for 12 months. This method also recorded the actual time schedule of tasks and rest periods, and thus, supplied a detailed profile of the working day. The data was subsequently uploaded onto a personal computer. Ninety-eight and forty-five farms used the timesheet and data logger recording methods, respectively. The allocation choice of timesheets or data loggers to farmers was at the request of individual farmers.

The tasks were collated into 10 tasks categories as follows; milking, maintenance, management, grassland, cow care, calf care, cleaning, veterinary, miscellaneous and other enterprises. Total farm labour input incorporated all 10 task categories, while total dairy labour input incorporated 9 task categories with the exclusion of other enterprises.

The specific study reported here refers to the 36 farms with spring calving herds in the medium (50 – 80 cows) (20 farms) and large (> 80 cows) (16 farms) herd size categories, that used the data logger methodology for data collection. The remaining 9 farms (of the 45 farms that had used the data logger were either mixed or autumn calving herds or had incomplete data sets.   (A set of time records from a particular farm was considered incomplete and consequently, excluded from the analysis if data for more than two consecutive months was absent at any period over the year). The farms in the medium and large size categories had average herd sizes of 60 and 150 cows and average milk quota sizes of 302 x10^3 and 761 x10^3 litres, respectively. In addition to the labour input data collected on these 36 farms, a questionnaire survey was completed for each farm. This survey recorded the labour sources on each of the farms, i.e. all labour persons available to the farm, whether family or hired, full-time or part-time.

Data Analysis

The labour input data were analysed using a repeated measures model (PROC MIXED) described below using the statistical procedures of SAS (SAS, 2002). Farm was included as a random effect while month and herd size group were included as fixed effects. The following model was used:

$R_{ik} = \mu + M_i + H_k + MH_{ik} + e_{ik}$

where R_{ik} = the labour input of the farm in month i, and herd size k, M_i = the effect of ith month (i = 1 to 12); H_k = herd size (k = 50 to 80 cows, or >80 cows); and e_{ik} = the residual error term.

Results

Total farm labour input demand

Average total farm labour input per day for dairy task categories and other enterprises on medium and large farms is shown in Table 1. Herd-size group had a significant effect (P<0.001) on total farm labour input, total dairy labour input and the labour input associated with milking, grassland, cow care, calf care, veterinary and miscellaneous. Average total farm labour input per day over a 12-month period on medium and large farms is shown in Table 2. Examination of the data for seasonal effects showed that herd-size group had a significant effect (P<0.05) on total farm labour input per day in all months except August, with labour inputs on large farms being higher than those on medium farms. The highest labour inputs were observed in the period between February and May in both groups, with the lowest inputs recorded in January and December.

Table 1: Average total farm labour input per day (h) in relation to dairy task categories and other enterprises on medium and large farms (n=36)

	Herd-size group			
	Medium	Large	s.e.m.	Significance
	(n=20)	(n=16)		
Total farm labour	9.8	14.9	0.93	***
Other enterprises	1.3	0.7	0.33	ns
Total dairy labour	8.5	14.2	0.90	***
Milking	2.9	4.4	0.25	***
Maintenance	1.0	1.9	0.33	ns
Management	1.2	1.9	0.30	ns
Grassland	0.8	1.4	0.10	***
Cow care	1.2	2.0	0.16	***
Calf care	0.4	0.8	0.07	***
Cleaning	0.6	0.6	0.07	ns
Veterinary	0.3	0.7	0.08	***
Miscellaneous	0.1	0.5	0.09	***

*** = P<0.001

Table 2: Average total farm labour input per day (h) over a 12-month period on medium and large farms (n=36)

	Herd-size group			
	Medium	Large	s.e.m.	Significance
	(n=20)	(n=16)		
February	11.2	17.1	1.57	*
March	12.2	19.5	1.60	**
April	13.1	18.2	1.55	*
May	12.1	17.0	1.08	**
June	11.1	16.6	1.25	**
July	10.5	14.9	1.25	*
August	10.7	13.3	1.06	ns
September	8.3	12.5	0.78	**
October	8.1	12.3	0.83	**
November	8.2	14.0	1.60	*
December	6.4	11.2	0.88	***
January	7.6	10.4	0.90	*

*** = $P<0.001$, ** = $P<0.01$, * = $P<0.05$, ns = non-significant ($P>0.05$)

Available labour resources

The survey data indicated the proportions of farms within both herd-size groups with different types of available labour (full and part-time, family and hired). The role of the principal farm operator was filled by a family labour person on 1 and 0.75 of medium and large farms, respectively. Proportionally, 0.15 of medium sized farms were operated by one person, while the remaining 0.85 of the medium farms and all (1.0) of the large farms had additional labour available. This additional labour comprised family labour on 0.7 and hired labour on 0.35 of medium farms. Alternatively, the additional labour comprised family labour on 0.81 and hired labour on 0.56 of large farms. The average numbers of available labour sources (full and part-time, family and hired labour persons) on farms of both herd-size groups are shown in Table 3. The average number of total full-time and hired full-time labour persons available increased significantly ($P<0.05$) with increasing herd-size group.

Table 3: The average number of full and part-time, family and hired labour persons available on medium and large farms (n=36)

	Herd-size group			
	Medium (n=20)	Large (n=16)	s.e.m.	Significance
Total full-time	1.3	1.7	0.14	*
Total part-time	0.9	0.9	0.17	ns
Family full-time	1.2	1.0	0.15	ns
Family part-time	0.7	0.7	0.16	ns
Hired full-time	0.1	0.7	0.14	**
Hired part-time	0.2	0.2	0.10	ns

$* = P<0.05$, ns = non-significant ($P>0.05$)

Contributions to labour

The average day start and finish times, labour input and non-farm-activity periods for family and hired full-time labour persons across all farms are shown in Table 4. Hired full-time labour persons finished earlier ($P<0.05$), had shorter non-farm-active periods ($P<0.05$), and had shorter working days ($P<0.05$) than family full-time labour persons. Both start times and labour input were similar for family and hired labour sources. Ultimately it appears that hired labour had more defined working periods, while family members may have been combining their working day with significant non-farm-active tasks related to the farm household and farm family.

Table 4: The average start and finish times and length of working day for family and hired full-time persons on medium and large farms (n=36)

	Herd-size group	
	Medium	Large
Family	(n=20)	(n=16)
Start	7:35	7:30
Finish	19:00	18:15
Length of working day (h)	11.4	10.7
Labour (h)	8.0	8.0
Non-farm-activity (h)	3.4	2.7
Hired		(n=8)
Start		7:40
Finish		17:50
Length of working day (h)		10.2
Labour (h)		8.4
Non-farm-activity (h)		1.8

The average contributions of full and part-time, family and hired labour sources to average total labour consumed on farms of both herd-size groups are shown in Figure 1. Herd-size group had a significant effect (P<0.01) on the average proportional contribution of full-time family and full-time hired labour sources. Full-time family labour sources contributed less, on a proportionate basis, (P<0.05) on large farms (0.58 of total farm labour) than on medium size farms (0.87). Full-time hired labour sources contributed more (P<0.05) on large farms (0.27) than on medium size farms (0.01).

Figure 1: The average contributions of full and part-time, family and hired labour sources to average total farm labour consumed on medium and large farms
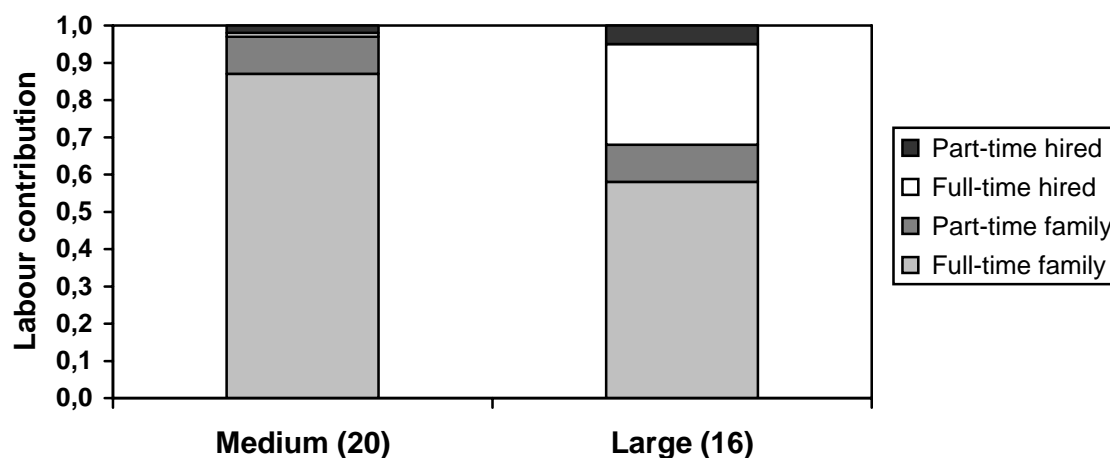
The data also showed that the tasks of management, cow care and other enterprises were among the tasks most dependent on full-time family labour sources (minimum 90%) on medium farms with part-time sources contributing greatly to calf care (25-30%) in both groups. Cleaning, maintenance and milking

were among the tasks most dependent on full-time hired labour sources (30-35%) on large farms, with full-time family sources retaining a high proportion of management (>70%). Full-time family labour sources contributed (proportionally) their highest level between September and January (80-90% on medium and 60-70% on large farms), while part-time family labour sources contributed their highest amount between February and April on medium (15-20%) and large (10-15%) farms. This illustrates the dependence on part-time labour sources during the peak labour demand observed in spring-time. Meanwhile, the contribution of full-time hired labour sources remained relatively constant throughout the year on large farms (20-25%).

Discussion

The variation in labour input per cow when linked to size of herd (labour input on medium farms [44.2 h/cow/year] was 1.5 times greater than the labour input on large farms [29.5 h/cow/year]) is consistent with the findings of an American study (Hadley et al., 2002) where increasing herd sizes resulted in improved labour efficiency. The annual hours per cow recorded in this study convert into 41.8 and 62.6 cows per labour unit (LU) on medium and large farms, respectively, (assuming that 1848 h/year [40 h/week] equates to one LU or one full-time farm operator [NFS, 2004]). This is substantially less than the 150 cows typically managed by one LU on New Zealand dairy systems (New Zealand Dairy Board, 1996). This scenario suggests that a continued focus must be placed on improved farm facilities and practices to allow one operator to manage medium sized farms on their own and also on technological change on both medium and large farms in order to ensure that the potential benefits of increased scale are not counteracted by increased labour input and associated cost.

Medium and large farms were exposed to the external labour market in different ways. Medium farms were dependent on the part-time assistance of members of the farm household, while large farms required the availability of full-time hired labour sources, their supply of family labour clearly unable to meet the increased labour demands associated with increased scale. A number of Irish and international studies recorded family labour contributions at between 80 and 90% (Maunier et al., 1985; Gilbert and Pellerin, 1996; CSO, 2002) while this study recorded family labour at greater than 95% and less than 70% (of total farm labour) on medium and large farms, respectively. This could be interpreted as a move towards hired labour with increasing herd size. This trend is also described by Hopps (2006) as prevailing in Northern Ireland farms and is set to continue given the increases in farm scale that are predicted in the near future, unless very substantial increases in labour efficiency prevail. In contrast to this however, was the fact that while hired full-time labour was required on large farms, these farms remained dependent on supplementary family labour to the same extent (10% of total labour) as medium farms. Therefore, while Benjamin et al. (1996) have previously stated that spousal labour and hired labour are substitutable, this study has shown that the employment of full-time hired labour was due to the labour demands associated with increased scale and not the substitution of family labour.

The relative labour input contribution of all labour sources to all tasks was reasonably similar, with the exception of calf care (including the calving process). This was a task which was largely carried out in the spring-time and early summer periods. Part-time family labour sources contributed a greater proportion of labour to calf care than any other task, on both medium and large farms. A study on Australian dairy farms has also indicated a considerable involvement by family members in calf rearing (Nettle, 1998).

While the annual contributions of part-time family and part-time hired labour sources were not high, this labour was mainly utilised during peak labour periods and its presence prevented even larger increases in the length of the working day for the principal farm operator during such times. The relative contribution of part-time sources was at its highest on all farms during the spring and early summer periods when farm labour requirements reached their peak.

Part-time hired labour sources have served farmers well in the past, through the use of farm relief services, but with an increasing scarcity of labour in this sector, the relative contribution to total labour input is small. This study saw their emergence in the peak April-May period, in tasks such as calf care and cleaning, as well as milking on large farms. Given the increasing cost of employing labour all year round, there may be scope for the development of a more targeted farm relief service, relating to tasks such as calf care and cleaning. Issues associated with hired labour, which have been described previously by Gasson and Errington (1993) include uncertainty relating to seasonal labour requirements, the lumpy and heterogeneous nature of labour sources and both transaction and emotional costs related to 'hiring and firing' labour.

With CSO data (2002) indicating that the relative labour contribution of the farm holder is increasing, with a corresponding reduction in the contribution of all other family workers, the hours worked by full-time labour persons in this study was analysed. Both family and hired full-time workers worked approximately 48 h per week (not including break times), which, while well in excess of the '39-hour week', compared favourably to the 55-60 h week worked by principal farm operators in New Zealand (McCrostie Little et al., 1997). Meanwhile, the RABDF study (2005) has suggested that the domestic dairy industry was still heavily reliant upon the principal operator, with the average dairy farmer working a 57-hour week (RABDF, 2005).

Even though the hired full-time labour person ultimately contributed similar labour levels to the family full-time labour person, the hired full-time labour persons had shorter working days and finished earlier than family full-time labour persons, but they also had shorter non-farm-activity periods. Long non-farm-activity periods for full-time family operators would indicate that operators may have lengthened the working day to allow a more equally balanced milking interval on many farms since milking intervals are often identified as being the main determinant of start and finish times and consequently, the length of the working day (Whipp, 1981).

This study has identified a future dependence on full-time hired labour sources in light of predicted increases in scale. Large farms in this study were highly dependent on full-time labour sources, while a requirement for flexible, part-time labour source was also noted on all farms. Therefore, recruitment programmes are necessary in order to attract potential labour sources to the industry. Bogue and Phelan (2004) have documented the importance of quality of life in assessing the returns from any farm. Therefore, farm systems must take cognisance of the 'labour person' as opposed to the farm worker, and farm facilities and practices should be adapted to recognise the tastes, preferences and lifestyles of those on the farm, e.g., milking intervals could be adjusted to more practical times (O'Brien et al. 1998). Alternatively, hired labour should be allowed similar conditions to industrial workers in terms of working hours, health and safety and remuneration, in order to allow agriculture to compete effectively for labour within the wider economy.

Conclusion

In conclusion, a progression from medium to large farms was associated with a replacement of full-time family sources with full-time hired sources. The contributions of part-time family were mainly utilised during peak labour periods. Part-time family labour sources contributed a greater proportion of labour to the task of calf care than any other task. Family labour does exhibit the advantage of being flexible, however part-time hired labour sources may need to be actively directed towards the spring-time labour peaks in an environment of increased enterprise scale.

With regard to the acquirement of labour sources, it is suggested that firstly, the application of technology in terms of adoption of relevant facilities and an appropriate level of mechanization would make dairy farm work more attractive and consequently, would assist in securing potential labour sources to meet the labour requirement of large herds. Secondly, improved organization of potential labour sources including agricultural workers from transition countries (e.g. Latvia, Poland) by establishing recruitment programmes, provision of training and matching of skills to specific dairy tasks would help agriculture to compete for labour sources with other employers.

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