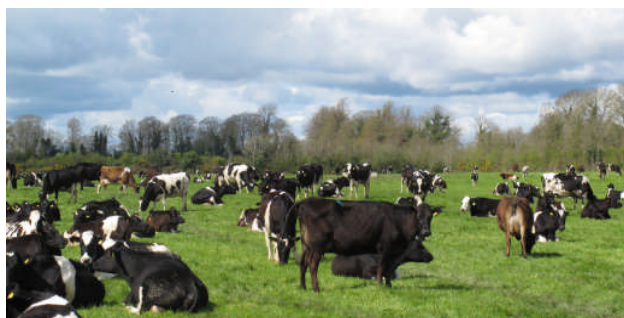


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## Demonstration and transfer of technologies for existing, expanding and new dairy farms in a none quota environment



### Key external stakeholders:

Dairy Farmers, dairy processors, DAFM, farm organisations

### Practical implications for stakeholders:

New Greenfield dairy farms can stand on their own as viable units once on farm efficiency and productivity is the focus of the business

National Farm Survey data suggests that increases in scale at farm level can be associated with increases in on-farm efficiency

Total factor productivity has increased on Irish farms between 1996 and 2010

### Main results:

- **Greenfield** Over the first 5 year period (excluding the setup year of the business in 2010) the Greenfield dairy farm has return an average return on invest (ROI) of 9% and return on equity of (ROE) 19% which compares extremely favourably with other investment opportunities
- **Farm level** Efficient producers used less input per unit of output, had higher production per cow and per hectare in terms of total output and had a longer grazing season, higher milk quality standard, were more likely to have participated in milk recording and had greater land quality compared to the inefficient farms.
- On average dairy producers were not fully efficient in 2008 with technical, allocative and economic efficiency results under variable returns to scale (VRS) of 0.771, 0.740 and 0.571 respectively.
- Technical efficiency was found to be on average 0.757 under constant returns to scale (CRS), 0.799 under variable returns to scale (VRS) with scale efficiency estimated at 0.951 across the 2008 NFS data. The optimum scale on Irish dairy farms was found to be 80 cows farming 41 hectares of land. Twelve per cent of the sample were operating at optimum scale (CRS). Fifty six percent of the sample was operating below optimum scale and 32% of the sample was operating above optimum scale.
- Productivity grew by on average 2.5% per year on Irish dairy farms over the period 1996 to 2010 with technical efficiency change increasing by 1.3%, technical change increasing by 0.9% and scale efficiency change increasing by 0.3% per year on average.

### Opportunity / Benefit:

This analysis suggests that there is strong potential for profitable expansion at farm level once focus is placed in technical efficiency and cash flow management is central to the expansion process.

### Collaborating Institutions:

Rural Economy and Development Programme, Teagasc, Athenry, Co. Galway Ireland

**Teagasc project team:** Laurence Shalloo (Project Leader/PI)  
Eoin Kelly  
Anne Kinsella  
Brian Moran

**External collaborators:** Michael Wallace of University College Dublin

### 1. Project background:

Systems of milk production designed to maximise grass utilisation while investing in technologies that will increase farm productivity will be the basis for successful expansion in the Irish dairy industry. The abolition of EU milk quotas by April 2015 will pave a pathway for successful expansion at farm level. Success will be realised through the adoption of low cost technologies that are key to successful dairy farming at farm level. There will be a requirement for increased financial and technical recording and monitoring in the new commercial environment. While technology adoption may have been an option in the past for commercial dairy farming it will be an absolute minimum requirement in the future. The demonstration of the financial viability of expansion will help to convince individual farmers of the potential from expansion on farm.

### 2. Questions addressed by the project:

- To develop and manage demonstration farms that show best practice in an expanding dairy industry
- To identify and quantify the key factors effecting efficiency and productivity at farm level

### 3. The experimental studies:

#### Greenfield farm

Two demonstration farms were set up and run by Teagasc in 2010 (Greenfield, Kilkenny) and 2011 (Greenfield Shinagh). The farms operate under similar business models with the ownership of the farms held by an external group of shareholders and Teagasc with contracted to manage the farms. Both farms have a similar objective of demonstrating robust and sustainable technologies for expansion at farm level, demonstrating the financial returns from stand alone dairy units where all resources were recompensed for the resources that they employ and to identify the issues associated with expansion at farm level.

#### Demonstration farms

Two demonstration farms were also included to demonstrate expansion on a family farm

#### NFS data and analysis

The aim of this study was to determine the levels of technical, scale and allocative efficiency on a sample of dairy farms. The analysis used data from the National Farm Survey (NFS). The NFS is an annual survey of approximately 1,200 farms weighted by size and system to represent a population of 104,800 farms in Ireland. Data Envelopment Analysis (DEA) was used in this study to generate technical efficiency scores under both constant returns to scale (CRS) and variable returns to scale (VRS) assumptions. Technical efficiency is defined as maximizing output from the lowest set of inputs and allocative (price) efficiency as the selection of the most appropriate inputs based on the market price that they hold. Overall or economic efficiency is defined as a combination of technical and allocative efficiency. Scale efficiency is defined as an indication of the amount that productivity could increase by moving to a point of technically optimal scale as a business may be technically efficient but not scale efficient. The methodology used to calculate total factor productivity (TFP) change was the Malmquist Index. The Malmquist TFP index is calculated using the non parametric, linear programming (LP) technique DEA.

### 4. Main results:

- **Greenfield** Over the first 5 year period and excluding the set up year of the business in 2010 the Greenfield dairy farm has returned an average return on invest ROI of 9% and return on equity of ROE 19% which compares extremely favourably with other investment opportunities
- **Farm level** The average technical efficiency scores were 0.785 under CRS and 0.833 under VRS. Efficient producers used less input per unit of output, had higher production per cow and per hectare in terms of total output and had a longer grazing season, produced milk of a higher quality standard, were more likely to have participated in milk recording and had were farming with higher quality land than the farms that were described as being inefficient.
- On average the sample of dairy producers were not fully efficient in 2008 with technical, allocative

and economic efficiency results under variable returns to scale (VRS) of 0.771, 0.740 and 0.571 respectively.

- Technical efficiency was found to be on average 0.757 under constant returns to scale (CRS), 0.799 under variable returns to scale (VRS) with scale efficiency estimated at 0.951. The optimum scale on Irish dairy farms was found to be 80 cows farming 41 hectares of land. Twelve per cent of the sample were operating at optimum scale (CRS). Fifty six percent of the sample was operating below optimum scale and 32% of the sample was operating above optimum scale.
- Productivity grew by on average 2.5% per year on Irish dairy farms over the period 1996 to 2010 with technical efficiency change increasing by 1.3%, technical change increasing by 0.9% and scale efficiency change increasing by 0.3% per year on average. In a second stage regression analysis it was found that changes in productivity were associated with the level of quota held, level of debt on the dairy farm, the size of the direct payments, whether the farm participated in the REPS scheme, whether AI was used on farm and the level of land quality. In terms of demographic variables productivity was associated with marital status of the farm operator.

#### 5. Opportunity/Benefit:

- The removal of the milk quota regime will create significant opportunities for many farmers for the first time in a generation. However associated with the increased potential is increased risk brought about by higher debt levels, increased milk price volatility and reduced productivity and efficiency associated with expansion. This study has highlighted many of the issues and pitfalls that may be apparent during the expansion process and has also demonstrated the potential for strong financial returns with expansion even when all of the farm resources are rewarded.

#### 6. Dissemination:

<http://www.greenfelddairy.ie/node/103>

##### Main publications:

Kelly E., Shalloo, L., Geary, U., Kinsella, A., Thorne, F. & Wallace, M. (2013). An analysis of the factors associated with technical and scale efficiency of Irish dairy farms. *International Journal of Agricultural Management* 2(3):149-159.

Kelly, E., Shalloo, L., Geary, U., Kinsella, A. Thorne F., and Wallace, M. (2012) Technical and Scale efficiency of Irish Dairy Farms – the effects of size, intensification and specialisation. *Journal of Agricultural Science* 150: 738-754.

Kelly, E., Shalloo, L., Geary, U., Kinsella, A. and Wallace, M. (2012) An Application of DEA to measure technical efficiency on a sample of Irish Dairy Farms. *Irish Journal of Agriculture and Food Research*. 51: 63-77.

##### Popular publications:

Kelly E., Shalloo L., and Wallace M. (2012). Productivity changes on Irish dairy farms between 1996 and 2010. In: *Agricultural Research Forum, The Tullamore Court Hotel, 12-Mar-2012*, p.56

Shalloo, L., O'Loughlin, J. and Long, M. (2011). The Greenfield business plan. Teagasc Greenfield Dairy Programme. Kilkenny Greenfield Open Day 4/5/11. Teagasc IE p. 6-18

Shalloo, L., O'Loughlin, J. and Long, M. (2011). Update on the Greenfield dairy farm - Irish Dairying Planning for 2015, Moorepark'11 Open Day (29/6/11). Teagasc IE p. 96 - 100

Shalloo, L., O'Loughlin, J., Ahern, K. and McNamara, J. (2011). Shinagh Greenfield dairy farm projections. Teagasc Greenfield Dairy Programme Shinagh Dairy Farm Open Day on 25/8/11. Teagasc IE p. 4-14

#### 7. Compiled by: Laurence Shalloo