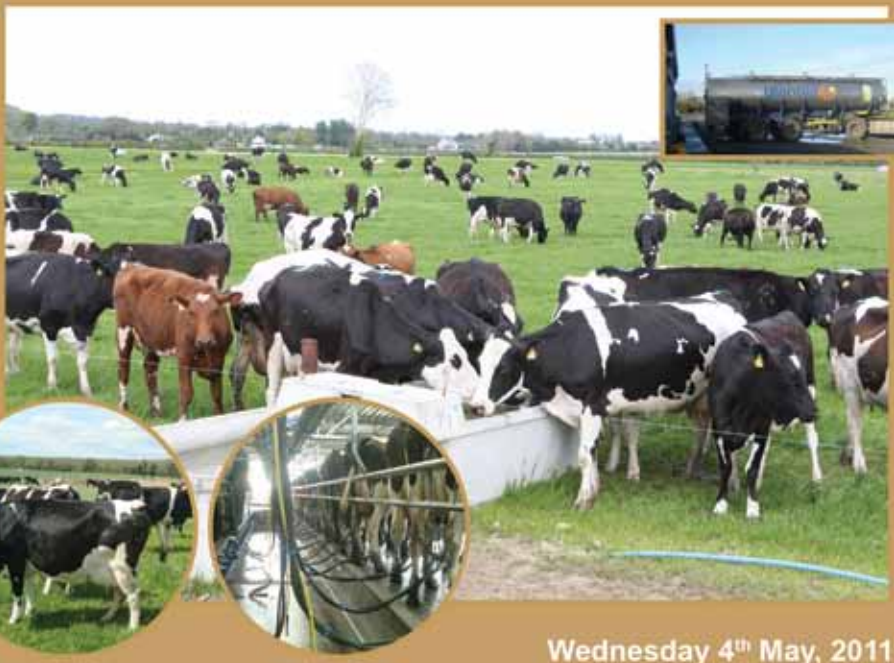
Moorepark Dairy Levy Research Update

Moorepark Animal & Grassland Research and Innovation Centre

Kilkenny Greenfield Open Day



Wednesday 4th May, 2011

Series 15

Teagasc Greenfield Dairy Programme

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Wednesday 4th May, 2011
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Series 15

Teagasc Greenfield Dairy Programme

Moorepark Animal & Grassland Research and Innovation Centre,
Teagasc,
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Co. Cork

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Foreword

It is generally recognised that this is an important project and AIB is happy to provide our support. The abolition of quotas in 2015 opens up an exciting, but challenging, vista for the Irish dairy industry. Exciting, because it allows for expansion after almost 30 years when national output was effectively frozen by the quota system. We can now plan to exploit the natural production advantage that we undoubtedly have. Challenging, in that we do so in a situation where there is no supply management, price volatility is more likely than in the past – albeit around a higher average price – and we will be operating without the certainty of market support as strong as that we have experienced for most of the past four decades. These challenges are in production, processing and marketing terms. AIB is confident that the industry, which has again demonstrated its strength and resilience over the past few years, will successfully meet the challenges and is happy to back the industry as it faces up to them.

Many farmers are already laying their plans for developing their dairy businesses or, in perhaps a much lesser number of cases, for starting up a dairy enterprise. For both groups this Greenfield development is an important demonstration in a commercial context of what is required and possible. It is clear from the experience to date that it is fulfilling the expectations we all had of it. This booklet outlines that experience and contains a wealth of extremely helpful information deriving from the project. It should be a very valuable technical handbook for many dairy farmers. It is clear that in a great number of cases farmers intending to develop their businesses will need bank credit over short, medium or longer terms. It is important in looking for that credit that the farmer prepares the application carefully and assembles the information that will facilitate an early and, hopefully in most cases, favourable response. To that end, we are grateful to have had the opportunity to include in the booklet an article on what information is necessary when a farmer approaches a bank with a credit proposition. Following this guide should generally greatly facilitate a speedy decision by the bank in question.

Finally, I would like to congratulate the Greenfield project shareholders - the Agricultural Trust, Glanbia and the Phelan family – and Teagasc and the farm management on the successful implementation of the project to date; thank all the contributors to this booklet; hope all who attend the open day have an enjoyable and informative experience and wish continued success to the Greenfield project.

Michael Dowling,
Head of Agri Strategy,
AIB Bank

Introduction

Pat Dillon and Padraig French
Teagasc, Moorepark Animal & Grassland Research and Innovation Centre, Fermoy, Co. Cork

There is now a renewed impetus by the Irish Government to focus on sections of the economy that can contribute significantly to Ireland's economic growth. One such sector is the dairy industry which at present exports 4.5 million tonnes of product worth approximately €2.2bn per year and has significant potential to increase further. The Irish dairy industry employs 8,500 people in processing and supports an additional 4,500 positions in ancillary services in addition to approximately 19,000 dairy farmers. The recently published Food Harvest 2020 report targets a 50 per cent increase in milk production deliveries by 2020 arising from the abolition of EU milk quota on the 1st of April 2015. The increased national production is anticipated to arise from expansion on existing family farms in addition to an increased frequency of new farm conversions from alternative enterprises. This will, for the first time since the early 1980's, allow Irish dairy farmers to increase production without incurring additional milk quota costs or super levy fines.

In the medium term, worldwide demand for dairy products is expected to increase by 2.5 per cent per annum as a result of global population growth and projected increases in per capita disposable income. However, the trend towards greater market orientation of agricultural polices at EU and WTO level is reducing the influence of market management instruments and is likely to result in greater market price volatility in the future. Irish dairy farmers planning to take advantage of quota removal must act now to develop and plan their farm systems for increased milk production, while at the same time insulating their businesses against the potential volatility that is expected in milk price. In this environment, only those dairy farmers who fully capitalize on the inherent competitive advantages associated with low cost grass-based seasonal milk production systems will be successful based on key technologies such as compact calving, higher stocking rates, and increased numbers of high EBI replacements, high quality pasture management and low cost labour efficient farm infrastructures.

In 2009, Teagasc in conjunction with key stakeholders (Irish Farmers Journal, Department of Agriculture, Fisheries and Food, Glanbia, FBD Trust and AIB) set up the Greenfield Dairy Programme. The programme encapsulated three models of expansion: existing family dairy farms, new entrants to dairying and a new greenfield demonstration farm. Two commercial family owned farms were selected to demonstrate how to maximise financial returns on capital employed within the family farm model. Successful applicants to the New Entrants

Schemes to dairying are provided with the required training to set up a new dairy farm operation. The third model was the conversion of a 112 ha tillage farm to a new low capital cost 300 cow dairy unit. The objective of the Greenfield dairy farm is to:

- Demonstrate the design and set up of a grass based Greenfield dairy farm.
- To operate a profitable large scale grass based unit.
- Provide direction and confidence to farmers considering large scale expansion.
- Identify the risks and demonstrate the risk management strategies associated with dairy expansion.

This booklet describes in detail the conversion of the new Greenfield farm from a tillage farm to an operational dairy farm. It details and describes the infrastructure at the Greenfield Farm including milking facilities, animal and slurry accommodation and grazing infrastructure. It also describes the process of conversion including the project management of infrastructural development, stock acquisition as well as the physical and financial performance of the farm during the first year. The support of all the stakeholders in the project is greatly acknowledged.
All information pertaining to the Greenfield Dairy Programme as well as weekly updates are available on the Greenfield website at: http://www.greenfielddairy.ie.

The Greenfield Business Plan

Laurence Shalloo, James O'Loughlin and Michael Long
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Summary

- Dairy expansion should be anchored on the development of a business plan which sets out realistic objectives, milestones and deliverables taking full recognition of the technical and financial risks involved.
- The business plan should be based on realistic targets in relation to herbage production and dairy cow performance as well as animal health issues in the context of a newly established herd
- Cash flow on the farm is the most important component in the initial period of dairy expansion so as to ensure the liquidity of the business.
- Monitoring protocols need to be put in place around all aspects of the dairy business but especially in the case of financial management.

Introduction

The economics of milk production at farm level will be a major determinant of the extent to which national milk supply will increase when milk quotas are removed. Production costs and the cost of expansion will be the main drivers of expansion with milk price determining the speed of expansion in a profitable expansion plan. The development and application of a business plan is the first essential step in the development of a thriving and successful dairy business. In order for any business to survive and prosper long term, it must constantly innovate so as to reduce costs and increase output. The business model that dairy farmers select for the future must withstand price and weather shocks and capitalise on price increases. The model used for the Greenfield dairy farm is designed to produce milk at the lowest possible cost, while reducing lead-in capital investment using low cost housing technologies. The business plan is designed to be as realistic as possible aided by the use of sensitivity analysis to determine the effect of variability in key input variables. The objective of this paper is to present the background to the development and application of a dairy farm business plan using the Kilkenny Greenfield Dairy farm as a case study. The plan will be discussed under the following headings;

(1) Objectives and mission statement
(2) Cash flow projections
(3) Profitability projections
(4) On-going monitoring - 2010 performance
(5) Risk identification
(6) Keys to success

(1) Objectives and mission statement

The first and most important task in developing a business plan is to set out the goals for the business over the time horizon being considered. These goals should be incorporated into a short memorable statement, (known as the Mission Statement) outlining both financial and personal objectives of the business. An example mission statement may read;

"In 5 years time, I want to be in partnership with my son/ daughter, milking 100 cows, working 40 hours per week and earning €50,000 from the farming enterprise."

It is extremely difficult to develop a business plan that will be successful in the long term unless the farm business goals are identified and agreed with all the participants.

The mission statement for the Kilkenny Greenfield farm is: "To develop and run a farm that demonstrates the technologies required to maximise shareholder return in an environmentally sustainable manner, through high grass utilisation, and with minimal capital investment."

(2) Cash flow projections

The most important component of any start-up and expanding business is liquidity (cash) especially in the current economic environment. A realistic cash flow projection for a farm will determine if the proposed business is viable. A cash flow statement essentially shows the cash inflows from milk sales and other expected income as well as all expected cash costs. The cash flow projection should:

- be developed on a monthly basis for the first number of years of the development plan. (Cash deficits may indicate that the plan is unviable or that there is a larger capital requirement at the start of the project)
- be based on realistic expectations of biological performance as well as inflation adjusted input prices and conservative estimates of output prices
- include sensitivity analysis to evaluate the sensitivity of the plan to changes in key input variables such as milk price, interest rates, labour and other cost commitments relevant to the individual farm situation.

Table 1 shows the biological performance, interest payments, capital repayment, cash and profit projections for the Kilkenny Greenfield dairy farm for years one to fifteen. A full breakdown of the projected biological performance, capital investment, surplus cash to be generated and profit were published in the Greenfield Open Day in January 2010 and can be found on

http://www.greenfielddairy.ie under the management policies section of the Kilkenny farm.

The main characteristics of the Greenfield farm are outlined below.

- Farm area of 117 ha of which 112 ha is usable
- Replacement animals are reared off farm and they leave the farm at two weeks of age and return in the month of December prior to when they are expected to calve.
- All male calves are sold directly from the farm
- Two full time staff manage the farm with some relief (through work experience students and farm relief services) at particular periods of the year. A high level of labour efficiency is achieved and this is one of the key objectives of this farm business.

The original projections were carried out with a base milk price of 24c/l. While this price is considerably lower than that achieved in 2010 (27.5c/l base) or the projected milk price for 2011 (30.8c/l), it was decided not to adjust the original budget now as all long term decisions should be made on the farm in the context of being able to survive future potential low output prices especially milk price (23c/l in 2009).

Table 1 shows that the projected cash flow for the farm is low in the first four years of the plan at a base milk price of 24c/l. This farm has a significant fixed cost element as a result of the land rental charge €52,000, labour costs €88,000 and interest repayments of €25,000 with capital repayments being incurred from year three onwards. The cash surplus increases after year three mainly as a result of increasing grass utilisation and milk output coupled with increased milk solids and reductions in veterinary related costs.

Table 1. Farm projections over the 15 years of the investment

Year	Cow	Milk produced Kg	Interest repayment €	Capital repayment €	Profitability* €	Surplus Cash* €	Borrowings Year-end €
0	0	0	0		0	0	
1	250	1,245,976	24,175	0	-7,065	24,094	749,650
2	270	1,353,619	38,734	0	-26,756	4,403	749,650
3	290	1,517,064	38,734	0	-1,057	30,101	749,650
4	300	1,602,113	38,734	48,177	35,034	17,715	701,173
5	310	1,669,677	36,555	50,638	49,656	30,136	650,535
6	320	1,738,864	34,275	52,938	70,156	48,376	597,596
7	330	1,795,874	31,891	55,320	84,633	60,471	542,276
8	340	1,849,056	29,402	57,810	96,628	69,977	484,466
9	350	1,903,440	26,800	60,111	108,777	79,165	424,035
10	350	1,903,440	24,082	63,130	122,293	90,321	360,906
11	350	1,903,440	21,241	65,971	123,836	89,024	294,935
12	350	1,903,440	18,272	68,939	125,342	87,561	225,996
13	350	1,903,440	15,170	72,041	122,398	81,713	153,954
14	350	1,903,440	11,928	75,283	119,994	75,869	78,671
15	350	1,903,440	8,540	78,671	111,484	65,971	0
Total						853,218	
Stock value at end of period							
Cows 300*€1,300						390,000	
Replacement heifers 65*€1,300						84,500	
Yearlings 70*€700						49,000	
Cash Surplus + Stock value						1,376,718	

**All machinery operations are carried out on contract including fertiliser spreading. Fixed facilities are depreciated fully over the 15 years of the investment. Cash flow refers to the cash transactions in and from the business during the year while profitability refers to all costs incurred by the business including all non-cash expenses e.g. depreciation.*

Over the lifetime of the investment it is projected that the farm will generate €853,218 in surplus cash with the highest cash level being generated in year 10 at €90,321 and subsequently declining as a result of cost inflation. In practice, this decline in profitability after year 10 should be offset by improved farm productivity as a result of new production innovations. All borrowings are fully repaid at the end of the investment period. Sensitivity analysis was carried out on milk price, concentrate costs, input price inflation and interest rates in the initial analysis. While the business still generates a positive cash return over the 15 years at a milk price of 22c/l, there is extreme pressure on the business in the initial period (years 1 to 5). The base interest rate used for the analysis was 4.5 per cent with the exception of year one. Reducing interest rates by 1 per cent generated an additional €70,609 surplus cash over the lifetime of the investment. Increasing or decreasing the inflation rate on costs has a substantial effect on the amount of surplus cash generated from the business. However, the effect is most severe in the later years of the plan when the business is at its best in terms of the cash generated and therefore, should be in a good position to deal with these cost fluctuations.

Plans for 2011

Cash flow

The 2011 cash flow budget has been set for the farm based on a plan to milk 295 cows on average. Cow numbers were not expected to reach this level until year 4. However, as a result of better than expected herbage production in year one, it was decided to increase the rate of expansion of the herd, which consequently increased milk output from the farm. It is expected that the majority of the increased milk output will be achieved through higher grass utilisation and not from additional concentrate. The herd mean calving date is March 7th with peak herd milk yields included at 22 litres/cow/day. It is projected that milk output from the farm will be 1,350,000 litres in 2011 with similar milk solid concentrations to 2010 (3.54 per cent protein and 4.22 per cent fat). While the milk yield per cow projections are below the original budget, milk solids concentrations achieved are higher than originally projected. A base milk price of €4.34/kg milk solids (30.8c/l) was included for 2011. It is expected that the farm will generate just over €72,698 in surplus cash in 2011 based on the performance projections and expected input costs and output prices (Table 4).

The Greenfield board of management decided to ring fence a large amount of this surplus cash as a reserve fund for the farm. From 2012, both interest and capital will be repaid on a yearly basis over a 13 year period.

Table 4. Greenfield Dairy Farm budget 2011

		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Milk Deliveries (L)		128,493	537,056	484,420	221,160
RECEIPTS					
Milk Sales €	478,325	10,364	150,865	186,805	130,292
Calf Sales €	6,000	3,000	3,000	0	0
Cow Sales €	22,400	1,600	1,600	3,200	16,000
Total Receipts €	506,725	14,964	155,465	190,005	146,292
PAYMENTS					
Dairy Feed €	20,280	1,365	9,930	0	8,985
Dairy Feed (Forage) €	10,000	0	0	10,000	0
Fert. & Lime €	29,196	6,048	9,072	14,076	0
Vet €	22,412	5,620	7,410	4,723	4,660
AI/ Breeding €	11,000	0	9,000	2,000	0
Contract rearing €	58,045	8,743	16,558	16,372	16,372
Contractor (Silage) €	17,200	0	6,000	11,200	0
Contractor (other) €	22,810	4,360	8,150	7,650	2,650
Bark mulch €	16,200	2,200	6,000	4,000	4,000
Seed & Spray €	1,000	0	1,000	0	0
Milk Rec. & Parlour €	11,590	1,362	4,543	4,323	1,362
Polythene & Additive €	350	0	0	350	0
Levies & Transport €	2,975	2,150	150	0	675
Straw €	400	400	0	0	0
Sundry V. Costs €	4,500	0	1,500	1,500	1,500
Labour €	92,532	23,383	24,383	23,383	21,383
Machinery €	5,700	800	2,300	800	1,800
Jeep €	3,600	1,350	750	750	750
ESB €	6,900	1,300	1,500	2,900	1,200
Phone €	1,110	300	270	270	270
Repairs & Maint. €	5,000	1,000	1,500	2,500	0
Insurance €	6,040	5,490	0	0	550
Professional Fees €	3,100	0	0	0	3,100
Interest Payments €	24,800	6,200	6,200	6,200	6,200
Land Lease €	52,798	26,399	0	26,399	0
Staff Costs €	4,500	450	1,350	1,350	1,350
Total €	434,038	98,919	117,566	140,746	76,807
Total Expenditure €	434,038	98,919	117,566	140,746	76,807
Net Cash Flow €	72,687	-83,955	37,899	49,258	69,484
Current A/C Bal	72,687	-83,955	-46,056	3,202	72,687

(3) Profitability projections

The essential difference between cash flow and profitability relates to non cash items which are included in the overall analysis of the business. Therefore, some items appear in the cash flow statement but not in the profit and loss account and vice versa. Depreciation on buildings and machinery is included in the profit and loss account but not in the cash flow statement. On the other hand, the capital loan repayments is included in cash flow statements but not in the profit statement. Inventory change in stock numbers is also included in the profit calculations but not in the cash flow statement. For the purpose of this analysis, all inventory change is capitalised at the end of the fifteen year period to avoid double counting. Table 1 shows the importance of using both profit and cash flows when completing an economic appraisal of a business. In the initial years of the business, there is a net loss in the Profit and loss account, while cash flow is positive. This is mainly as a result of the moratorium in capital repayments for the first three years. Based on this analysis, the requirement for a three year moratorium on capital repayments was identified.

(4) On-going monitoring

The preparation of a business plan, an identification of the risks involved and an implementation phase have been identified as vital steps in the development of a successful business. In addition, there is a requirement to prepare protocols for the continual monitoring of the business. It is only through the strict application of detailed budgets that the business can progress in achieving its targets. An implementation plan on how the key technologies (grassland management, genetics, etc) will be advanced on the farm has been developed. The financial recording on the Kilkenny farm is carried out using a computer package called Quickbooks. While this is a relatively simple accountancy package, it provides clarity around the financial recording of all expenditure and receipts and provides a simple budget vs. actual comparison on a periodic basis. The Quickbooks package is updated every two weeks, when there is agreement between the farm manager and accounts technician to make certain payments. The majority of the payments from the farm are carried out via electronic bank transfer making problem solving in relation to farm records easier at the end of the financial year. At the end of each period of recording, within Quickbooks, the bank records are reconciled with the “Quickbooks package” records ensuring full reconciliation of all accounts. At any point in time the Quickbooks package can be interrogated to determine what is owed to and by the company as well as assessing the financial performance of the business to that date.

Greenfield dairy farm performance: 2010

A summarised trading, profit and loss account and operating cash flow statement are included in Tables 2 and these are compared to the projected

farm performance. These figures have been summarised for the purpose of this analysis and are presented in more detail at http://www.greenfielddairy.ie under the management policies section of the Kilkenny farm.

Physical performance

Table 2 shows the profit projections for 2010 compared to the actual profit for 2010 using the same methodology. In 2010, much of the development of the farm continued while operating as a functioning farm. As can be observed from Table 5, the stock numbers on the farm only reached there target number in May, resulting in below planned performance up to June with the farm largely performing to target after this point. Milk sales from the farm were 150,000 litres below target for the year as a whole, however milk protein and fat percentages were 0.14 per cent and 0.38 per cent above target. Milk solids sales from the farm were 4,821kg lower than projected in the budget. Management policies put in place to reduce somatic cell count resulted in excellent SCC levels for most of the year especially considering the herd consisted of groups of animals brought together from many differing sources. Within the budget, it was projected that there would be high mortality at 6 per cent and 7 per cent in cows and calves respectively, while actual mortality rates were considerably lower at 2.6 per cent and 5.5 per cent, respectively.

Profitability

In any start up farm situation, the most important target must be to generate a cash surplus. While the farm may not be profitable, solvency is ensured when surplus cash is generated. In the 2010 performance, when inventory change was taken into account the change in livestock numbers due to culling had a significant effect on profitability. This, however will become much less of an issue in 2011 as there will be two lots of animals to counteract the effect of animal culling and mortality. In the original budgets, the inventory change effect in the livestock numbers was only taken into account at the end of the investment thus ensuring that the value of livestock change was not double counted. Also in the original budget, the costs associated with the first winter's feed were included in the capital budget as the provision of feed for two winters would have a significant effect on the viability of the business. In Table 2, when the profitability is compared between actual and budget with the whole crop feed capitalised and the livestock number change accounted for in year 15, the farm just broke even. The budget projection was for a loss of just over €7,000 at a base milk price of 24c/l.

Operating Cash flow

The operating cash flow for the farm (separate from the farm development) is shown in Table 2. It shows the operating cash projections for 2010 compared to the actual cash in 2010 using the same methodology. As evidenced by the data

in Table 2, the farm operating cash surplus projection was €24,093, while the actual operating cash surplus was €47,239.

Table 2. Greenfield Dairy Partners Ltd actual versus projected profit and operating cash flow budget for 2010 based on methodology used for budgeting

	Profit		Cash	
Receipts	**Projected**	**Actual**	**Projected**	**Actual**
Milk	310,174	338,858	310,174	338,858
Livestock	47,223	59,091	47,223	59,091
Sales	357,397	397,949	357,397	397,949
Variable Costs				
Concentrate	9,694	11,874	9,694	11,874
Fertiliser, lime & reseeding	27,480	24,758	27,480	24,758
Livestock rearing	30,209	28,778	30,209	28,778
Contractor	11,828	10,232	11,828	10,232
Silage making	15,531	20,339	15,531	20,339
Vet/ AI & medicine	34,453	35,186	34,453	35,186
Other	4,000	5,275	4,000	5,275
Total variable costs	**133,195**	**136,442**	**133,195**	**136,442**
Fixed Costs				
Wages and salaries	88,800	87,810	88,800	87,810
Land lease payable	52,200	53,409	52,200	53,409
Insurance	6,571	4,789	6,571	4,789
Machinery running and repair	11,554	24,036	11,554	24,036
ESB & oil	5,775	5,845	5,775	5,845
Telephone	2,400	943	2,400	943
Hire of equipment		1,535		1,535
Diesel & motor expenses jeep	4,296	3,758	3,634	3,758
Consultancy	1,500	681	1,500	681
Accountancy	3,500	13,564	3,500	13,564
General expenses		777		777
Depreciation	30,496	47,121		
Bank loan interest	24,175	17,121	24,175	17,121
Total Fixed Costs	**231,267**	**261,389**	**200,109**	**214,268**
Net	**-7,065**	**118**	**24,093**	**47,239**

The data in Table 3 describes the capital expenditure on the farm to date. The original budget projected a total spend of €1,100,000. This was surpassed by €139,008, some of which was related to additional capital expenditure while the majority was related to additional stock that were purchased on the farm. The farm is now in Year 2 but has expanded to the projected position in Year 4 of the development. This will have positive influences on projected cash flows and profitability in future years.

Table 3. Investment assumptions and actual cost for the farm set up in the Greenfield programme.

Item	Description	Projected	Actual
Stock	265 lactating cows €1300 70 heifers @ €1200	€344,500 €110,500	€389,268 €84,000
Reseeding of farm	117 ha, one pass till, sow, roll + grass seed + fertiliser	€35,000	€48,589
Fencing	20,000 m @ €0.9/m	€17,500	€17,617
Water supply	40 water troughs + 7 km water pipe laid + water store+ Boring the well	€26,500	€29,040
Infrastructure	Stand off pad, Earthen bank tank Roadways, Site work, Gate, Tank fencing, Bark Mulch, Head feed, Calf shed, Gates, Yarding	€176,400	€326,738
Milking parlour	30 unit herring bone shed + dairy + collecting yard/ and office, wiring, plumbing, heating	€196,140	€228,709
Silage Slab	Silage bases	€16,300	
Feed bin			€4,000
Electricity supply	3 phase transformer + connection fee	€9,742	€8,584
Machinery	Jeeps and tractor	€20,000	€16,230
Labour	Labour from Start to December	€3,500	
Planning	Drawings + site assessment + mapping + planning application + council development fee	€20,000	€12,770
Working capital	Feed	€19,000	€24,800
Office	Computer, farm package, phone connection, broadband etc	€5,000	€25,688
Company	Set up plus legal		€5,705
Contingency	10 % allowance to allow for unexpected costs that may arise	€99,968	€8,669
VAT paid **Total** **VAT back** **Net capital**		 **€1,100,000**	€86,000 €1,316,408 €77,400 **€1,239,008**

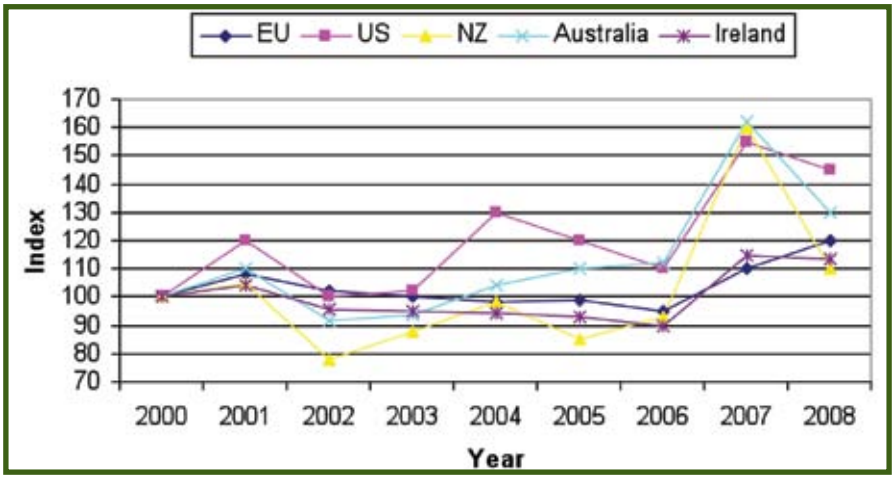
Table 5. Physical performance of the Greenfield Dairy Farm during 2010

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Milk deliveries L	-	9,765	58,537	114,139	111,432	192,448	132,433	115,815	143,491	96,021	56,343	2,263
Protein per cent	-	3.49	3.34	3.22	3.19	3.41	3.52	3.55	3.76	4.04	4.24	3.55
Fat per cent	-	4.07	4.14	3.84	3.97	4.00	4.16	4.29	4.59	4.88	5.32	4.25
Milk solid kg	-	760	4,509	8,299	8,217	14,688	10,476	9,352	12,341	8,822	5,547	182
Somatic cell count	-	249,000	133,000	163,000	118,000	135,000	147,000	166,000	188,000	212,000	357,000	100,000
Cows – purchased	-	222	-	11	56	-	-	-	35	-	-	70
Cows – culled	-	-	-	1	-	-	-	-	10	6	52	2
Cows – died	-	1	2	1	-	1	-	1	-	-	-	1
Cows - on farm	-	221	219	228	284	283	283	282	307	301	249	316
Calves – born	-	85	100	21	8	2	-	1	-	-	-	-
Calves – died	-	5	4	2	1	-	-	-	-	-	-	-
Calves – sold	-	-	-	20	96	14	-	-	4	-	-	-
Calves – on farm	-	80	176	175	86	74	74	75	71	71	71	71

(5) Risk Identification

Risk identification is an important consideration in any business. It creates a business environment that provides both opportunities and threats and so risk can be both positive and negative. The important question is how much is the business "at risk", or how vulnerable is the business to the external pressures (weather, price, etc). It can be expected that milk price fluctuation will pose the greatest risk to the dairy business. However, there are other risks to the business. These include financial risks (feed and fertilizer price, interest rates and fuel cost), weather risks and disease risks (BVD, IBR, Johne's, etc.). There may be other risks that are relevant depending on circumstance (e.g. milk quotas) and farm location (soil type and climate). The business plan should set about developing strategies that will test the effect of each of the identified threats. Figure 1 shows the volatility in price for a selected number of countries over the past ten years. It is clear that the volatility in price has become much more pronounced in recent years. This is the case not only in the EU, but also in New Zealand and Australia, where milk price increased by 60 per cent from 2006 to 2007 and then dropped back again. Price fluctuation should encourage dairy farmers to focus on lowering costs. It is no accident that the lowest costs were observed in the regions where price fluctuation was largest. Risk reduction strategies may be implemented, depending on the aversion to risk of the producer. For example, one source of insulation that has helped some milk producers in 2009 is being in a position where they have a large proportion of heifers reared for expansion purposes which could be sold to generate additional cash reserves during the very difficult 2009 season.

Figure 1. Milk price between 2000 and 2008 in the EU average, US, NZ, Australia and Ireland



(6) Key to success

A set of key performance targets or indicators (KPI's) should be identified in addition to a strategy for how each will be delivered and monitored. Key performance indicators that have been identified include grass utilisation (kg DM utilised per hectare, level of concentrate feeding, milk production per kg of utilised herbage), reproductive efficiency (six week calving rate, submission rate, empty rate), production costs (€ per kg milk solids; MS), labour efficiency (cows per labour unit) and profitability (€ per hectare).

A measurement protocol should be created for each KPI in order to benchmark performance within and between years and against the plan for the business. These protocols will be essential if the plan is to be implemented successfully and they should include protocols for grass budgeting, financial budgeting and herd recording. Each year the farm should be benchmarked against the plan, against other farmers in the discussion group, against top farmers and research level targets. There may be a need to adjust the plan periodically.

Lessons from Business Planning the Greenfield Farm, Kilkenny:

1) The best time is to expand is during lower milk price years when you are much more motivated to negotiate better deals and when other farmers are not spending. Build a war chest of funds for these occasions.
2) The need for very close monitoring and recording of all activities that are part of any expansion development (loads of stone, loads of concrete, contractor hours, depth of concrete, quality of material from quarries etc) cannot receive enough emphasis.
3) The temptation to include additional work (extra development,) not in the expansion budget is great. A large amount of unplanned small capital spends will cause significant deviations from the plan and may cause cash flow problems.
4) Make sure that everybody involved in the operation is fully familiar with the detailed business plan and create monthly accounting procedures to compare budget to actual position within a week of the end of each month.
5) During expansion, a farms financial position will remain very tight and this will continue until expansion is complete and a high level of operational performance is achieved.

Conclusions

Current milk price volatility is such that the cash requirements and future liquidity of the business must be a key component in the expansion plan. Better utilisation of grass and low capital investments are the foundations of viable expansion. There is an urgent requirement for all dairy farmers to develop business plans which will include both long term and short term objectives and requirements. The technology is available to create the opportunities that will underpin any expansion at farm level. Insulation of the farm business from a large proportion of the volatility can be achieved by focusing on low cost grass based technologies.

Infrastructural Requirements for a Greenfield Dairy Farm

Padraig French & Adrian Van Bysterveldt
Teagasc, Moorepark Animal & Grassland Research and Innovation Centre, Fermoy, Co. Cork

Summary

- The main focus of investment for expanding dairy farms must be on aspects of the business that directly increase profitability such as increasing stock numbers, high performing pastures and grazing infrastructure.
- The siting of the farm infrastructure will be critical in achieving high labour efficiency and high animal performance
- The construction of farm roadways in terms of design and surface smoothness will be critical maximising animal movement and reducing lameness
- The design of the milking parlour and collecting yard layout should focus on reducing labour requirement while at the same time providing gentle cow flow and good cow traffic speed through the milking facilities.
- Soil fertility status, organic matter content and drainage status should all be considered prior to a reseeding programme in a dairy conversion situation

Introduction

The goal of the Greenfield Dairy Farm was to minimise capital investment in non-productive depreciating assets (farm buildings and machinery) while ensuring that investment in areas that affect productivity were not compromised such as stock numbers, establishing high performing pastures and setting up grazing infrastructure. Minimising capital requirements in areas that do not affect the productivity of the business has to be the main focus of successful expansion. The capital cost breakdown for each item of expenditure is detailed in Table 3 of the 'Greenfield Projections' paper by Shalloo et al in this booklet. The key farm infrastructure areas that will require capital include;

(1) Milking, animal accommodation and slurry/soiled water storage
(2) Grazing infrastructure
(3) Farm roadway and water system layout

(1) Milking, animal accommodation and slurry/soiled water storage

The overall objective was to design a farmyard that could adequately milk and accommodate up to 350 cows in a labour efficient manner while at the same time cost less than €1,000/cow. The milking parlour and other farmyard facilities

were sited approximately central on the farm (considering current and future needs). The milking parlour, silage slab and standoff pad were sited where the land slope is suitable and favours easy drainage to the lagoon. The yard was designed to allow plenty of space for vehicle movement. The original layout of the farm and newly created layout are illustrated in Figures 1 and 2, respectively. Figure shows the location of the farmyard and milking facilities in relation to the overall farm map.

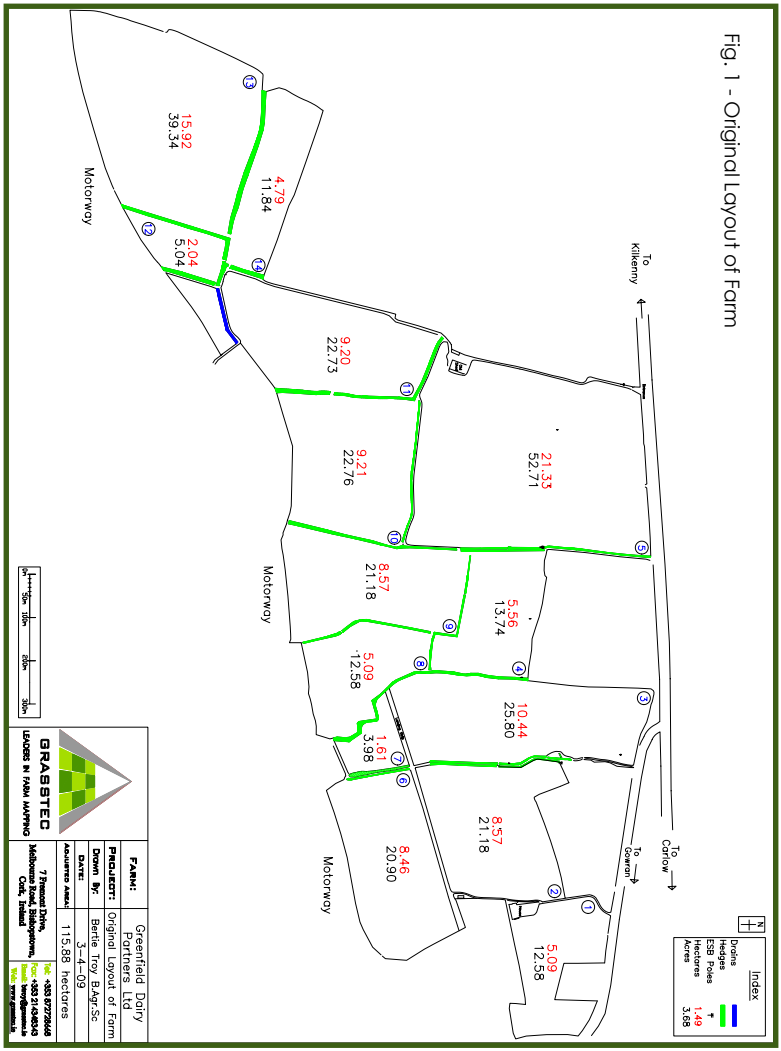
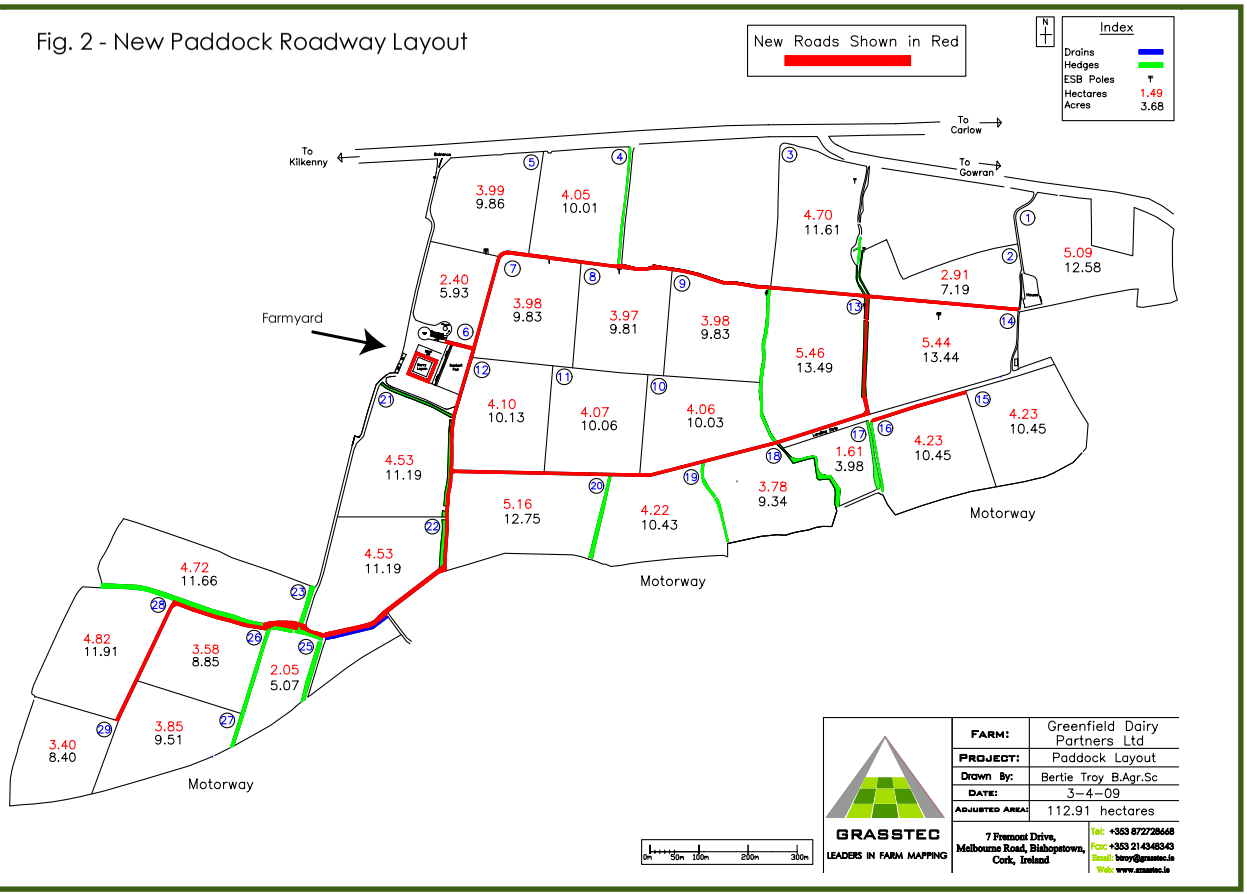


Fig. 2 - New Paddock Roadway Layout



The unique thing about grazing systems is that generally cows are required to walk to and from the milking parlour twice daily. In addition, cows may also need to be shifted between paddocks when grazing is completed. This occurs in all weather conditions and can be either during the day or night. Longer walks reduce animal production and require additional labour. Consequently, a lot of thought needs to be invested in deciding where to site the farmyard on the farm, how to subdivide the farm into a paddock system and what the optimum layout of roadways should make animal movement most efficient. The four key issues to consider are:

1. Distance that cows are required to walk.
2. Design and layout of cow roadways. (See race construction)
3. Access to the milking parlour for milk tankers and other large vehicles separate from cow roadways.
4. Farm security and animal disease biosecurity.

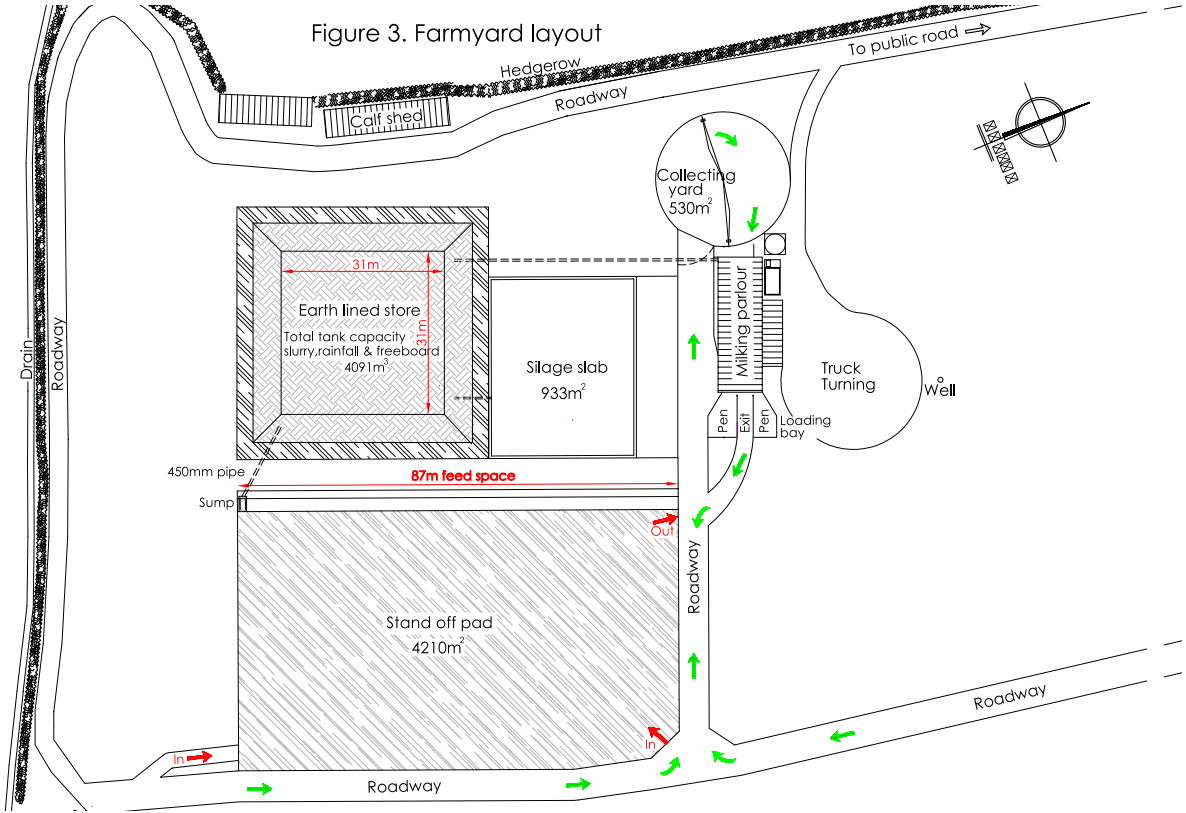
Large vehicle access onto a farm must meet local planning requirements as well as providing easy traffic flow, however they are secondary to the cow requirements which have the potential to allow far bigger efficiency and cost gains by minimising walking distance.

Key issues to consider in the siting of a new dairy unit

1) Milking parlour and other farmyard facilities need to be sited near to the centre of the farm (considering current and future needs). When a suitable site is identified, then a farm lane system can be designed to this point. This will be required, to reduce lane construction costs and increase the milking efficiency.
2) Locating the dairy unit away from public roads makes it easier to control security and prevent unauthorized access to restricted areas such as calf rearing sheds, etc.
3) The farm yard should be free of obstructions and allow space for possible future expansion of milking parlour, wintering facilities and slurry storage facilities.
4) Milk tankers and other large service transport should have a separate access to the dairy unit which should not cross the cow race race system and provide plenty of space for vehicle movement.
5) If a lagoon is used to store slurry and wash water then ideally the milking parlour, silage slab and wintering facilities should be sited where the land slope is suitable and favors easy drainage to the lagoon.

The farmyard design is illustrated in Figure 3.

Figure 3. Farmyard layout



Wintering facilities

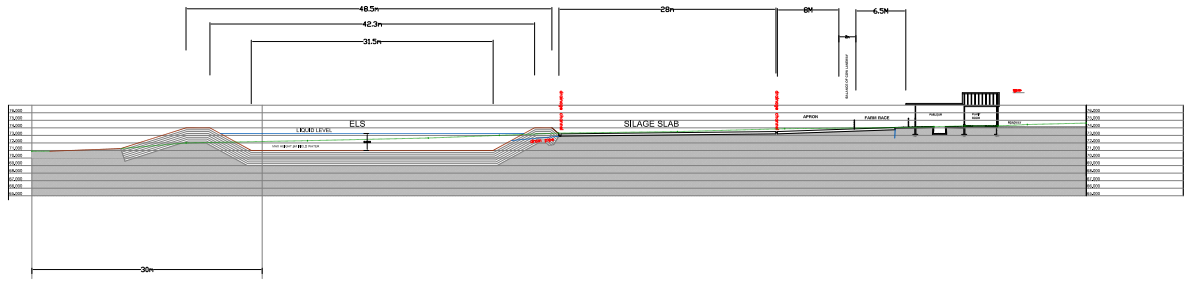
The wintering facilities at the Greenfield Dairy Farm consist of an outwintering pad (OWP) linked to an earth lined slurry store (ELS). The size of the OWP is approximately 4,200 m^2, providing adequate lying area for 350 cows @ 12 m^2/cow. The head feed area is 87 m long which is approximately adequate for 150 cows to feed simultaneously. The ELS has a net storage capacity of approximately 3,000 m^3 or approximately 19 weeks of slurry storage based on 160 m^3/cow/week. Both the OWP and ELS are constructed in an area of the farm that is underlain by subsoil with relatively high clay content (>15%). This subsoil met the specifications for an earth lined OWP and ELS. An artificial liner for both the OWP and ELS would have increased the capital costs by approximately €50,000. The design of the outwintering pad is shown in Figure 4 (see Appendix 1 also), while the feed face design is shown in Figure 5.

Out wintering pad versus conventional cubicle housing

When planning the Greenfield Dairy Farm conversion in early 2009 a number of key objectives were identified around investment in farmyard infrastructure. These included minimal capital outlay on depreciating assets in order to prioritise the limited capital towards productive assets such as stock and high performing pastures. The other objectives were to provide a labour efficient, environmentally compliant construction which provided good cow welfare and had low running costs. Capital costs of farm buildings have fallen significantly over the last 3 years, however access to capital has become much more difficult. Table 1 outlines the capital and operating costs of a range of alternative winter accommodation systems using 2011 construction costs. It includes a conventional cubicle shed with slatted slurry storage, an earth lined OWP/ELS and a low cost (topless) cubicle system with the slurry stored in a plastic lined lagoon (PLS). In the analysis, capital investment was depreciated over 15 years and the capital investment was financed with borrowed money at 6 per cent interest and woodchip was charged at €12/m^3. The analysis in Table 1 shows the estimated total annualised housing costs and evaluates the sensitivity to both interest rate and woodchip price.

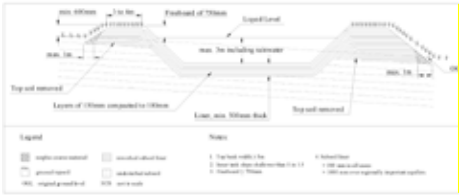
The conventional system has the highest capital and annualised housing cost whereas the OWP/ELS has the lowest capital cost but the low cost cubicle system/PLS has the lowest annualised housing cost. The cubicle systems are much more sensitive to variations in interest rate whereas the OWP/ELS are most sensitive to changes in woodchip price. Once the capital cost of the cubicle system is less than €850/cow it is more cost effective than OWP/ELS over the lifetime of this business. While the low cost cubicle system in this scenario has the lowest annualised cost and, would therefore, be the most cost effective option, it would require an extra initial capital investment of €117,950 which would not have been affordable at the time.

Fig. 4 - OWP



SITE LONGITUDINAL SECTION 1-200

BUILDINGS TO CIMPLY WITH THE DEPARTMENT OF AGRICULTURE SPECIFICATION S123 AND ALL OTHER APPLICABLE REGULATIONS.



DEPARTMENT OF AGRICULTURE ELS SKETCH RECOMMENDATION

EDDIE KENNEDY ASSOCIATES

PROJECT: PHELANS FARM

CLIENT: TEAGASC

LOCATION: RATHCASH WEST, KILKENNY

DRAWING: PROJECT NO.:

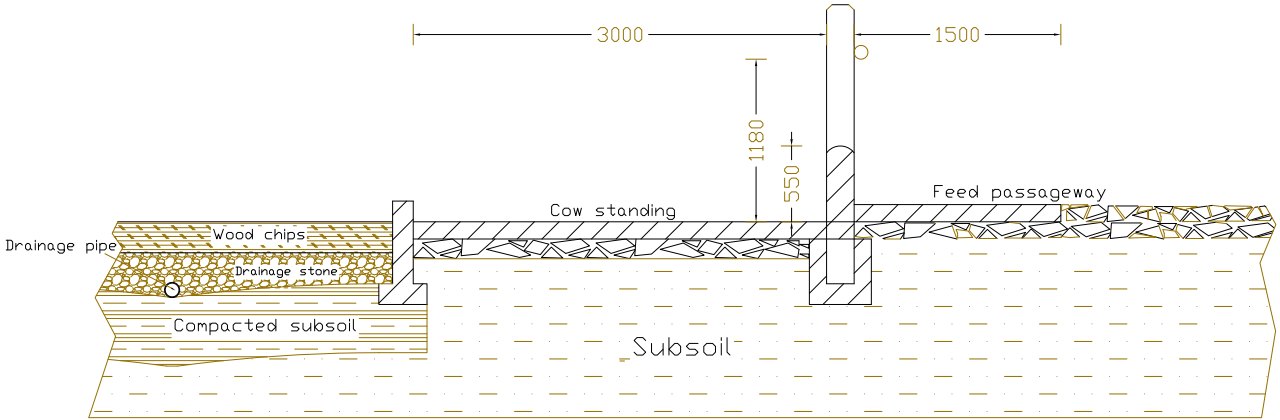
DATE: DWG. NO.:

SCALE: 1-200 CHECKED:

TITLE: LONGITUDINAL SECTION

REVISIONS:

Fig. 5



Cross-section of Feeding Area

Table1. The effect of winter accommodation system on construction cost, operating and annualised housing costs

	Conventional cubicle shed	Roofless cubicles/PLS	OWP/ELS
Slurry storage requirement m^3/cow/year	5.3	6.5	7.8
Total housing/slurry storage cost (€/cow)	1,218	708	371
Depreciation & interest (€/cow/year)	125	73	38
Bedding & slurry spreading(€/cow/year)	17	20	75
Total annualized cost (€/cow/year)	142	93	108
Sensitivity			
2% rise in interest rate (€/cow/year)	159	102	114
€10/m^3 woodchip price (€/cow/year)	142	93	101

Advantages/ disadvantages of OWP/ELS

Advantages

- Over-wintering facilities on farms can be greatly increased at low capital cost.
- Does not pose a significant threat to the environment when designed and constructed properly.
- Improved animal performance and welfare when managed properly.
- Costs are spread over the lifetime of the structure (rather than up front in conventional structures) thereby reducing business risk.
- More adaptable to a range of animal types than conventional housing.

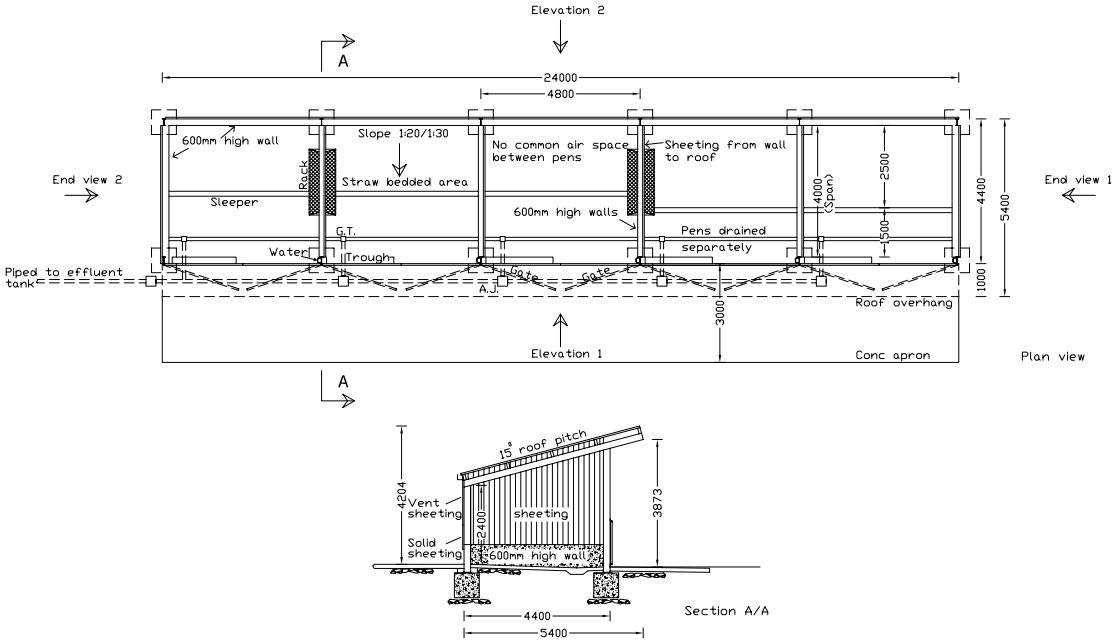
Disadvantages

- Requirement for competent site analysis and characterisation prior to construction.
- Annual requirement for bedding material (higher running cost).
- Unsuitable for lactating cows over prolonged period.
- Solid (spent woodchips) and liquid (OWP effluent, classified as slurry) management requirements.
- Farmer is exposed to the weather for animal management activities.

Calving and calf facilities

Most of the calvings takes place on a designated clean area of the OWP supplemented with a small shed (10m * 6m) on the OWP. This facilitates catching and handling of cows at calving and shelter to newborn calves during periods of inclement weather. All calves leave the farm within 2-4 weeks of birth with all male calves being sold and dairy replacement heifers sent to a contract rearer. A mono-pitch calf shed with 10 pens each 4.8 m * 4.0 m (Figures 6 & 7), with capacity for approximately 150 calves was constructed with each pen having isolated air and effluent movement. This allows 1.25m^2 of lying area per calf. These pens also fill the requirement under the dairy hygiene regulations for isolation facilities. Calves are grouped by age in the pens as they are born with an all-in all-out policy used for each pen. All calves are group fed from birth with hook over calf feeders and have access to meal and water from birth.

Fig. 6 - Calf Shed

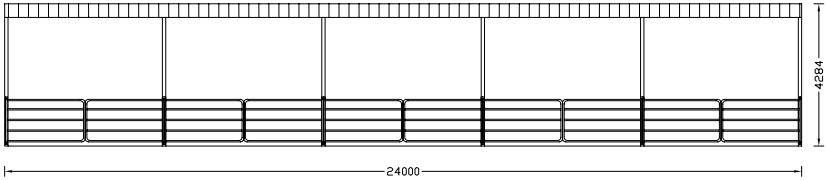


Open fronted calf/isolation pens
Plan/Section A/A

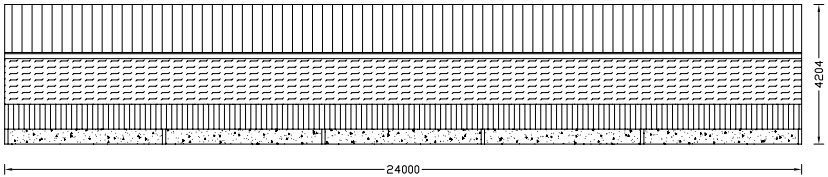
Note: All buildings to be constructed to current relevant Department of Agriculture Specifications.
All Dimensions are in millimetres.
All Dimensions to be checked on site.

Title	Plan/Section A-A		
Scale	1:100	Drawing No.	1
Date	Nov. 09	File Name	Chmana1
eagasc KILDALTON		Drawn By	Noel Nugent
		Checked By	Tom Ryan

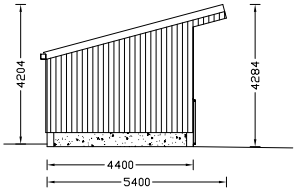
Fig. 7 - Calf Shed



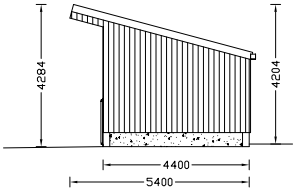
Elevation 1



Elevation 2



End view 2



End view 1

Open fronted calf/isolation pens

End views/Elevations

Note: All buildings to be constructed to current relevant Department of Agriculture Specifications.
All Dimensions are in millimetres.
All Dimensions to be checked on site.

Title	End views/Elevations		
Scale	1:100	Drawing No.	2
Date	Nov. 09	File Name	Chmono1
teagasc KILDALTON		Drawn By	Noel Nugent
		Checked By	Tom Ryan

Collecting yard and cow flow

There are two aspects to consider when constructing a collecting yard;

1. The average size of cows in the herd
2. The herd size.

Small cows require 1.2m^2 per cow while large cows require 1.5m^2. Multiply the average cow size by the maximum number of cows to calculate the total area required. Both circular and rectangular yards have positive and negative attributes (Table 2).

Table 2. Advantages and disadvantages of rectangular and circular collecting yards

Rectangular Yards	**Circular Yards**
Easier to build	More complex to build
Can be extended easily	Difficult to enlarge
Promotes good cow flow if cows enter from rear	Promotes good cow flow
Important to taper the yard towards dairy entrance	Can support automatic backing gate cleaning system
	Possible to put second herd onto same yard without moving backing gate

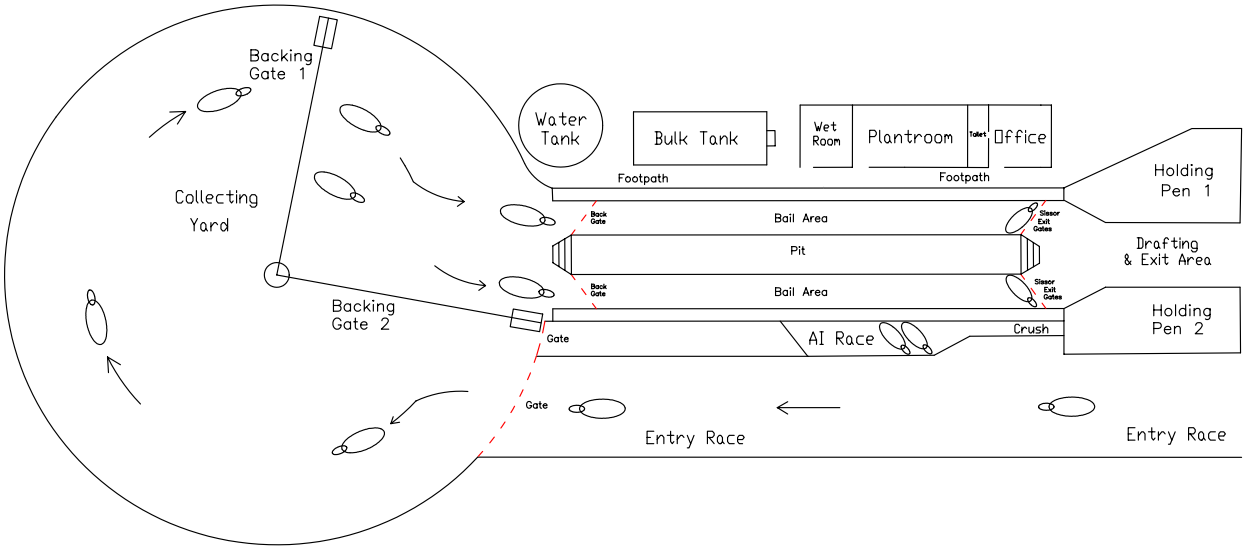
The milking parlour and collecting yard layout on the Greenfield Dairy Farm are shown in Figure 8. On a large dairy herd optimising cow flow around the milking parlour is essential for high labour efficiency. Approximately half of the entire labour requirement on the Greefield Dairy Farm is used in the milking process. The entrance race to the parlour provides an unobstructed 7m wide direct line to the back of the collecting yard. The circular collecting yard has a 13 m radius to provide adequate space for 350 cows in ¾ of the circle. The motorised backing gate is plumbed to facilitate automatic washing of the collecting yard. The bail and drafting area is designed to speed cow movement into and out of the parlour and to facilitate a simple drafting system. In-parlour feeders were not installed as they would disrupt cow flow, increase the cleaning-up time and increase the capital cost. When silage supplementation is required, the herd will be fed on the paddock as a first option and at the head feed on the wintering pad if ground conditions are unfavorable.

Well designed drafting facilities at exit from the parlour will:

- Save time, provide gentle cow treatment, and maximum cow traffic speed through the parlour.
- Cows can be accurately drafted and normal cow flows are not disrupted.
- A system that funnels cows into a single file on exit from the parlour and into a chute is required. This can then widen after drafting to allow for rapid cow exit.

- A short self closing drafting gate can be opened across the race from the pit via a rope and pulley system. It is important when cows are being drafted that she has adequate space in front so that she does not hesitate at the drafting gate passage
- A secure holding pen should be of adequate size, e.g. hold 10 per cent of the herd, should have a gate to guide animals towards a crush, and provide shelter where cows are held for long periods.
- Drafting system design is shown in Figure 9.

Fig. 8 - Milking Parlour Layout

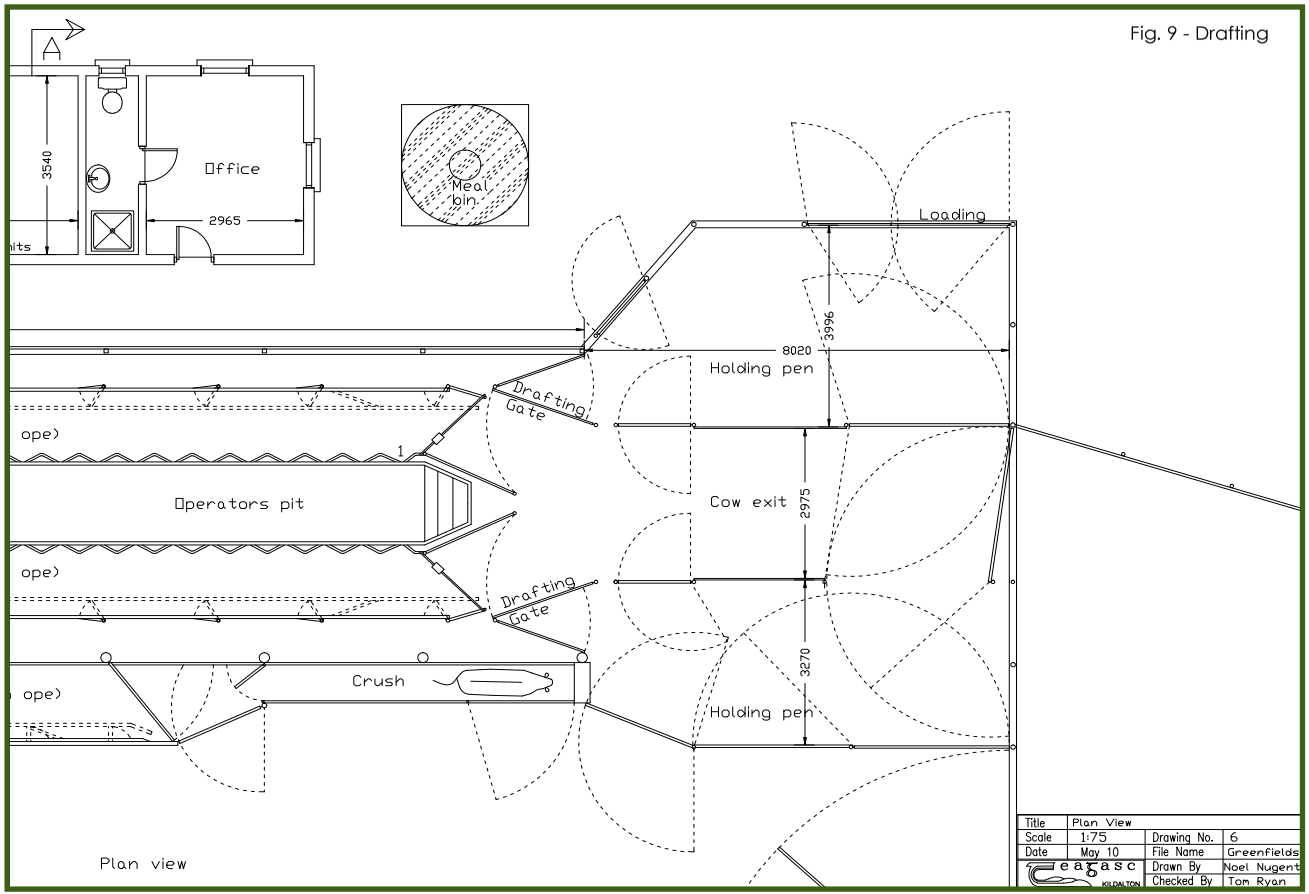


FARM:	Greenfields Dairy Partners Ltd
PROJECT:	30 UNIT HB
Drawn By:	Bertie Troy
Contact:	087 2728668

Dairytec CONSULTANCY LTD

IN ASSOCIATION WITH CHAPMAN DAIRY, MORRINSVILLE, NEW ZEALAND.

Fig. 9 - Drafting



(2) Grazing infrastructure

Proper subdivision of grazing land into paddocks is essential to be able to successfully manage pastures and achieve desirable rotation intervals. Paddocks must be connected with an efficient lane system so that the herd can move from one paddock to any other paddock on the farm. An accurate map of the farm is essential; preferably GPS.

The ideal paddock system should include:

- About 20 to 23 full sized paddocks and a few small paddocks near the parlour for sick cows etc.
- The lanes from the parlour/farmyard to the paddocks should be wide smooth and as short a distance as is practical.
- The paddocks should be big enough so that there is sufficient pasture for the full herd for 24 hours when the pre-grazing cover does not exceed 13-1500 kg DM per ha and on a 21 day grazing rotation.
- Paddocks should be rectangular to square in shape and wetter paddocks should have longest sides running adjacent to the races to avoid poaching in wet weather.
- Alter paddock shape to facilitate stock movement into and out of the paddock i.e. stock move down hill to exit paddocks.
- Races to follow contour where extreme and be wide with gentle sweeping bends.
- Locate races on the sunny windy side of a ditch, hedge or tree line.
- Avoid putting races directly through springs or swampy ground.
- Plan underpasses carefully to allow for gentle slopes into and out of the underpass and for drainage.
- Main paddock gateways to be angled to the race with at least two gateways for each paddock.
- Plan for multiple gateways from the race for paddocks on wet ground or for paddocks to be grazed by small mobs near the parlour.
- Have several gateways between adjacent paddocks.
- One wire (electrified) fences between paddocks with interconnecting gateways.
- Electrified fences divided into sections with easy to access cut off switches.
- The paddocks should be numbered with a tag on the gate and on a map of the farm.

Creating paddocks

1) Use the maps to consider several different ways of laying out the farm and consider the positives and negatives of each one.
2) Chose the option which ticks the most positives and the least negatives.

3) Mark the layout on the ground with marker pegs. Use different colours for race edges and paddock boundaries.
4) Re-consider the layout both from the practicality of construction and operation and from the perspective of the cow. Does this actually make sense?
   - *Are the paddock entrances in dry ground?*
   - *Are the paddock entrances in the down hill corner of the paddock?*
   - *Is the slope of the lane less than 10%?*
   - *Will the race disrupt normal flow of water down a slope?*
5) Re-align the markers on the ground to correct for the issues identified in 4 above.
6) Record the final layout on an accurate map and make lots of copies. Get a very large one made that is suitable to put on a wall at the milking parlour.

Project management

1) If the conversion involves re-seeding, it is recommended that the cultivation and re-seeding are done before putting in water reticulation, paddock fencing and constructing races.
2) New department rules require that where existing ditches are to be removed, new hedgerows have to be created before the old ditches are removed. The legislation also allows a farmer who is expanding his herd size to apply for the permanent removal of existing ditches without erecting a replacement. That is if the existing ditches would interfere badly with the operation of the new larger farming operation.
3) Accurately detail all the work that is to be done, (widths, distances, design) and get several quotes.
4) Select the contractor/ supplier on the basis of price, quality of work, and reputation for getting the work done on time.

Indicative costs

Where the specification is for mostly single wire electrical fencing and handle across gateways, using creosote posts and strainers, €0.90-€1.00/m can be obtained.

Reseeding

The varieties used at the Greenfield Dairy Farm are outlined in Figure 10 below. In the years prior to conversion, the farm was a very well managed tillage farm with regular soil sampling and the use of min-till technologies. At the outset of this project, soil fertility status was assessed by splitting the land into recognizable blocks and pooling soil samples within each block for testing. Soil fertility was addressed based on soil tests and the lime was applied as required prior to

tilling. A min- till option was used for reseeding so that the ground would be firm going into the first winter. The first grazing events after reseeding the swards were done at a low cover (200-800 kg DM/ha) to promote tillering to compensate for the low seeding rate.

(3) Farm roadway and water layout

Cow races- roadways

The objective is to have cows walking comfortably at 3 km/hr with their heads down so that they can see where they are placing their front feet (the back feet will step into the same place). Actual cow walking speed is determined by walking surface, cow training and cow fitness.

Construction aim

- To have a raised, wide, smooth, dry, gently crowned surface with gradual sweeping bends. Up to 200 cows 4m wide, over 200 cows 5.5m wide.
- A straight lead in and exit from the milking parlour of at least 30 meters.
- Widest at the entrance to the milking parlour.
- Construction to reflect the nature of the usage
- Never build on the shady side of ditches or shelter belts.
- Plan the route on a map but finally decide once it is marked out on the ground.

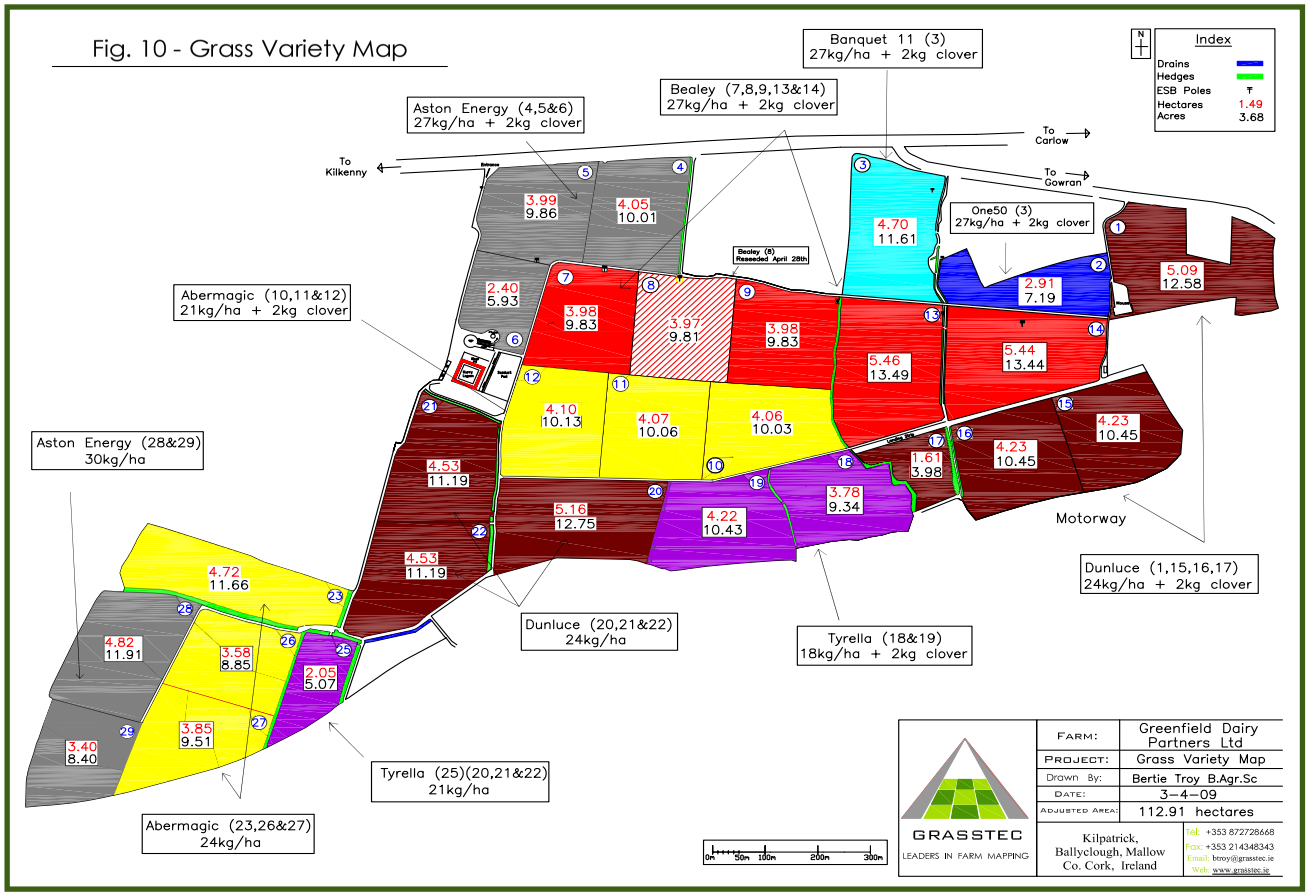


Fig. 10 - Grass Variety Map
Banquet 11 (3)
27kg/ha + 2kg clover
Bealey (7,8,9,13&14)
27kg/ha + 2kg clover
Aston Energy (4,5&6)
27kg/ha + 2kg clover
Index
Drains
Hedges
ESB Poles
Hectares 1.49
Acres 3.68
To Carlow
To Kilkenny
To Gowran
One50 (3)
27kg/ha + 2kg clover
Bealey (8) Reseeded April 28th
Abermagic (10,11&12)
21kg/ha + 2kg clover
Aston Energy (28&29)
30kg/ha
Motorway
Dunluce (1,15,16,17)
24kg/ha + 2kg clover
Dunluce (20,21&22)
24kg/ha
Tyrella (18&19)
18kg/ha + 2kg clover
Tyrella (25)(20,21&22)
21kg/ha
Abermagic (23,26&27)
24kg/ha
3.99 9.86
4.05 10.01
4.70 11.61
2.91 7.19
5.09 12.58
2.40 5.93
3.98 9.83
3.97 9.81
3.98 9.83
5.46 13.49
5.44 13.44
4.10 10.13
4.07 10.06
4.06 10.03
4.53 11.19
4.23 10.45
1.61 3.98
4.23 10.45
5.16 12.75
4.22 10.43
3.78 9.34
4.53 11.19
4.72 11.66
4.82 11.91
3.58 8.85
2.05 5.07
3.85 9.51
3.40 8.40
0m 50m 100m 200m 300m
GRASSTEC
LEADERS IN FARM MAPPING
Kilpatrick, Ballyclough, Mallow Co. Cork, Ireland
Tel: +353 872728668
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Web: www.grasstec.ie
FARM: Greenfield Dairy Partners Ltd
PROJECT: Grass Variety Map
Drawn By: Bertie Troy B.Agr.Sc
DATE: 3-4-09
ADJUSTED AREA: 112.91 hectares

High traffic race areas

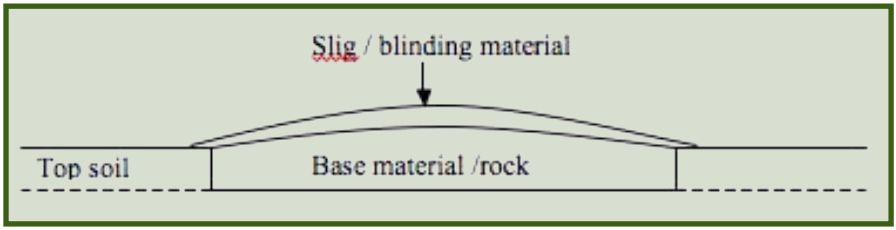
E.g. the first 200 – 500m in each direction from the milking parlour.

- Remove some of the top soil – about 6 inches – gives a more solid base and stops the road material from spreading.
- Lay a cheap base material and shape it to give a raised curved surface. This shape will shed water onto the pastures along side the lane but it still must be flat enough for the cows to walk across the whole surface.
- Compact with a very large vibrating roller e.g.19t
- Leave it with time to settle.
- If the base material will not form a smooth walking surface, then this will need to be cover with a 75mm – 100mm layer of slig/blinding material and compact with a very large vibrating roller. It is very important that this forms a smooth durable surface.

Low traffic race areas

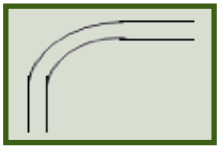
- The race construction is similar to that in the main traffic areas except that the base material is laid directly on top of the ground. This reduces the cost of construction but will not stand up to as much heavy traffic. Otherwise use the same method of construction as in the high traffic areas.

Cross section (end) view of high traffic race area.



Corners

Corners must have a wide sweeping curve- if not they will dramatically slow stock movement. Cows should flow round the bends in the same formation that they are in walking down the straight.

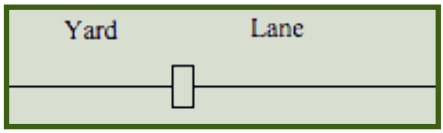


Junctions

Wide sweeping junctions that allow the cows to still stay in formation without them overcrowding.

Connection of lane to the collecting yard

Side cross section



It is important to have the race surface and the concrete of the collecting yard at the same level. The placement of a low (6" or 150mm) concrete nib wall at the junction of the race and the yard will mean that less stones are kicked onto or carried from the race onto the yard. This is very important in reducing the risk of lameness due to stone injuries.

Stone/rock used in the construction of farm roadways

- If cheap soft rock (e.g. shale) or rounded gravels with clay is available then the whole lane can be constructed with this.
- If the base is made of hard limestone then it will have to be capped with a softer material like shale/slig to be preventing lameness.
- When the surface is smooth enough for you to be able to walk along in bare feet or for you to wheel along a child's push chair with small wheels, then it is suitable for cows.

Project management

- If the conversion involves re-seeding do the cultivation and re-seeding before putting in the water circulation system, paddock fencing and constructing races.
- Accurately detail all the work that is to be done, (widths, distances, design) and get several quotes.
- Select the contractor/ supplier on the basis of price, quality of work, and reputation for getting the work done on time.
- Close supervision is required of all contractors to make sure that the job is done correctly. In race construction, the issue that will cause the greatest cost over run is the depth to which the digger removes the top soil.
- Record all loads of stone that are delivered to the farm. Check this against the contractor records and the invoices from the quarry.
- It is important to constantly check the quality of the material that is being delivered particularly if it is shale/slig because the quality of this material can vary greatly.

Race maintenance

- It is essential that no water is allowed to pool on the race surface
- Fill pot holes as soon as they form
- Remove any build up of material at the sides of the race that will prevent water running off.

- Restrict the speed of tractors, quads and other farm vehicles on farm roadways
- Keep vegetation trimmed well back to allow in light and wind onto farm roadways

Paddock and cow roadway layout on the Greenfield dairy farm

Figure 1 shows the original layout of the farm while Figure 2 shows the new paddock and roadway layout. The farm was designed with 28 paddocks – mostly of 4 ha size to facilitate 24 hour grazing for a herd of 300 cows. Most ditches were removed to allow size and shape requirement to be met. The paddocks are set up to be rectangular to square in shape and have longest frontage along the races if they are in the wetter areas of the farm. Paddock shape was designed to facilitate stock movement into and out of the paddock i.e. stock move down hill to exit paddocks. The farm roadways are set up to follow the contour and were designed to remove extreme bends. The main paddock gateways are angled to the race at 45^{o} with at least two gateways for each paddock off the race. There is one wire (electrified) fences between paddocks with interconnecting gateways between adjacent paddocks, two wires (electrified) are used where extra security is needed. The electrified fences are divided into sections with easy to access cut off switches. A number of paddocks have been designed close to the parlour to facilitate a small 'unhealthy' herd. A separate herd of colostrum cows operate during the calving season.

Indicative costs

For a 5.5m wide lane, €15 - €30 /m depending on the cost of the stone and slig.

Water systems

1) Deliver sufficient water to meet the stock needs during greatest demand. This means that the amount of storage and flow rate should be adequate, so that any trough never be less that $^{2}/_{3}$ full.
2) Use taps in easy to find, key locations to split the water system into sections so that it is quick and easy to shut off sections of the farm.
3) Make it easy to identify, locate, isolate and repair leaks, using easy to see storage water level indicators, or an easy to see water meter in the milking parlour.

Table 3 shows the water requirement on the Greenfield Dairy Farm. Total requirement is approximately 22,000 l/day.

Table 3. Water Requirements on the Greenfield dairy Farm

Requirement	Volume Required	Consideration
Cow drinking	50 l /cow/day	Weather dependant (10 to 90 l /cow/day)
Plate Cooling	3 l water/ l milk cooled Requires approximately 6,000 l/hour during milking	Important that water pump is only pumping when milk pump is operating
Washing milking plant and milk tank	40 l cold water /cluster/day 9 l hot water/cluster/wash	
Washing of collecting yard and bail area	5,120 l/day, collecting yard washed once daily and bail area twice, (16 l/cow /day)	Wash down pump uses 14,000 l/hour and washes collecting yard using backing gate
Total water requirement for Greenfield farm	22,000 l/day	Plate cooler water is stored and re-used for stock and wash down
Soiled water generated from milking parlour and yard	10,500 l/day	Currently flows directly to Earth Lined Slurry Store and land spread by umbilical slurry system

Future consideration

Recycled water from the soiled water tank could be used in the collecting yard in future with minimal separation via settlement tanks. This would reduce water requirement by 25 per cent and soiled water production by 50 per cent. Table 4 shows the specifications and sizes of the water equipment used on the Greenfield Dairy Farm.

Table 4. Specification and size of water equipment

	Herd Size		
	<200 cows	**200 – 400 cows**	**>400 cows**
Main MDPE pipe*	25mm	32mm	40mm
Branch MDPE pipe*	20mm	25mm	32mm
Length of branch lines	Less than 50m	Less than 50m	Less than 50m
Ball valves	Full flow	Full flow	Full flow
Trough size	1680 l (400 gal)	2,100 l (500 gal)	2 x 2,100 l (500 gal)
Pressure	3 bar	3 bar	3 bar
Delivery rate	10l/min	30l/min	50l/min

**Medium Density polyethylene pipe internal diameter*

Water system layout

1) Divide the farm into sections, with a tap at each major junction
2) Locate pipes along obvious features e.g race and fence lines or if the pipes cut across paddocks, mark the nearest post (entry and exit) and/or plot with GPS.
3) Mark pipe location, joiners (and sizes) and taps on a large farm map.
4) Install a water flow meter at the milking parlour. This will quickly highlight if a leak occurs if it is not obvious.
5) Use a ring main to improve water volume and pressure to the fields at the end of the system.
6) Use gravity if possible to reduce pumping costs and improve pressure.

The layout of the water systems to the paddocks is shown in Figure 11, while the design and layout of the water system at the milking parlour is shown in Figure 12.

Indicative costs

1) Bulk purchase of 500 gal concrete water troughs €350 - €400 / trough
2) Joiners – €10-€15 for 40mm T joiners
3) 32 mm MDPE piping @ 90c/m in large 2 km roles
4) 40 mm MDPE pipe @ €1.15/m in large 1 km roles
5) 70-90c per metre for pipe moling

Underground or overground water lines?

Water lines on the ground surface will freeze solid in frosty weather and are more liable to damage but leaks are easy to find and fix. The MDPE pipe used on the Greenfield conversion is strong enough to withstand freezing without splitting.

Fig. 11 - Water Layout Map

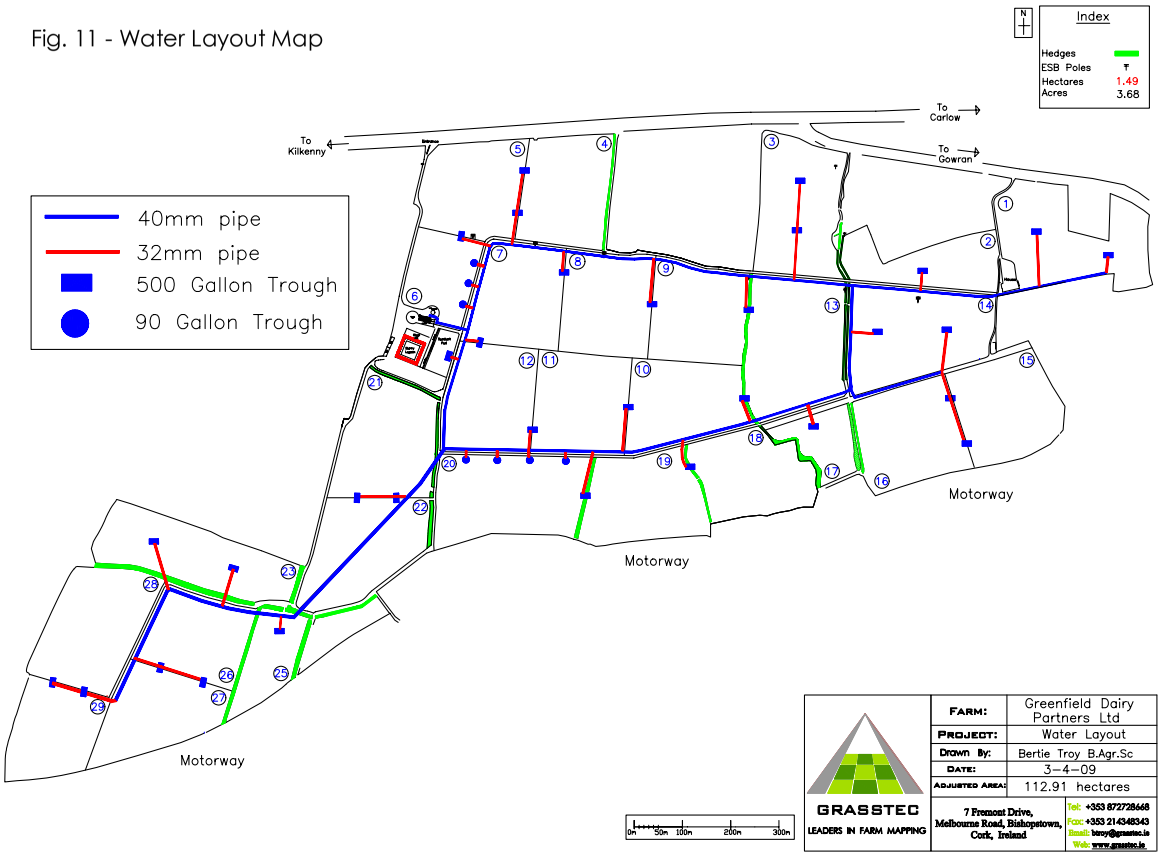
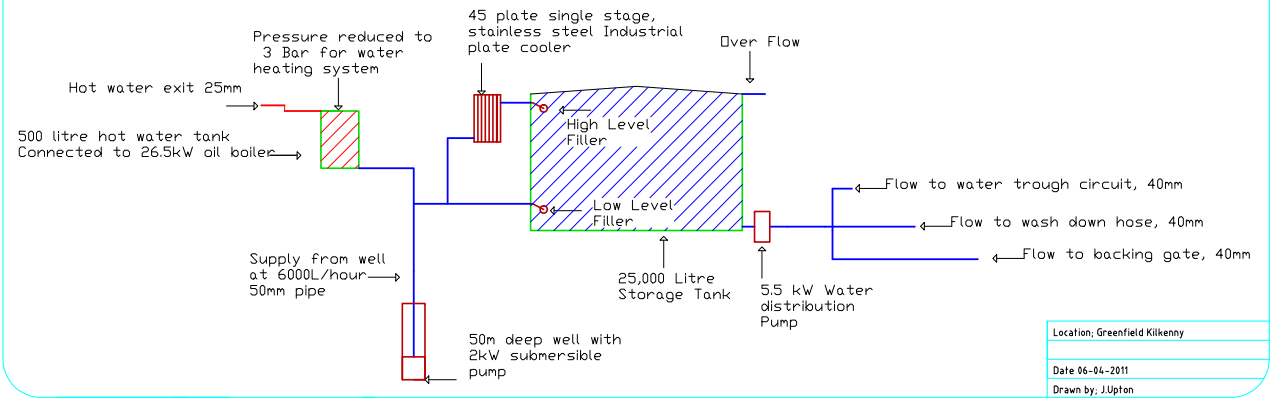


Fig. 12 - Water System



Lessons learnt from the infrastructure development on the Greenfield Dairy Farm

1) Farm lanes take time to bed in and to become suitable for intensive walking use as cow tracks. The best lane surfaces were those put down in prolonged wet weather. Lanes constructed in dry conditions and not given enough time to bed in resulted in an increase in lameness. Constructing in dry weather conditions will required a big emphasis on watering and rolling.
2) New infrastructure, staff and the herd take time to settle down and initial operational performance will be less than optimum.
3) Attention to soil nutrient status will be critical in improving the ability of the farm to grow. Key issues to focus on will be soil test/soil fertility, drainage and pasture species.
4) Pastures ideally should be re-seeded in the spring or late summer to give enough time for proper establishment and for the ground to firm up before the winter months.
5) Land previously used for cropping is going to be lower in organic matter and so will require additional N. The minimum level of organic matter required for reasonable pasture performance is 2.5%. Applying for Nitrates derogation is essential.

Appendix 1. Out Wintering Pad Design

- All outwintering pads will require planning permission and a Site Assessment Report completed by an approved site assessor. A planning application is then prepared and, together with the completed and signed site assessment report, is sent to the Local Authority for planning permission.
- Some locations will be unsuitable for soil-lined out-wintering pads, by virtue of the presence of very close underlying rock; the presence of unsuitable subsoils such as sand or gravel; high water tables; or other adverse conditions. Such locations may necessitate lining the OWP with a geo-membrane.
- The OWP must be built in accordance with DAFF specifications S132 and certified by the construction contractor which is the liner supply company in the case of geo-membrane lined OWP's.
- The specifications and a guidance document are available at *http://www.agriculture.gov.ie/areasofi/fds/S132OWPSpecFeb2007.pdf* or from your local Teagasc office.

Greenfield Farm Milking Facilities

John Upton[1] & Tom Ryan[2], drawings by Noel Nugent[2]
[1]Teagasc, Moorepark Animal & Grassland Research and Innovation Centre, Fermoy, Co. Cork:
[2]Teagasc, Kildalton

Key Points

- Plan new milking facilities carefully paying particular attention to specifications set out by the Department of Agriculture, Fisheries and Food and the Teagasc/ IMQCS Recommendations for the Installation and Testing of Milking Machines.
- Plan to milk (cups on/off) the expanded herd in no more than 1 hour 30 mins.
- It is recommended to change milking liners after 2,000 cow milkings or six months whichever comes first. Milk yield losses of about 5pc occur if liners are not changed.
- It is better to focus on having adequate milking units at the expense of high levels of automation. Plan for adding automation at a later date.
- Plate cooling can reduce milk cooling costs by 50 per cent.
- Bulk tanks should be sized to allow for an expanded herd.
- A minimum hot water requirement is 9 litres of 80°C water per milking unit for each hot wash cycle plus a reserve for bulk tank washing, typically 1-2 per cent of the total volume of the tank.

Introduction

Milking is the main chore on dairy farms. In the past, most dairy farmers focused on having about ten cows per milking unit and space for additional units was in many cases omitted. In future, there will be a requirement to have a milking parlour with a high output in terms of litres of milk produced per operator per hour of total milking process time. The number of milking units that an operator can safely handle is now a major issue and all forms of automation are being considered to reduce labour demand in milking parlours. Over 23 per cent of herds in Ireland now exceed 100 cows and this is likely to further increase driven by the abolition of the milk quota system in 2015. Against this background, many farmers are milking in unsuitable milking parlours and need to invest in a new parlour to suit their needs. With high labour costs, including problems accessing skilled labour, the recent trend has been to install milking parlours with a greater number of units to be handled by one operator. Installing a new milking parlour with associated infrastructure is an expensive, once in a generation investment and must be planned carefully.

Installation standards for milking machines

An initial important requirement when planning a new dairy should be to consult the specification S106, 'Minimum Specification for Milking Premises and Dairies' published by the Department of Agriculture, Fisheries and Food. In particular, it is important not to overlook the presence/proximity of an open slurry tank. The parlour must be at least 10 meters from any existing open slurry tank and must not share a common wall with silage or ensiled material. Location in relation to surface waters and a public water supply source is also an important issue when deciding on the location. There is a distinction made between existing and new farmyards. Reference should be made to S103 for modifications to existing parlours. International and Irish Milk Quality Co-operative Society (IMQCS) standards exist and are a basis for installing a new milking machine. The IMQCS was set up in 1989 to ensure that Irish milking machine installation and testing standards are at least equal to ISO standards. Teagasc, the Irish Co-Operative Society (ICOS), the main milking machine manufacturers and the milking machine technicians were closely involved in implementing the new revision of ISO standards, which were introduced in 2008. This publication is essential reading and can be downloaded from www.milkquality.ie

Milking equipment

The choice of milking systems should be directly related to the number of cows currently being milked and the herd size envisaged for the future. Plan to allow for milking an expanded herd in no more than 1 hour 30 mins. Larger herd sizes will lead to a greater focus on time, working conditions and ergonomics (work as it affects humans) associated with milking. It is important that maximum potential milking performance be achieved from new milking installations and from changes in existing milking parlour size and design.

The particular requirements of the individual dairying enterprise and the cost of labour must dictate the level of automation decided on. The capital, maintenance and running costs of the automation must also be considered. If a high level of automation is installed, then it must be ensured that it is reliable and dependable, can be operated by a person of reasonable skill and requires that there is a very good timely repair service available locally. Initially, it is better to focus on having adequate milking units at the expense of high levels of automation. However, provision should be made for the easy addition of automation at a later date, for example swing-over arms are usually required to support the rams for cluster removers and also to support the long milk tube. There is about a 10 per cent increase in milking speed with 16mm bore long milk tubes, compared to conventional 13.5mm bore tubes. In most cases, the swing-over arms prevent excessive sagging of the 16mm bore long milk tubes. If planning for the installation of automatic cluster removers (ACRs) at a later

date, swing-over arms should be installed making the fitting of ACRs easier in the future. The installation of individual animal bailing systems allows cows to be located conveniently for proper operation of ACRs. There is considerable debate now on the feasibility and necessity of installing bailing systems in new milking parlours. The main advantage with bailing systems is that cows are controlled and positioned better for easy cluster removal, compared to having a straight-breast rail or angled mangers. They are however, expensive and slow down milking. Dump lines are also an optional extra however, operating a second herd of 'unhealthy' cows (mastitis, lameness or other ailments which require antibiotic treatment) is recommended practice from a milk quality perspective.

Factors affecting milking performance

The main time-saving elements of milking include an adequate number of milking units, milking units with minimum vacuum losses, an efficient work routine time, fast cow flow at entry and exit, a reliable drafting system and stall work that gives good cow control. It is extremely important that the operator does not have to leave the pit during milking. Upgrading of many parlours in respect to these characteristics is required.

Efficient milking units

The fastest milking is obtained with a 16mm bore long milk tube, simultaneous pulsation and Moorepark type wide-bore tapered liners. Most old milking machines have milk tubes with a 13.5-14mm bore. There is no advantage in increasing the claw volume above 150ml, particularly with simultaneous pulsation. For new machines and conversions, 16mm bore long milk tubes is now the preferred option. Excessive sagging of milk tubes below the standing cow can reduce the vacuum at the teat end. It is recommended to change milking liners after 2,000 cow milkings, or every six months, whichever comes first. Milk yield losses of about 5 per cent occur if liners are not changed. Only Moorepark approved liners should be used. While selection of a milking system that has established milking performance data is of paramount importance, maintenance of milking systems is given a low priority with many farmers and the under-milking due to worn liners can contribute to increases in cell count. The changing of liners on time gives probably one of the highest returns on investment to a dairy farmer. Milking machines should be fully serviced and tested at least once per year. Any problems identified during this routine check should be rectified immediately and the machine tested again post maintenance to ensure all equipment is operating correctly.

Greenfield dairy & milking facilities specifications

Milking Parlour	
Number of Units	30
Unit Centres	710mm
Pit width	1520mm
Milk Line	100mm Stainless Steel
Wash line	63mm Stainless Steel with Jetstream
Liners	DM916s
Clusters	3.2kg DM swiftflo clusters
Receiver Jar	160 Litre
Interceptor	100 Litre
Sanitary Trap	20 Litre
Milk Pump	2 x centrifugal pump with 2 x 1.1 kW Variable speed motors
Vacuum Pump	1 x DM8 with 7.5 kW motor
Pulsation	4x0 multi line electronic pulsation
Plate Cooler	Single stage 45 plate stainless steel industrial cooler
Ancillary Equipment	
Bulk Tank	22,000 Litre DariKool direct expansion flooded evaporator, out-door model, with 2 x 5.5 kW compressors
Water heating	500l dual coil cylinder with 26.4 KW oil boiler
Lighting	Water proof Double 58 Watt T8 fluorescent tube fittings
Electricity supply	3 phase supply brought 600m at a cost of €10/meter plus a connection fee of €3,700

Water heating

An adequate and reliable supply of hot water is an essential element in the production of high quality milk on any dairy farm. Water used for cleaning milking systems including milking units, pipelines, receivers, and bulk milk storage tanks must be available in adequate quantities and at required temperatures for each cleaning process. Failure to have adequate supplies of hot water at required temperatures can lead to rapid increases in bacterial contamination and a subsequent reduction in milk quality. Hot water requirements vary from farm to farm and are directly related to the number of milking units, pipeline sizes and lengths, and system accessories (receivers, recorder jars or milk meters, ACRs, etc.). Generally, a minimum hot water requirement is 9 litres of 80°C water per milking unit for each hot wash cycle plus a reserve for bulk tank washing. Table 1 shows oil and electricity tariffs used in the calculations (correct on 21/03/2011).

Table 1. Oil and Electricity Tariffs used in Cost Analysis

Unit Type	Cost per unit (€) (Excl VAT)	Tariff
Electricity Day units (kWh)	0.16	ESB Rural nightsaver
Electricity Night units (kWh)	0.08	ESB Rural nightsaver
Kerosene (Litre)	0.8	Based on quote for 1,000L

Table 2 shows the results of a water heating trial at Moorepark. In the study, 500 litres of water were heated from 14°C to 80°C with a 3 kW immersion element and a 26.4 kW oil fired burner running on kerosene.

Table 2. Effect of heating system on the cost of heating water

Heating Method	Power consumed (kWh)	Rated Power (kW)	Heating Time (Hrs)	Cost per 100L (€) Night rate/ Day rate	Kg of Co2 produced / 100L
Electricity	48.24	3	16.5	0.88 / 1.80	6.23
Oil	45.5 (4.4L kerosene)	26.4	1.75	0.85	3.05

The specification of the water heating system used at the Greenfield farm is shown in Table 3.

Table 3. Greenfield water heating system specifications

Oil Boiler	26.5 kW Firebird boiler with double lined flue
Water Tank	500 Litre dual coil insulated cylinder with baffle plate on cold supply
Piping	25mm copper
Insulation	25mm x 20mm Armaflex
Expansion	50 Litre
System Pressure	3 Bar

Milk Cooling

Refrigerating milk on the farm has two main aims, to inhibit bacterial spoilage and to extend storage on the farm so as to minimise milk transport cost. While good hygiene in all aspects of milk production is essential to the production of quality milk, the growth of bacteria during the storage interval must also be curtailed. At body temperature, bacteria in milk increase very rapidly and even milk with a low initial bacterial count will sour rapidly. Milk cooling is the largest consumer of energy on Irish dairy farms. The cooling of milk immediately after milking is vital to maintaining high milk quality levels. On a typical Irish dairy farm, the cooling process is completed in two stages; pre-cooling and refrigeration. Pre-Cooling is achieved by passing the hot milk through a Plate Heat Exchanger (PHE) before entry to the bulk tank. Cold water is pumped through the opposite side of the

PHE. The cold water absorbs a portion of the heat, thus pre-cooling the milk. A PHE is designed to run at certain operating conditions; each PHE has a specific milk to water flow ratio and extra plates can be added to accommodate for very large milk flow rates. The goal of pre-cooling is to bring the milk temperature as close as possible to that of the water. In July 2010, a series of audits on plate heat exchangers currently being used on active dairy farms was carried out at Teagasc Moorepark. It can be concluded from the results of these studies that the vast majority of plate heat exchangers were performing at only a fraction of their full cooling effectiveness. This was mainly due to the improper milk to water flow ratios being employed, the average of which was 1:1.2. PHE manufactures recommend milk to water flow ratios of between 1:2.5 and 1:3 depending on the model. If a PHE is sized correctly in relation to the output of the milk pump and the correct ratio of water is supplied then the power consumed during the refrigeration stage can be dramatically reduced.

Table 4 shows the results of PHE testing carried out at Moorepark Engineering Laboratories. A PHE was analysed at varying milk to water flow rates and with an increasing number of plates. The milk and water entry temperatures were set to 35°C and 10°C respectively and the milk exiting temperature from each test was recorded.

Table 4. Milk exit temperatures (oC) for a PHE ratio and plate capacity test

	Milk:Water ratio			
No. Plates	**1:1**	**1:2**	**1:3**	**1:4**
25	20.8	16.8	14.8	13.7
29	20.7	16.6	14.6	13.6
33	20.5	16.3	14.5	13.5
37	20.5	16.1	14.3	13.3
41	20.4	16.0	14.1	13.2
45	20.4	15.9	14.0	12.9

The most noticeable result from the above test is the reduction in milk exiting temperature corresponding with the increased milk to water ratio. However it takes an ever increasing water flow rate to reduce the milk temperature, as the ratio increases the cooling effect per litre of water is reduced.

Another observation from the test is the influence of increased plate capacity on milk temperature. The extra plates have a moderate effect on the performance of the PHE. The addition of extra plates to the heat exchanger increases its heat transfer area however this also increases the number of flow channels, thus reducing the milk flow velocity and water flow velocity at a set flow rate. This reduction in flow velocities retards the heat transfer rate in the PHE. The

resulting effect is that increasing the number of plates on a PHE produces only a modest increase in cooling performance.

Some of the benefits of pre-cooling will be undone if the bulk tank cooling unit isn't installed and maintained properly. It is important to ensure a good airflow to and from the condensing unit (radiator). Anything that restricts the supply of fresh air and /or causes the recirculation of warm air will increase running costs and reduce compressor life. It is very common to see condensing units on farms that are damaged, partially blocked and recirculating warm air.

Two types of milk cooling systems are used on Irish dairy farms. Firstly "Direct expansion" (DX) refers to a system where the evaporator plates are incorporated in the lower portion of the storage tank in direct contact with the milk. Liquid refrigerant expands inside the evaporator taking heat out of the milk directly thus the name "direct expansion". Milk cooling takes place within the tank. Generally, this milk cooling system cannot cool the milk as fast as the milk enters the tank. The cooling system must run for a period during and after milking. DX cooling systems are the most efficient cooling system in terms of kWhs consumed per litre of milked cooled however the must operate on "day rate" electricity.

"Instant" cooling is where the milk cooling is completed external to the storage tank and then pumped into storage. An intermediate cooling fluid, such as chilled water from an ice builder is used to cool milk rapidly in a dual phase plate heat exchanger. This cooling system is less efficient in terms of kWh consumed per litre of milk cooled however ice bank builders can generate enough ice at night to meet the entire milk cooling demand the next day. This system takes advantage of significantly cheaper night rate electricity.

Milk pumps

There are many options to choose from when it comes to deciding on a milk pump. A common choice is to use a centrifugal pump, operated by a liquid level controller. These have high flow rates that are very suitable for circulation cleaning but flow rates are excessive for effective pre-cooling. For centrifugal pumps to be effective for pre-cooling they need to be matched with a variable speed drive and liquid level indicators to smooth the flow of milk through the plate cooler. In addition, a solenoid valve may be fitted in the water line to the cooler. This solenoid valve is wired to the liquid level controller on the milk pump and ensures that water flows only when the milk pump operates and thus helps to conserve water. The solenoid should have a time delay feature which will allow the water to continue to flow for a short time after the milk pump has stopped. This will improve the performance of the plate cooler. The time delay should be no longer than 20-30 seconds. Inserting a restrictor between the pump and the

filter will reduce the flow rate through the filter and plate cooler but it will also cause milk fat damage and possibly froth in the milk. Using a restrictor is not a solution and should not be considered.

Sizing of bulk tanks

To calculate the capacity of the bulk tank you require, you need to know how many milkings you need to store at peak. It is 5 milkings for E2D (every second day) collection and 7 for E3D (every third day) collection. Other factors include the current herd size, the expected herd size planned for in 5 years time and the yield per cow e.g. 30 litres/day at peak (6.5 gals/day)

Example: Herd Size: 100 cows
Bulk tank capacity for E2D: 100 x 30 x 2.5 = 7,500 litres (1,652 gals)
Bulk tank capacity for E3D: 100 x 30 x 3.5 = 10,500 litres (2,313 gals)

It is advisable for the farmer to get detailed written quotations stating: model of tank, rated capacity, make, model and the power of condensing unit(s), details of automatic washer, details of new pre-cooling system or modifications to existing system, rough sketch of where tank and any ancillary equipment fits into dairy and clarification of responsibilities regarding the building work, plumbing, electrical or modifications to milking machine. The specification of the bulk tank used on the Greenfield dairy site is given in Appendix 1.

Lessons from the Greenfield Farm: Milking Infrastructure

1) *Construction of a new milking facility requires the co-ordination of a large range of suppliers and contractors; this takes time and planning. Allow at least six months for planning and a further six months for construction.*
2) *A good cow flow set-up has a much bigger effect on milking efficiency than investment in automation: critical cow flow factors are orientation of parlour, good milking routine, separation of lame cows and good farm roadways*
3) *In a seasonal system the labour requirement in the milking process will vary enormously, requiring flexibility in working routine; in busy periods it is not necessary to use all clusters, thereby saving the requirement for cluster removers.*
4) *Operation of a separate herd of mastitis/high SCC cows milked after the main herd was the most critical factor in controlling the spread of mastitis.*

Appendix 1. *Specification of Greenfield bulk milk tank*

Bulk Tank volume and cooling capacity must be capable of holding and cooling a minimum of at least 5 (7 for some processors) milkings at the relevant farm peak supply/collection period.

- *The Greenfield farm tank is 22,000 litres which is adequate for 6 milkings at peak assuming peak cow numbers of 330 and peak milk volume at 22.5 litres.*

Compressor capacity must be capable of cooling milk down to less than 4 Degrees Centigrade within 2 hours of the start of milking.

- *The Greenfield farm tank has 2 * 7.5hp 3 Phase 22kW output flooded condensing unit.*

Gas must be compliant with Current Environmental Legislation.

- *The Greenfield farm compressors use refrigerant : R404A.*

All enclosed tanks must be plumbed with hot water for washing.

- *On the Greenfield farm, hot water is heated by oil boiler and plumbed directly to bulk tank.*

Bulk tanks must be installed in dairies with outlets towards the exterior door. At least 600mm space must be allowed all around the tank for access, maintenance and service.

- *The Greenfield farm tank is an outdoor tank with a lockable manhole and a vent fitted with pollen filter.*

For outdoor tanks the outlet connection from the tank must be indoors.

- *The tank on the Greenfield farm has the outlet enclosed in a lockable cabinet.*

Control panel must be easily visible and accessible for the milk supplier and the bulk milk collection tanker driver.

Outlet connection should be 75 mm from the tank itself, fitted with a 75 mm outlet valve. In most cases a reducer valve will be required and this will be specific to the milk processor and may also vary within processor region.

- *The tank on the Greenfield farm has an additional reducer to 50 mm Din Male.*

Sourcing the Dairy Herd

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Summary

- Acquiring the right animals at the right cost and at the right time, is a fundamental step in establishing a dairy herd.
- Individual circumstances will require whether the strategy is to buy calves, weanlings, 15 month heifers, 'springers' or even milking cows.
- Always remember that the entire enterprise could be threatened by buying low quality animals or animals carrying disease so this is a relatively risky part of establishing the enterprise.
- The target is to acquire livestock which are fit for purpose for an establishing or expanding herd at acceptable cost and low disease risk.

How to acquire the heifers/stock

- Decide a maximum price consistent with your project financial budget and at about or lower than the apparent market price.
- Purchase stock that fit the farming system. If more than 70 per cent of the cows feed is grazed grass then research shows that cows between 450 and 550 kg Lwt are best suited to this. Ideally this is a crossbred cow.
- Visit farms selling stock; establish EBI and disease status of the herd.
- Identify the age, weight and breed of animals and number available.
- Agree disease testing procedure and quarantine arrangements.
- Negotiate the price – subject to being free of disease.
- Do the disease testing.
- Agree collection or delivery date.
- Decide on the vaccination and quarantine strategy for the animals on arrival.

Table 1. Risk Identification when buying heifers or mature cows

Risks	How to mitigate the risk
Infertility	For heifers, obtain assurances that heifers did not have a male twin and establish weight for age is ok. Measure body condition score. Confirm EBI fertility subindex (target > €60).
Low genetic merit	Establish EBI from the most current EBI report. (EBI of 100+ with the fertility subindex over 60.) Be wary of unrecorded animals especially from stock bulls.
Diseased animals	Reject groups where any animal on the farm has tested positive for Johne's disease. Reject animals if they test positive for BVD virus. Reject animals with high antibody titres for Neospora, IBR. Reject animals that are lame. Reject animals with a dysfunctional teat placement. Vaccination, quarantine – discuss the strategy with your vet.
Paying too much for the animals	Stick to the budget, carefully establish the market price and negotiate.
Difficult calving	Get confirmation that they have been mated to an easy calving bull.
Poor calving spread	Get confirmation of the start and end of mating dates and scan for pregnancy.

Budget considerations

Your available budget will need to cover

- Animal cost
- Disease testing
- Vaccinations
- Transport

Other considerations

- Minimise the disease risk by purchasing stock directly off farm and by purchasing from as few different farms as possible
- Have one person completely responsible for the sourcing and purchase of the stock. This person also has to check at delivery that the correct stock has arrived on farm and that they are still in excellent condition

The disease control plan for newly purchased stock

While there is compulsory pre-movement testing of cattle for bovine TB and brucellosis, the occurrence and cost of other contagious diseases such as BVD, IBR, Salmonella, Leptospirosis, Johne's and Neosporsis is very high when new herds are assembled. In international studies, it is estimated that an active BVD infection in a herd can result in on-going losses from €20 to €70 per cow per year. In Ireland, farmers who have assembled new herds, either as a result of being de-populated or to stock new conversion farms have reported stock and production losses that are in the order of hundreds of € per cow. The very real potential is for a disease outbreak to cause far higher immediate and ongoing

losses than would ever be recovered by the potential productivity and financial gains resulting from very high EBI animals. By having a healthy herd with a good EBI for fertility we are in the best position to be able to rapidly expand numbers and to breed the ideal cow for a grazing system. Greenfield Dairy Farm had a restricted budget for stock purchases and so cattle were selected for purchase primarily on health status and then at as high an EBI as possible, with a particular focus on EBI fertility subindex.

Purchase criteria (order of priority)

1) Health status
   - *Must be confirmed to be from a TB free herd*
   - *Only purchase from herds that have never been de-populated due to Brucellosis.*
   - *Must be Johne's negative (and ideally from a herd with no history of Johne's)*
   - *Must not be a BVD PI.*
   - *Must not have a history of high somatic cell count*
   - *Should be free of Neospora, Mycoplasma bovis, Mortellaro*
2) Cost – animal, plus disease testing and transport must fit within budget.
3) Must be an animal of less than 550 kg
4) AI bred and be in-calf to easy calving AI
5) Fertility EBI should be above €60.
6) Ideally the animal should be a dairy cross bred

Post purchase biosecurity of stock for the greenfield farm

After Purchase

- Stock must remain isolated while on seller's farm.

Upon arrival on farm

- Quarantine stock in separate groups for a minimum of 30 days, and ideally until the point of calving.
- Medicate immediately against fluke, worms, lice, and mortellaro (Peracetic acid)
- Vaccinate cows for Rotavirus one month prior to the start of calving.
- Daily inspection of all pregnant animals and immediate isolation of any animal that is about to abort its pregnancy, or has aborted its pregnancy with immediate removal of calf and placenta etc.
- Teat seal all heifers one month prior to calving to reduce the incidence of mastitis.

At Calving

- Operate a 'springers' herd and at the point of calving, move the calving

animal onto a separate area of clean chip to reduce the possibility of new born calves picking up Johne's infection.
- All cows must have low somatic cell count before leaving colostrum herd and entering main milking herd (use CMT test).

Lessons from Greenfield: sourcing stock

- Acquiring suitable stock requires a clear understanding of the number of animals required, the total amount available to be spent, and the strategies and testing to be used to minimise the possibility of a financially crippling disease outbreak.
- Limiting the number of groups purchased, proper pre-purchase disease testing, on-farm quarantine (and monitoring), on-going testing and vaccinations prevent disease outbreak on farm.
- The time taken to find potential animals, properly check health status, and negotiate a deal takes several weeks. We eliminated about 50 per cent of potential groups of animals through completion of a health questionnaire with information from the farmer and their vet and or DVO. A further 30 per cent of animals were rejected from test results. (see animal purchase criteria on web site)
- When purchasing mature cows two additional disease/ill health conditions are very important to consider – lameness and mastitis/somatic cell counts. These two diseases don't just cause animal losses but also cost hugely in staff time.
- A lift in bulk SCC and new mastitis cases occurred with the inclusion of every new group of animals during the milking season. This was despite rejecting cows on milk recording records and doing a CMT test on each cow within a week before it was to arrive on the Kilkenny farm.
- It was very important to have a key person there on the farm when the stock were loaded to double check that the correct cows (and only those) were being collected for delivery to greenfields.
- With hindsight the preferred position would be to only purchase in-calf maiden heifers.
- Most of the mature cows that became lame had a history of feet problems. They were accepted because at the time of purchase they were not lame. There is a huge variation in the natural walking speed of cows. Cows from small herds that were used to short distances had a big problem with getting used to the increased distances on a larger farm. Cows with a naturally slow walking speed hardly increased their walking speed over the year much to the frustration of the farm staff.
- The EBI for fertility is accurate!

Guidelines for the Contracting and Hiring of Labour in a Large Dairy Unit

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Summary

- Contract rearing of replacement heifers can be used to increase milk output from the grazing platform and should be considered when land and labour become limiting
- In a contract dairy replacement situation, the risk of conflict between rearer and dairy farmer can be minimised by having a written contract of agreement linked to animal performance targets
- The use of contractors to perform all machinery tasks can be successfully used in a scenario of limited labour and capital
- Sourcing the right people with the necessary education and training to fulfil the required employment position is fundamental to the success of running a large dairy unit
- A staff management plan is essential on a large dairy unit and indicates what has to be done and who is going to do it

Introduction

The Food Harvest 2020 report has set a target of a 50 per cent increase in milk production in Ireland by 2020. This will require an increase in the size of the national dairy herd by approximately 300,000-400,000 dairy cows. More land, labour and capital will be required to support this increase in milk output. On dairy farms with a limited land base, contact rearing of the dairy replacements may allow milk production on the 'grazing platform' to be increased. On existing dairy farms, extra labour will be required as herd size increases. Additionally on some dairy farms, certain farm tasks may be contracted out because of limited labour and capital resources. On the Greenfield Dairy Farm, replacement heifer rearing and all machinery operation (fertiliser and slurry spreading, silage harvesting and feeding) are contracted out. All farm tasks are carried out using paid labour. This paper will deal with (1) contract rearing of dairy replacements; (2) out sourcing of machinery operations and (3) hiring labour on a dairy farm.

(1) Contract rearing of dairy replacement

The future of the dairy herd is represented by its next generation: the replacement heifer. Heifer rearing is the second largest expense after feed costs

on a dairy unit. On dairy farms with a limited land base, contract rearing of dairy replacements maybe an option to allow increased milk production. However, it is essential that the rearing of the replacement heifers is not compromised; target weights should be identified and achieved at key times during the rearing process. Heifers should be calved at 2-years of age and at 90 per cent of mature body weight to ensure maximum return of investment. Achieving target body weight gains is an integral part of heifer rearing systems. Previous research indicates that heifers should be mated at 60 per cent of mature live-weight and should calve at 90 per cent of mature live-weight. However, recommended mature live weights vary considerably between breeds and crossbreds. Table 1 shows the recommended target weights for Holstein Friesian, British and New Zealand Friesian and crossbred Jersey X Holstein Friesian heifers at different stages during the rearing period.

Table 1. Target weights for purebred and crossbred replacement heifers at different ages during the 24 month rearing period.

	% of Mature liveweight	Holstein Friesian	New Zealand / Br. Friesian	Jersey X Holstein Fr.
Birth		38	36	34
6 Weeks		63	60	56
3 Months		90	85	80
6 Months	**30%**	**155**	**148**	**138**
12 Months		280	267	250
15 Months	**60%**	**330**	**315**	**295**
21 Months		490	470	437
24 Months	**90%**	**550**	**525**	**490**

Results from a Moorepark study monitoring 1,400 heifers on more than 40 farms showed that:

- Bodyweight and condition score of maiden heifers at mating start date are more critical in ensuring high fertility than age at which the heifers are mated;
- Heavier heifers at mating start date produce significantly more milk in their first lactation;
- Heifers in poor condition at mating start date (less than 3.0), calved later and produced significantly less milk during their first lactation;
- Weight at first calving also affects second lactation milk yield.

Replacement rearing costs

Table 2 shows the costs associated with replacement heifer rearing developed at Teagasc Moorepark. These costs represent a full breakdown of the costs associated with heifers, including a land and labour charge. The fact that

approximately 10 per cent of the animals mated will not enter the dairy herd and will be subsequently sold from the system is factored into the calculation of herd costs.

Contract rearing of dairy replacements

Which dairy farmers should consider off-farm heifer rearing?

Off-farm heifer rearing is an option worth considering in the following situations:

- where overall farm profit can be increased with a greater number of cows;
- where labour is a limiting constraint;
- where land is a limiting constraint;
- where replacement heifers are failing to reach the target live weights;
- where separation of cows from replacement heifers (even calves) is required for disease control purposes e.g. Johne's Disease.

Table 2. Costs associated with rearing replacement heifers to calving at 24 months of age

Category	Cost/heifer (€)	Assumptions
Variable Costs		
Concentrates	109	**Concentrates** Calves €300/t Yearlings €220/t Calves (kg) 392 Yearlings (kg) 56
Fertilizer, Lime and Reseeding	90	
Land Rental	150	
Machinery Hire	15	
Silage Making	164	Urea €400/t CAN €320/t Land Rental €350/ha
Vet, AI and Medicine	132	
Total Variable Costs	**660**	
Fixed Costs		
Car use, water and electricity	30	
Labour	186	€12.50/hour
Machinery operation and repair	20	
Phone	10	
Insurance, A/C's, transport, sundry	32	
Interest repayments – term loan	34	
Total Fixed Costs	**312**	
Depreciation		
Buildings	55	
Machinery	22	
Total Costs	**1,049**	
Initial value of the calf	350	
5% not in calf	51	
Net cost of rearing a replacement heifer	**1,451**	

The costings shown in Table 2 should be used as a guideline only and will vary considerably from farm to farm. The guideline net cost of rearing a replacement is €1,451 per head and an adjustment for the cost of empty replacement heifers is incorporated into the model.

Types of Heifer Rearing Contracts

Heifer rearing contracts usually apply to heifers delivered to a contract heifer rearer between two to twelve weeks of age and returned four to six weeks prior to calving.

The main types of contracts available are:

1) **Per animal per day** - a flat rate fee per animal per day based on actual rearing costs.
2) **Per kg of Weight Gain** - based on a delivery weight to the rearer and return weight to the farmer using an appropriate cost per kg live-weight.
3) **Sell/Buy back Contract**- the farmer sells the heifer calves to the contract rearer with the principal right to purchase back the same animals
4) **Full Contract** - the farmer supplies the feed, semen and medicines while the contract rearer supplies the labour and facilities.

The most popular type of contract is the 'Per animal per day' and is usually associated with a minimum weight guarantee.

Contract rearing costs

Table 3 shows how the rearing costs may be divided between the farmer and rearer. The rearer will incur both variable and fixed costs. A broker maybe used between the farmer and the rearer. For example, in New Zealand where the practice is well established, brokers such as the New Zealand Grazing Company Ltd. provide a professional service to dairy farmers looking to place heifers with a rearer. Typically, calves will move to the rearer's farm on the first of May. They will return home in early December of the following year.

Table 3. Who pays for what? (example division of costs between owner and rearer)

Costs belonging to Heifer Owner	Costs belonging to Heifer Rearer
Transport of animal to and from rearing unit	Animal health costs- including vaccination
AI and synchronization costs	Labour
Supply of Stock Bull	Supplementary feeding
Monitoring/broker fees	Excessive losses due to death and misadventure
Insurance for heifers	Normal husbandry costs
Normal losses due to deaths and misadventure	Normal farm insurance costs to include public liability Heat detection

Table 4 shows contract rearing costs for February born calves that arrive on the rearer's farm on May 1 (at 10-12 weeks of age) and return home to the dairy farmer's own herd on December 1 (at 21-22 months of age). The estimated cost per day and per week is €1.10 and €7.70, respectively. The costs of rearing

replacements will vary considerably from farm to farm depending on the grazing management skills, farm fixed costs infrastructure, animal heath status and labour efficiency. Depending on the financial contract agreed, the profitability of contract rearing of dairy replacements can be potentially higher than most beef systems.

The replacement heifers on the Greenfield Dairy Farm are reared by a contact rearer at a cost of €1/day, however under this arrangement AI and vaccination costs plus one herd test are covered by the Greenfield Dairy Farm. The calves move to the rearer's farm at two to three weeks of age and return to the Greenfield Dairy Farm in early November at approximately 21 months of age.

Table 4. Estimate of variable and fixed costs incurred in rearing spring born replacement heifers from 1 May to 1 December of the following year

	1 May to 1 December
No. Days	579
Breed of Animal	Holstein Friesian
Concentrates[1]	€72
Land rental costs[2]	€122
Grass	€73
Silage[3]	€ 76
Vet/AI	€ 40
Fixed Costs	€103
Labour	€151
Total	**€637**
Cost/Week	€7.70
Cost/Day	€1.10
Average Daily Gain	0.70 kg

[1]Concentrate input estimated at 220 kg from May 1st to December 1st the following year.
[2]A heifer unit is a weanling and yearling heifer.
[3]Heifers are returned to the owner's farm off grass on December 1st.

What are the risks associated with contract heifer rearing?

- **The risk of a disease outbreak:** with animals on two farms, the risk of either group contracting diseases such as TB, Leptospirosis etc. is doubled. If the rearer is simultaneously taking heifers from other owners or has another livestock enterprise on his farm the risks may be further multiplied. Contingency plans must be put in place to ensure that an outbreak of disease does not have implications for the smooth return of the heifers to the dairy farm at the end of the rearing period or result in calving heifers 'stuck' with a rearer with no facilities to calve or milk such animals. The disease status of the rearer's herd and contiguous farms will be very important.

- **Possibly poorer replacement heifers:** not all rearers will be suitably skilled to achieve the target weights set down for replacement heifers. It is very useful to weigh heifers at defined times throughout the rearing process (e.g., 6-months, before the first winter, pre-breeding and before the second winter) to ensure that the appropriate targets are achieved. A plan should be put in place in advance of entering the contract to address the issue where targets are not reached e.g., through concentrate supplementation over winter.
- **Risk of conflict between the owner and rearer:** in all cases, clear targets must be agreed by both parties in advance of entering the contract arrangement. In addition, an independent arbitrator should be agreed in advance in the event of a conflict occurring between the owner and rearer.

Issues to be considered in a rearing contract

Many of the risks outlined above can be minimised by preparing a written contract of agreement. Formal written contracts for rearing replacement heifers have been in place in New Zealand for over 20 years. Approximately 70 per cent of heifers are grazed off-farm with a written contract in place. A sample contract agreement is included in Appendix 1. The main terms that maybe covered within a contract are:

- **Payment:** to the rearer; direct debit, monthly or quarterly plus an arrangement for dealing with late payments;
- **Performance:** clear performance targets for growth rates, body condition score, breeding age, must be set;
- **Health protocols:** required during rearing; vaccination, worming and parasite control;
- **Artificial insemination:** Persons responsible for AI sire selection, payment for AI services and provision of sweeper bulls should be stated;
- **Bio-security:** where the rearer receives heifers from more than one source, quarantine facilities and management must be agreed in addition to protocols in the event of a regulatory disease outbreak;
- **Transport:** agreement on responsibility for transport to and from the rearer unit including confirmation of arrival and departure dates of stock;
- **Length of contract, renewal and termination:** every contract should include definite terms for each of these issues;
- **Records and reporting:** should describe what level of detail is required for heifer records to comply with the contract and with legislation;
- **Deaths, loss and liability:** contract must specify a maximum accepted level of losses;
- **Communication:** good communication is key to the success of any joint venture; both parties must be clear as to the manner by which they

communicate.

- **Arbitration:** every contract should include terms which covers any disputes between the dairy farmer and rearer during the course of the contract.
- **Conditions for the termination of the agreement:** the contract must be specific over time periods for termination of an agreement so that both parties have sufficient time for the rearer to obtain replacement stock and for the farmer to obtain an alternative rearer.

(2) Outsourcing machinery operations

Machinery operation and running costs on dairy farms can be substantial. Dairy farmers in 2010 invested €96.6 million on farm machinery or 35 per cent of total investment nationally. Using NFS data for 2008, machinery operation and running costs were 3.2c/l with a further 2.7c/l in depreciation charges and a further 2.5c/l in contractor charges.

All dairy farms must consider opportunities to reduce machinery costs. The following points need to be considered:

1. Machinery investment needs to be carefully planned because of the long term nature of such investment.
2. Machinery technology continues to develop, offering potentially more cost-efficient machines.
3. Where labour availability is restricted, the optimum use of labour and contractors needs to be determined
4. The concept of an individual contractor specialising in machinery operations and offering that service across a number of farms has the potential to be a cost and labour efficient means of supplying mechanisation needs.
5. Capital will be limiting when a dairy farm is in an expansion phase, therefore capital allocation should be prioritised toward outcomes with the highest potential return.

For the reasons outlined above it was decided that all machinery operations in the Greenfield Dairy Farm would be contracted out. This includes all slurry and fertilizer spreading, cow feeding, silage harvesting and pasture reseeding. Table 5 shows tasks that could be undertaken by the machinery contractor and approximate costs involved. In 2010, contracting costs on the Greenfield Dairy Farm were 4 c/l with an additional 0.5c/l for machinery operation, depreciation and repairs. This compares to 8.4c/l for the average dairy farm based on NFS data in 2008.

*Table 5. Farm machinery tasks and a range of costs obtained**

Tasks	Description	Costs
Fertilizer spreading	With or without fertiliser handling	€37/ tonne
Slurry spreading-umbilical	Agitation	€70/ hour
	Spreading	€100 / hour
Silage -large round bales	Cutting, bailing and stacking	€15 / bale
Feeding	Loading and feeding-diet wagon	€40 / hour
Reseeding	Cultivation,	€45 / acre
	Seeding	€15 / acre
	Rolling	€5 / acre

**All costs are exclusive of VAT. A biosecurity protocol should be agreed between dairy farmer and contractor so as to minimise the risk of spreading disease from farm to farm.*

(3) Hiring labour to work on a dairy farm

Getting the right people is fundamental to the successful running of a large dairy unit. You need people with the required education and training to fulfil the role of farm manager, farm assistant and general farm staff. It is important that the staff have a drive to succeed, take ownership of the job and treat the unit as their own. They must be able to show initiative and be willing to deal with problems. Likewise employers must allow people to use their initiative, must understand that others will do things differently and that getting the job completed is more important than how it is done- "see good people as a resource, not a cost". The following are characteristics that may determine the suitability of a good employee for a position:

Attitude

Attitude is relatively difficult to measure, but is still an important quality of an employee. (Attitude encompasses enthusiasm, punctuality, general positive or negative outlook on life, etc.) Employers need to get a good measure of this during an interview.

Fit within a team

How well is the applicant likely to fit in with the existing team in terms of attitude, habits?

Farming philosophies

Is the applicant an advocate of grass-based systems of milk production? If not then this may influence the way he/she works.

Initiative
Would the applicant identify work that needs to be carried out and do it without prompting?

Flexibility
Would the applicant be the sort of person who would manage change in their daily work routine?

Time management
Would the applicant manage time effectively?

Communication skills
Does the applicant have good communication skills?

Experience
Has the applicant the required level of experience?

Qualification
Has the applicant the required level of education?

Other considerations
There were special requirements in relation to the Greenfield farm manager position within a technology demonstration unit requiring regular interaction with visitors onto the farm covering a range of issues and requires additional communication and flexibility skills.

Discrimination in the specification
The specification and contract must be fully compliant with Irish labour law and should not include anything that is not related to the job performance.

Appendix 2 outlines an example of a contract that could be used in the hiring of a Farm Manager.

(4) Staff planning

Staff planning is the process of deciding what has to be done on the farm and who is going to do it. The process will identify the number and type of jobs and then give an overview of the responsibilities of each staff member. This process feeds back into the farm budget and business plan by way of optimising labour inputs and identifies the skills that need to be hired to meet the business goals. In managing employees, staff planning helps communicate the work routine to a potential employee during recruitment and selection. It is also an important criterion in managing the performance of an employee.

How to write a Staff Plan

To do a simple staff plan, the following procedure is recommended;

1. Brainstorm all the major work carried out on the farm and write it up into a list similar to the example below in Table 6. Owners, managers and staff may be used in the brainstorming process to ensure all ideas are fully captured. Use the examples provided as a starting point and cross off or add tasks to the list so it reflects fully on the individual farm situation.
2. Start with the owner/manager column. Here the owner or primary manager on the farm has the opportunity to decide what it is they want to do. This is closely linked with the business planning process in terms of managing the work-life balance and meeting lifestyle goals. The owner/manager ticks off the parts of the work load they want to take responsibility for.
3. Divide the remainder of the work between other farm staff by ticking off tasks in one column per person on the farm. This may include unpaid family labour. Be sure the responsibilities being assigned to each individual role are realistic. In the case of existing employees, they must have the skill sets necessary to complete the assigned responsibilities. In the case of a new job, there is more freedom to assign responsibilities as it is possible to go out and recruit someone to fill that role. Be careful, to ensure a realistic mix of responsibilities. A further consideration is whether the job can be done in a reasonable number of hours. Initially, it may not be possible to assign all vacant responsibility areas to staff because of lack of skill or experience. This means the manager will have to do them until the appropriate person with the required skills can be hired or trained.
4. Finally, compare these newly designed jobs to industry standards in terms of the types of tasks and duties they will be performing. The roles can then be named in line with industry standards.

Table 6. Template for staff planning on the Greenfield Dairy Farm

Farm :Greenfield Dairy Partners **Key** **Responsibility level:** **Indicate if the person is responsible (R)** **for the task or will assist (A) by marking an R or an A**	**Person 1 :** Farm Manager	Responsibility Level:	**Person 2 :** Farm Assistant	Responsibility Level:	**Person 3 :** Teagase	Responsibility Level:	**Person 4 :** Contractor	Responsibility Level:
Financial Management								
Annual budget and monthly cash flows	√	A			√	R		
Monitoring budgets vs. actual	√	A			√	R		
Monthly reporting	√	A			√	R		
Approve purchase orders	√	A						
Accounts payments	√	A			√	R		
Invoicing	√	R			√	A		
Liaise with accountant	√	A			√	R		
Milking								
Milking	√	R	√	A				
Plant hygiene	√	R	√	A				
Farm dairy cleanliness	√	R	√	A				
Slurry and waste water management	√	R	√	A				
Communication with Co-op	√	R	√	A				
Training relief milkers	√	R	√	A				
Milk hygiene (test spraying)	√	R	√	A				
Replacement of rubber ware	√	R	√	R				
Feed management								
Management policies	√	R			√	R		
Seasonal feed budgeting	√	R			√	R		
Daily/weekly pasture allocation	√	R	√	A	√	A		
Silage conservation	√	R	√	A				
Purchase of supplementary feed	√	R	√	A				
Culling & drying off cows as required	√	R	√	A				
Fertiliser program	√	R			√	A		
Re-seeding	√	R			√	R		
Stock								
Animal health program	√	R	√	A	√	A		
Calf rearing	√	R	√	A				
Milk quality	√	R	√	A				
Heat Detection	√	R	√	A				
Calving	√	R	√	A				
AI	√	R	√	A				
Manage sale of surplus stock	√	R	√	A				
Maintain stock records	√	R	√	A				
Contract Heifer rearing							√	R

(Table 6 continued)

Key **Responsibility level:** **Indicate if the person is responsible for the task or will assist by marking an R or an A**	**Person 1 :** Farm Manager	Responsibility Level:	**Person 2 :** Farm Assistant	Responsibility Level:	**Person 3 :** Teagase	Responsibility Level:	**Person 4 :** Contractor	Responsibility Level:
Asset management								
Maintenance of all plant & machinery	√	R	√	A				
Order annual milking plant check	√	R	√	A				
Daily check on vehicles	√	R	√	R				
Building maintenance	√	R	√	A				
Fences/gates	√	R	√	A				
Lanes/tracks	√	R	√	A				
Water system	√	R	√	A				
Weeds	√	R	√	A				
Contractor management	√	R	√	A			√	A
Reporting								
Daily diary of grazing events	√	R	√	A	√	A		
Weekly stock reconciliation	√	R	√	A	√	A		
Weekly farm management notes	√	A	√	A	√	R		
Weekly farm data sheet for web	√	A	√	A	√	R		
Monthly managers report for shareholders	√	R	√	A	√	A		
Open Days and Visitors								
Keep a log of visitors	√	R	√	A	√	A		
Host and present to visitors	√	A	√	A	√	R		
Prepare and maintain handout	√	A	√	A	√	R		
Preparation of material for Open Days	√	A	√	A	√	R		
Prepare farm for Open days	√	R	√	A	√	A		
Staff								
Recruit and select staff	√	R			√	A		
Plan and allocate work within the team	√	R						
Manage staff performance	√	R			√	A		
Administration	√	R			√	A		
Relief staff	√	R						
General								
Health & Safety	√	R	√	A	√	A		
Environmental management & consent compliance	√	R	√	A	√	A		
Maintain a tidy workplace	√	R	√	A				
Liaise with contractors where necessary	√	R	√	A				

Lessons from Greenfield: the labour plan

- Getting the right people is essential. Attitude (integrity, hard work, keen to learn, can do) is more important than having all the skills but they need to have at least 60 per cent of the skills required for their position.
- The objective is to have a management/operating team where the personality styles will work together well and where all the skills required are covered by the team members.
- The most difficult set of skills to find in staff are management skills, especially planning, analysis, problem solving, time and work allocation, managing to a budget, and motivating and managing staff.
- Formalise key farm information and operational procedures into an Operating Manual which then encapsulates both farm knowledge and states clearly "how we do things". This will include maps of, farm layout, water system design, power routes for electric fences and standard operating procedures (S.O.P's) for farm safety, machinery operation, financial management and reporting, disease control (lameness, mastitis, grass tetany, milk fever, testing and vaccination, mineral supplementation), biosecurity, pasture assessment and allocation, calf rearing, mating management, mixing teat spray, mineral mixture for dosotron etc.

Appendix 1. A sample of a basic Heifer Rearing Contract from New Zealand- for information purposes only

Grazing Contract to be signed by all Parties

The person who is grazing the stock will be known as the grazier. The person whose stock are being grazed will be known as the owner.

This is a contract between grazier _____ and owner _____

Commencement of contract 1 May _____ Termination of contract 30 April _____

The grazier shall manage stock with good husbandry in accordance with efficient farming practices but shall not be responsible for any outbreak of disease, sickness or other ill-thrift in stock or any consequent loss incurred by the owner unless arising from a breach of any obligation on the part of the grazier under this agreement.

There is no death compensation for stock.

The owner guarantees that the young stock are from a TB, Brucellosis and EBL accredited herd and ensures that stock are inoculated for Leptospirosis and BVD and other diseases with a history of occurrence on the owners or graziers property.

All stock must be identified by ear tag.

Stock must be dehorned at least one month prior to arrival.

Should the service of a veterinary surgeon be necessary, the fee for this service is the responsibility of the owner.

Drenches and all animal health products will be purchased and administered by the grazier but will be charged back to the owner.

Jersey yearling bulls will be hired by the grazier and charged back to the owner on a per head basis. Mating start / finish dates in accordance with the owner's wishes.

Payments will be on a monthly basis payable 20th of month, first payment in month of stock arrival e.g. 20th May.
Per head per week ____ plus VAT
Monthly charges will vary due to bull hire, health costs etc.

The owner may inspect his stock at any time but by appointment only.

This contract firmly binds both grazier and owner for the period stated. Only in the event of the said stock not being farmed in a good and proper manner, and agreed upon by an independent agricultural consultant or arbitrator can this contract in any way be terminated.

Signature of owner _____ Signature of grazier _____

Appendix 2: Example of a contract of employment for a Farm Manager

[EMPLOYER'S NAME]

[EMPLOYEE'S NAME
AND ADDRESS]

[ ] [ ] 2011

RE: Contract of Employment Farm Manager

Dear [EMPLOYEE'S NAME]

This document sets out the terms and conditions of your employment with [EMPLOYER'S NAME] and supersedes all previous arrangements or agreements whether oral or in writing between you and the Company in relation to the matters dealt with in it.

Commencement of employment
Your employer is [EMPLOYER'S NAME] (Company or we). Your employment with the Company commences on the [ ] [ ] 20[ ].

The first six months of your employment shall be a probationary period and your employment may be terminated during this period at any time on four weeks prior notice. (The employee may also terminate during this period and must also give 4 weeks prior notice).
During the probationary period there will be two formal performance assessments against agreed criteria. We may, at our discretion, extend this period for up to a further six months. During this probationary period your performance and suitability for continued employment will be monitored. At the end of your probationary period you will be informed in writing if you have successfully completed your probationary period.
You warrant that you are entitled to work in Ireland without any additional approvals and will notify the Company immediately if you cease to be so entitled at any time during your employment with the Company.
You shall not work for anyone else while you are employed by the Company unless this has been agreed to in writing by the Company.

Job title
You are employed as Farm Manager and report to [EMPLOYER'S NAME]. Your duties are the normal duties of a dairy farm manager and will include input on developmental aspects of the farm project, including infrastructural requirements and labour structures, while providing technical assistance to make the farm project a success. You will also be required to take part in the extension program of the farm.

Place of work
Your normal place of work is the [EMPLOYER'S NAME] farm near xxx or such other place that may be required from time to time this is linked to the operation of this farm.

Salary
Your salary will have 2 components; a base salary the specifics of which are referred to in 4.2 and a risk portion which is an additional €_____. Details of the "at risk" are referred to in 4.3.

Your salary is €_____ per year which shall accrue from day to day and be payable monthly in arrears on or about the 30th day of each month directly in to your bank or building society account
Payment of any bonus will be quarterly and be directly linked to the agreed scores from a formal

performance assessment at that time. Your performance assessment will be against the agreed criteria in the Performance Management document (appendix A)
Your salary will be reviewed annually and may be increased from time to time at the Company's discretion without affecting the other terms of your employment. There is no obligation to award an increase. There will be no review of the salary after notice has been given by either party to terminate your employment.

Hours of work
Dairy farming is a highly season and so the workload will also vary greatly through the year and will include minimal duties on rostered weekends. The annual hours worked will be approximately 2,400. You may be required to work such additional hours as may be necessary for the proper performance of your duties without extra remuneration.
Only essential work is to be done on weekends or on public holidays.
The farm manager has the authority to organise the day's work activities in a way that facilitates the proper operation of the farm.

Cell phone
The employer will supply a cell phone for business purposes only and the employer will pay for the rental and business calls. The employee will be responsible for all home landline telephone rental costs and calls.

Vehicle
The Farm Manager will be provided with a farm utility vehicle for use on farm business. The employer will pay all the costs of operating the vehicle. The farm manager will ensure that the vehicle is always operated in a safe and lawful manner and that proper maintenance is carried out.

Holidays
You are entitled to 28 days' holiday during each holiday year. You will be paid your normal basic remuneration during such holidays. The Company's holiday year runs between 1st January and 31st December. If your employment starts or finishes part way through the holiday year, your holiday entitlement during that year shall be calculated on a pro-rata basis rounded up to the nearest day.
In addition you are entitled to take 9 days of public holiday in Ireland or a day in lieu where we require you to work on a public holiday. These are New Years Day (Jan 1), St Patrick's Day (Mar 17), Easter Monday, The first Monday in May, June and August, the last Monday in October, Christmas day (Dec 25) and St Stephen's Day (Dec 26).
The employer expects that staff will use their annual leave in the year in which it is granted. Annual leave that is not used in the year it is granted will be forfeited unless carry over have been approved by the employee's manager. The maximum amount of leave that can be approved for carry forward from one year to the next is ten (10) days.
The employee agrees that annual leave is to be taken at a time that will not unreasonably impinge on the performance of his duties. The employee must receive written approval from his manager prior to taking annual leave.
On termination of employment you will be entitled to a payment in lieu of any untaken holiday at the rate of one day's pay for each day's holiday not taken.
If you have taken more holidays than your accrued entitlement at the date your employment terminates, we shall be entitled to deduct from your final salary payment one day's pay for each excess day.

Sickness Absence
If you are absent from work for any reason, you must notify your manager of the reason for your absence as soon as possible but no later than 8am on the first day of absence and are required to have organised suitable replacement staff to undertake the duties needed to continue the operation of the dairy farm.
Any unauthorised absence must be properly explained and in the case of an absence of uncertain duration you must keep the Company informed on a daily basis until you have provided the Company

with a medical certificate.
If you are absent from work due to sickness or injury which continues for more than two days you must provide the Company with a medical certificate on or before the third day of sickness or injury. Thereafter medical certificates must be provided to the Company to cover any continued absence.

Termination and notice period
After successful completion of your probationary period as provided in clause Error! Reference source not found., and subject to clauses 10.2 and Error! Reference source not found. the prior written notice required from you or the Company to terminate your employment shall be a minimum of three calendar months.
When an employee is rendered incapable of the proper performance of his/her responsibilities and duties required under this agreement, as a result of mental or physical illness or injury, then employer may terminate his employment by giving not less than one month's notice to the employee. Before taking this action the employer will ask the employee to undergo a medical examination by a registered medical practitioner nominated by the employer. The employer will meet the cost of the medical examination. The employer shall consider any reports or recommendations made available to the employer as a result of that examination and any other relevant medical reports or recommendations which may be given to the employer by or on behalf of the employee.
We shall be entitled to dismiss you at any time with one week's notice or payment in lieu of notice, if you are proven to have committed a serious breach of your obligations as an employee, or if you cease to be entitled to work in Ireland. A serious breach would be either, theft, fraud, cruelty to stock or abuse of staff.

Disciplinary and grievance procedures
If you wish to raise a grievance you may apply in writing to the [EMPLOYER'S NAME] in accordance with normal grievance procedure.

Redundancy
You will be entitled to statutory redundancy after two years of continuous employment amounting to two week's pay for each year of continuous service, plus one further week's pay.

Changes to your terms of employment
No change to this agreement or any of the terms in it will be effective or binding on either the employee or the employer unless the change is made in writing and both parties have signed it.

Confidential information
You shall not use or disclose to any person outside of [EMPLOYER'S NAME] or members of the Farm Management team, either during or at any time after your employment with the Company any confidential information about the business or affairs of the Company or any of its business contacts, or about any other matters which may come to your knowledge in the course of your employment. For the purposes of this clause confidential information means any information or matter which is not in the public domain and which relates to the affairs of the Company or any of its business contacts.

Please indicate your acceptance of these terms by signing and returning to me the attached copy of this letter.

Yours sincerely,

..... For and on behalf of [EMPLOYER'S NAME] .....
I hereby confirm that I agree to the above terms

....
[EMPLOYEE] [DATE]

Appendix 3. Performance and Management Checks

John Maher, Dairy Specialist, Teagasc Moorepark

Summary:

- Farm performance and management checks need to be put in place.
- Daily check: bulk milk tank docket/processor website.
- Weekly check: Average farm cover, milk quality report, concentrate and fertiliser usage.
- Monthly check: livestock count, stock-taking, work roster.
- Seasonal check: animal disease assessment, body condition score assessment, target weight of replacements assessed.

For the farm to function successfully, performance and management checks need to be put in place. These will vary from daily measurements to certain targets to be met or completed on a seasonal basis. Some of these are outlined in the table below.

Daily	Weekly	Monthly	Seasonal
Milk Production (Bulk tank or Website)	- Farm Cover report - Concentrate usage report - Fertiliser usage report - Milk Quality Report - Management Report - Work Roster	- Stock-Taking: ➢ Animals ➢ Feed ➢ Fertiliser - Cash Flow Report - Merchant account(s) status - Work Roster check	- Animal Health Check ➢ TB ➢ Bulk Tank Analysis - Cow Condition - Animal Weights - 3rd Party tenders, Contractor, Vet, etc.

Daily:

The level of milk production can be assessed via the bulk tank docket or via the processor website (not provided by all processors).

Weekly:

The entire farm should be walked once per week. Primarily, this will allow an assessment of grass supply on the farm through measurement of the farm cover. A management report should be completed weekly on the basis of this farm walk. An example of this Management Report is attached. The level of fertiliser applied and concentrates fed should be included in this report. Critical issues that arise from the weekly walk should be identified and actions specified within an agreed timeframe. In addition, it will allow an assessment of the farm fencing and boundaries, farm roadways, weed control, water supply, etc. Achieving milk quality targets in relation to SCC, TBC, thermodurics, etc. is critical for the success of the farm. Control of SCC is particularly important as the losses from both financial and animal perspectives can be very high. The work roster needs to be assessed on a weekly basis for planning and organisational purposes.

Monthly

Stock taking should take place on a specified date every month to assess animal sales, purchases, deaths, etc. In addition, an assessment of the quantity of fertiliser and feed should also be recorded. Cash flow is essential to keep a business afloat. It is even more critical in the start-up phase. A programme/ system should be put in place to record monthly incomings/outgoings to create a picture of the financial position of the farm. It is also necessary to keep a check on your financial position with your merchants. The Work Roster needs to be assessed for sick leave and holiday periods. The level of sick leave can be used to indicate the level of job satisfaction of staff.

Seasonal

Animal Disease is a serious challenge for any new start-up dairy farm. Having an ongoing monitoring procedure in place is essential to track the level of disease in the herd. There are several animal health analysis packages available in the market. Dairy replacements should be the best genetics on the farm. However, these animals are often treated as second class citizens on the farm. Achieving the target weights especially at breeding is necessary for them to realise their genetic potential. Cost Control is vital in any business but especially in the start up phase. Setting up a tendering process for 3rd party work (e.g. contractors) will help ensure cost competitiveness. Using contractors will also benefit the farm in terms of labour and initial capital outlay. Assessing cow Body Condition Score at certain times during the season is essential to meet the targets at calving down (3.25), drying off (2.9) and breeding (2.9) for the cow to achieve her potential.

Milking Process Efficiency

Bernadette O'Brien
Teagasc, Moorepark Animal & Grassland Research and Innovation Centre, Fermoy, Co. Cork

Summary

- The milking process is a function of the interaction of three key elements - cows, people and facilities and all three elements must interact well at milking time.
- Milking process has four distinct parts each requiring different skills and infrastructure.
- Measuring performance is the first step on the road to improving productivity
- Good cow flow is essential at all times, particularly in return travel time between paddock and yard and at parlour entry and exit.
- Milking machine must be correctly sized for the available labour to avoid over milking and operator idle time.
- Improved technology can reduce time required for after milking cleaning tasks very significantly.
- Milking operators may put different values on different aspects of milking, e.g. time versus cost.

Introduction

The aim of this chapter is to provide guidelines to make milking cows a task which produces a premium quality product, i.e. milk, from a herd of healthy cows, by a reasonable, practical and relatively comfortable labour input level, that is also satisfactory for the cow and ultimately, that meets the pre-requisite of being profitable for the dairy farmer. Thus, it will follow the movement of the cow from once she leaves the paddock for milking until she returns, through the herding, parlour entry, milking and washing process together with an appraisal of the associated infrastructure and facilities.

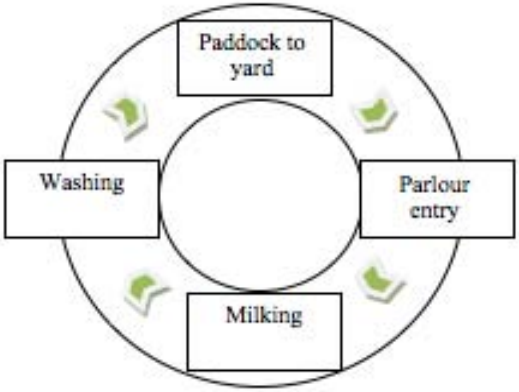
The chapter will set out:

- Key targets required for satisfactory milking:
  - *increasing labour productivity*
  - *making milking easier and*
  - *awareness of good stock handling*
- Outline current 'Best Practice' for the milking operation, incorporating facilities and cow management, and
- Indicate what is realistically possible to achieve in terms of milking time and how milking performance in different parlours can be measured and benchmarked.

The milking process is a function of the interaction of three key elements - cows, people and facilities.

- Behaviour of cows is directly influenced by their interaction with the facilities and milker
- Milker work rate is dependent on the cow-flow and type of equipment
- Design of the facilities determines how cows and the milker interact with the equipment
- Efficient dairies have well designed facilities suitable for both cows and people
- Cow and operator comfort is equally important
- If the milker interacts well with cows, they will respond by being less fearful of people and equipment at milking, resulting in good cow flow
- Stress-free work places are generally safer for both the milker and cows

Figure 1. Four distinct milking processes



Improving cow flow

- Provide wide, clear, well-lit pathways for cow movement.
- Cows are attracted by the sight of others moving ahead so they need to maintain visual contact with these animals or see the exit point of where they are traveling to.
- Surfaces, i.e. material or floor type should be as consistent as possible, e.g. slats changed to concrete surface in race /yard construction would inhibit cow-flow.

In addition to the construction of roadways which was discussed earlier, a well-designed, carefully built and properly maintained paddock-to-yard.
system can produce many benefits. These include:

- reduced lameness, less mastitis and better general animal health.
- faster and easier stock movement.

- cleaner cows, potentially reduced teat preparation.
- improved milk quality.

The design and maintenance of paddock gateways, laneways and junctions is critical for the efficient travel of cows to the dairy. Minimising restrictions and maintaining a good laneway surface is the best way to encourage cows to keep walking to the dairy. Water is the enemy of a stable laneway. Regular laneway maintenance saves money in the long term. Examples of quick and cost effective changes to improve key aspects of the paddock to yard cow movement process:

- Paddock gates should be the full width of the lane to enhance cow-flow
- Support heavy gates with wheels
- Put in two gates per paddock to reduce gateway wear and tear
- Put in hitching points so that open gates don't blow shut
- Moving troughs away from the gate prevents drinking cows blocking the gateway and also reduces wet areas around gateways
- Lane width will limit cow speed - but generally there is no advantage in gates wider than the laneway
- Slow down - calm cows produce more milk when they get to the milking parlour
- Clean drains to facilitate laneways lasting longer.
- Keep cows out of the drains on the side of the laneway
- Critically watch the cow movement and remove restrictions and distractions to cow-flow
- Remove trees that shade the laneway and cause poor drying conditions
- Get cows to enter the holding yard at the rear to preserve their social order for milking

Milking parlour entry

Holding yard

Good design will help ensure cows remain calm and willingly enter the parlour. Details on satisfactory holding yard design and operation are outlined in the section 'Infrastructural Requirements for a Greenfield Dairy Farm'.

Backing gates

A calm and consistent routine as the cows enter the parlour results in: fast milk let-down, shorter milking duration and less-frequent dunging and urination. It also encourages the critical element of cows entering the parlour for milking willingly without relying on the milker leaving the pit. Backing gates can assist with cow-flow into the milking parlour but they need to be well designed and used correctly. Backing gates work by reducing yard size as the number of cows reduces which keeps cows close to the dairy entrance. Audible (not loud) alerts (such as a bell) can be used to warn cows that the backing gate is advancing.

The holding yard should provide a clear entry into the milking area. The yard is often built to the full width of the dairy. Tapering-in to the parlour entrance aids cow-flow as it eliminates corners and cows are spaced for smooth entry to the dairy. Yards and entrance should be wetted before cow arrival.

Although not part of the entrance to the dairy, the positioning of other cow handling facilities can impact on the flow of cows as they enter. If correctly positioned, the race, crush and loading ramp can share space without diminishing yard performance. But a screen should be placed so as to prevent entering cows being distracted by drafted cows and other activities taking place. The backing gate should move very slowly, at a speed sufficient for cows to move ahead of the gate without being run over by it. The milker must be able to activate the backing gate from the pit and the gate should only move while the milker is activating it.

Dairy entrance design

The interface between the holding yard and inside the dairy should be designed to encourage cows to enter. There are several factors that need to be considered to create a good entrance design. These include: footing, lighting levels and entrance widths. A well-designed entrance to the parlour promotes the voluntary entry of cows into milking positions. Safe, reliable footing is essential to give cows confidence to enter the dairy. Grooving concrete helps provide traction, but the grooves need to be consistent with the drainage direction. The slope of the entrances to the dairy should not exceed 1 in 25 and steps should be avoided if possible. Skylights combined with natural lighting can even out light levels between the outdoor yard and indoor parlour - dark shadows in the entrance cause cows to pause before entering. Cows need to feel secure as they move from the holding yard into the parlour and therefore, any physical restrictions at the entrance should be avoided including poor lighting, inappropriate floor surfaces, sharp turns, railings, posts and inadequate space allowances. It is also advisable to avoid doing painful procedures to cows while in the dairy. The natural pecking order of the cows should be maintained, a timid cow may be bullied at this point and may stand further back, where she feels safer. Cows

have a natural tendency to follow one another, thus if the entrance design obscures the cow in front from view, the next cow will be reluctant to follow. Protection from the wind and elements at the parlour entrance can also aid cow-flow. A typical entry race width is 760-820 mm.

Milking

Cow preparation

Remember: clusters should only be attached to clean, dry teats. Teat preparation is an essential task of the milking routine in terms of milk quality and udder health. Time spent preparing the cow usually results in quicker milk let-down and a faster, cleaner milk out, thus, time spent on teat preparation can be partially offset by shorter milking times. Washed teats must be dried with individual pieces of paper towel. Preventing teats getting dirty between milking intervals and on the way to the dairy is an efficient way of reducing teat preparation time. Clipping of udder and tail hair during the lactation is also an effective measure. It is important that the milker wears gloves during milking, which allows frequent rinsing with clean water and spraying with teat dip to reduce the chance of spreading bacteria.

Identifying cows requiring individual attention is a key part of the milking routine. Problem cows should be instantly recognisable (by the use of e.g. freeze brands, stock paint on udders, tape on legs and tail). Such cows might include those treated with drugs, cows to be drafted for herd health procedures or AI and cows that impact on the milking routine, e.g. colostrum cows.

Cluster attachment and milking

Teat cups should be attached gently and in the same order, so that the cow is not disturbed or irritated and in a quick and efficient manner to minimise letting air into the system. Clusters should be aligned properly on cows during milking. Milking should cease at the correct time to prevent under or over-milking, i.e. usually an end flow rate of ~200 ml/minute. Practically, this looks like a small, continuous dribble (within the claw bowl). Incomplete milking is defined as having more than 20 per cent of quarters with greater than 100 ml of milk that can be stripped out by hand after milking. Over-milking is generally more common, particularly in the late lactation period of seasonal calved herds and can cause teat damage with it's associated problems of mastitis incidence and high SCC.

Cluster removal

When milking has ceased, the cluster should be removed only when the vacuum has been completely cut off and the cluster starts to slide off the teats. Alternatively, if vacuum remains at cluster removal, the milker's routine is slowed down and the situation may cause mastitis and affect cow comfort. Thus, air admission holes should be checked regularly and faulty vacuum shut-off valves repaired as soon as possible. Excessively swollen teats are the result of milking machine malfunction or excessively long milking times. If clusters are removed manually, milkers need to have enough time to reach all cows before significant over-milking occurs. Automatic cluster removers (ACRs) take the guess-work out of predicting the end point of milking, eliminates overmilking and can allow substantial increases in productivity per milker. Also, many milkers have commented on how this equipment de-stresses milking. Alternatively, ACRs

may be seen as an expensive luxury item if the milker can manage the current number of milking units without any over-milking and find their current system satisfactory. ACRs provide a consistent end to milking and are a tool to help minimise trauma to teat tissue and the teat canal. Many people are not aware of how much over-milking occurs in their dairy. There can be up to 8 minutes of over-milking for heifers. In some swing-over parlours, heifers have been seen to finish milking out well before the rest of the row has had the units attached. However, correct installation is essential and automatic cluster removal works very well when cows are familiar with a good routine and have milk let-down before the clusters are attached.

Teat disinfection

Disinfecting teats plays an important role in mastitis control, and teat and udder health. Care must be taken to ensure good coverage of the teat with the disinfection solution. Coverage of the entire teat barrel is advised in order to lower bacterial numbers on the teat, otherwise protection will be incomplete. Teat disinfection can be conducted by dipping or spraying. Teat dipping is very effective, as it gives good coverage of teats but it is more time consuming than spraying. Spraying can also be effective if care is taken in it's application. At least 10 ml or 15 ml/cow/milking should be used if using the dip or spray method, respectively. If dipping, the solution may have to be replaced frequently throughout milking, not just topped up, to avoid contamination by milk, which, in turn reduces the efficacy of the mixture. Having an appropriate number of cups or spray nozzles (for the size of parlour) strategically positioned in the parlour means there is always teat disinfection to hand. Additionally, it must be ensured that the spray nozzles are always working properly.

Cow exit

A good exit gate must open and close quickly and be easy to operate and be controlled from any point in the pit. The exit path should be free of obstacles and the floor surface should consist of safe, reliable footing (as at the parlour entrance); this is essential to give cows confidence to smartly exit the parlour once the exit gates are opened. Exits should be short, wide and have minimal turnings. Widening the exit area can reduce cow exit times. Drafting should be possible without the milker leaving the pit. The drafting gate should be set up such that the cows walk through it every day. Positioning the drafting gate a distance along the race allows cows to pass the drafting gate in single file which makes drafting easier.

Washing

Milking machine

An effective cleaning routine for the milking plant may be an automatic system, a hot wash system consisting of at least one hot circulation cleaning per day or a cold circulation cleaning with one hot circulation cleaning carried out weekly. Larger plants and those with accessories, e.g. milk meters should receive hot circulation cleaning. Irrespective of the cleaning system used, the detergent cleaning product should be selected from the Teagasc tested list of products. *(http://www.agresearch.teagasc.ie/moorepark/Articles/Chemicalanalysisofdetergentsterilizerproducts.pdf).*

Example steps of manual hot circulation cleaning

1. Wash jetters and outside of clusters and attach clusters to jetters (remove milk filter).
2. Rinse plant with 14 litres of cold water per cluster.
3. Mix an approved alkaline chlorine detergent-steriliser at the recommended use rate in hot water at 75-80^{o}C allowing about 9 litres of solution per cluster.
4. Circulate the solution for 10 minutes.
5. After the circulation wash, rinse the plant with 14 litres of rinse water per cluster.
6. Ensure that milklines are drained completely before milking.
7. A regular descale acid wash routine for hot circulation cleaning is required weekly.

8. Use a solution of approved milkstone remover (acid detergent), (preferably hot water) for 5 to 10 minutes and flush to waste with cold water
9. Follow with usual alkaline chlorine detergent-steriliser wash, preferably in hot water at about 60°C
10. Flush the plant with 14 litres of cold water per cluster to finish.

Risk points

- Use only detergent cleaning products from the Teagasc list and use according to manufacturers recommendations.
- Check water temperatures regularly (75-80°C before and 43-49°C after circulation.
- A circulation rate of 3.5 – 4.5 litres/min/unit is required.
- If the detergent-steriliser contains chlorine the solution should be rinsed from the plant directly after circulation (not left in plant until next milking).
- Monitor the rate of usage of the detergent product.
- Automatic washers should be serviced annually.
- Renew the cleaning solution after two milkings.
- Change rubberware after 2,000 cow milkings, or every six months.
- Avoid storage of warm water (plate cooler) for machine cleaning.

Yards

High volume-low pressure systems are best at moving manure deposits in the yard. An excessively rough or cracked concrete surface can affect the ease of cleaning and increase the time spent hosing these areas. Water pumps should be placed close to the water storage tanks to minimize demand on pumps. A piece of partially flattened 38mm stainless steel pipe can serve as a nozzle to increase water pressure delivery. Alternatively, cleaning times can be reduced by using scrapers and water jets mounted on backing gates.

Measuring performance of the milking system

This is dependent on the milking facility which, in turn, is dependent on herd size, preferred milking duration, labour availability, level of automation, and capital investment. Various measures can be used to assess milking performance, but these measures must be interpreted in the light of the values of the owner of the system. For example, a farmer may wish to spend more time preparing cows for milking in order to protect milk quality, and so, may prefer a less than optimum result for the cows milked/operator/hour performance measure. Care is required when using these measures; they are a 'tool' rather than a 'rule'.

Common performance measures used to describe different aspects of the milking process

- kilometres/hour, i.e. at what walking speed do cows go to the dairy?
- cows/operator/hour, i.e. how many cows can one operator milk per hour?
- litres/operator/hour, i.e. how many litres does each milker put in the bulk tank /hour?
- time cleaning machine, i.e. how long does it take the milker to clean the milking machine?
- time cleaning yard, how long does it take the milker to clean the yard
- clusters/operator, i.e. how many clusters can a single milker handle in a particular work environment?
- cows/cluster/hour, i.e. how many cows can each cluster milk in an hour?
- litres/operator/hour of total milking process time, i.e. how well is the overall milking process working (taking paddock to yard, milking parlour entry, milking and washing into account)?

Monitoring on a number of farms has indicated values for these performance measures as outlined below.

Where do your milking parameters sit within these measurements?

Cow walking speed to the dairy

The time it takes to bring the cows from the paddock to the dairy and the distance between both locations can be easily measured. Range for herd size up to 99 cows: 0.3-3.8 km/h with the middle farm at 1.7 km/hr and the top 25 per cent of farms starting at 2.4 km/hr.

Cows/operator/hour (1st cluster on to last cluster off)

Many farmers measure their performance in terms of cows/hour which is good where there is one milking operator in the parlour. However, larger parlours (with more than one milker) always appear better with this measure. Thus, the cows/operator/hour measure may be more appropriate in that instance as it takes account of the effect of cluster number on the number of cows that can be milked, so it enables a clear comparison between different sized parlours. Range: 20-140 cows/operator/hour with the middle farm at 65 and the top 25 per cent of farms starting at 80 cows/operator/hour.

Litres/operator/hour (1st cluster on to last cluster off)

This measure also allows for the size difference in parlours and focuses on the productivity of the labour used in the parlour. From a labour productivity point of view, it is better to milk fewer, higher producing cows than a greater number of lower producing cows. Farmers are not paid for the cows milked per hour but

are paid for the volume of good quality milk going into the bulk tank. Range: 300-2,100 litres/operator/hour with the middle farm at 650 and the top 25 per cent of farms starting at 1200 litres/operator/hour.

Time cleaning machine
This measurement is used to gauge the labour time spent washing and cleaning the milking machine. Range: 2 (automatic system)-35 min with the middle farm at 15 min.

Time cleaning yard
This measurement is used to gauge the labour time spent washing and cleaning the parlour and yard areas. When examining labour time, it is important to consider the total time taken by all labour units to complete the tasks. No benchmark data available.

Clusters/operator
Although it is useful for individuals to evaluate their own work practices in their own parlour, it is not an appropriate measure to compare different systems. The efficiency of the parlour is determined by a complex set of factors, including the milker's work routine time and the unit time of the clusters. Range: 5-20 clusters/ operator with the middle farm at 10 and the top 25 per cent of farms starting at 12 clusters/ operator.

Cows/cluster/hour
This is a good measure to use to evaluate equipment performance, as it examines how many cows are milked by an individual cluster in each hour of milking time. This performance measure is determined by the cluster unit time and is greatly influenced by the cow's milk yield and the type of dairy. Range: 2-11 cows/cluster/hour with the middle farm at 6 and the top 25 per cent of farms starting at 8 cows/ cluster/ hour.

Litres/operator/hour of total milking process time
This performance measure includes the labour required for all milking processes, i.e. paddock to yard, parlour entry, milking and the cleaning up. Thus, different sized dairies and herds, with different labour requirements, can be compared on the same basis. Range: 250-1,450 litres/ operator/ hour with the middle farm at 400 and the top 25 per cent of farms starting at 900 litres/ operator/ hour.

Recent research study conducted at Moorepark
The effect of milking performance influencing factors such as milking cluster number, pre-milking routine and stage of lactation on milking row time, over milking and operator idle time were measured. As cluster number increased, row time and duration of over-milking were increased and idle time was reduced. The

type of routine practiced, largely dictates the number of clusters one operator can handle and the overall efficiency of the milking operation. Choices of alternative milking infrastructure exist depending on herd size, preferred pre-milking routine, desired milking time and available capital for investment. For example, in a one-person milking process, when a minimal pre-milking routine is applied throughout lactation, 22 milking clusters may be operated without experiencing over-milking of longer than ~2 min in the absence of ACRs, resulting in a milking time of 2 h and 1.6 h in early and late lactation, respectively, for a herd of 220 cows (e.g. 10 rows, 9.5 min milking row time). The presence of ACRs would allow a cluster number of up to 26 to be managed due to the ACRs effect in eliminating over-milking in late lactation, thus enabling a 260 cow herd to be milked in 2 h and 1.8 h in early and late lactation, respectively, (e.g. 10.2 rows, 11.8 min milking row time).

Alternatively, when a full pre-milking routine is applied throughout lactation, milking cluster numbers of 14 (early lactation) or less (late lactation) may be operated without experiencing over-milking of longer than ~2 min in the absence of ACRs. While ACRs would prevent over-milking with increased milking cluster numbers, such additional units in this scenario would not allow significantly greater cow numbers to be milked within a specified time of ~2 hr, as the pre-milking routine is the limiting factor.

The remaining alternative of applying a minimal and full routine in early and late lactation, respectively, is limited by the full routine in late lactation, and therefore ACRs are required to prevent over-milking. While minimum unit numbers reduce capital investment, guidelines have indicated that it is increasingly difficult for the operator to remain focused if milking more than 10 cow rows.

Additional comments on milking efficiency by case study milking operators

- Careful planning of new or extended parlours can save time and money
- Adequate drainage away from the parlour and dairy site is very important
- Good, professional concreting is critical
- Natural lighting should be used when possible
- A quite and consistent routine at each milking is necessary
- Cows must not be conditioned to expect the milker to come out of the pit to collect them and usher them into the parlour
- Some hand contact with teats allows a check for mastitis and ensures faster let-down of milk and higher milk flow rate
- Organized working from one end of the pit to the other means that time and energy is not wasted with unnecessary walking
- Operator controls should be positioned conveniently, e.g. hoses, and

disinfection sprayers, entry and exit gate controls in the pit
- It is worth checking if a higher horsepower water pump would speed up yard washing on individual farms
- Automation should be used when it saves time, manual labour or running costs

Maximising parlour efficiency

Milking parlours are run most efficiently when the capacity of the milking equipment matches the capacity of the labour person(s) milking the cows. The milker should not be waiting for the milking equipment (e.g. cluster) to become available and the equipment should be fully utilised, not idle and waiting for the milker to catch up. Thus, efficiency is maximised when the equipment and labour are balanced.

From a green field to a working dairy farm: the importance of project management

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Summary

- Project management involves the management of the conversion from a green field site to a working dairy farm. Without it, you will struggle to complete the conversion successfully.
- Project management will take up all of your time during the conversion phase; you will have to ensure that the multiple activities and tasks are identified, scheduled and managed in the correct order.
- In addition there are always unexpected problems and decisions that will need to be made. Often these decisions will result in compromises, so the project manager must be very clear about what can and can not be compromised.
- Each activity or task will have different timelines, certain tasks will have to be completed before the next task can commence while other tasks can run in parallel.
- Taking the time to successfully project manage your conversion will yield rewards and will be the biggest risk reduction exercise that you can complete.
- A simple, four-phase process can be followed involving (1) scoping the project; (2) planning the project; (3) implementing the project; and (4) evaluating the project.

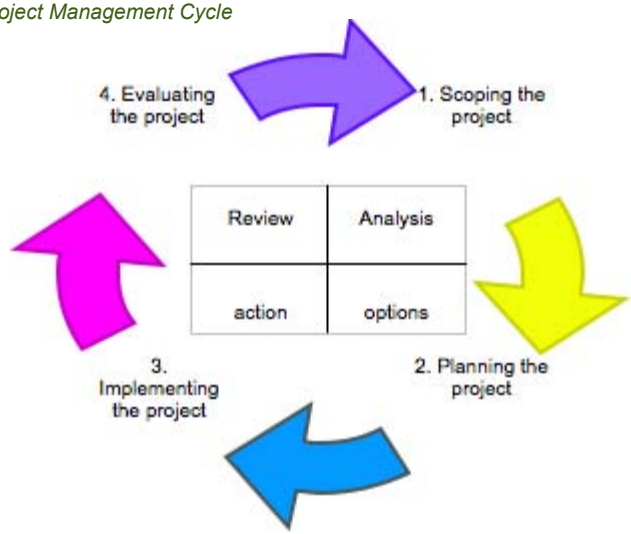
Introduction: what is project management?

A simple definition of project management is 'managing a movement from one state to another'. In this case it will involve the management of the conversion from a green field site to a working dairy farm. It is really the co-ordination of a number of essential activities, many of which are being performed by other people. You could think of a project manager as the conductor of an orchestra. But in an orchestra all members will be playing from the same music sheet; this may not always be the case.

Figure 1 represents the Project Management Cycle. It consists of four stages: scoping, planning, implementing and evaluating. Each stage is important and must be completed. For example, it would be a mistake to skip the first stage,

scoping, and jump right into the second stage, planning. A lot of work must be carried out before planning, and ultimately implementation, can even begin. Planning is critical, is multi faceted and takes a great deal of time and skill to do properly. It is also vital that the fourth stage, evaluating, is completed as the project is being implemented and also following the completion of the project. Reviewing the progress of the project (evaluation) against planned targets on a regular (monthly) basis is critical.

Figure 1: Project Management Cycle



(1) Scoping the project

This is the part of the project where we 'prepare the ground'. If not done properly, the project could go horribly wrong. There is a tendency to skip this stage and start drawing up plans but it is vital that objectives and outcomes are clearly identified; this is the purpose of the scoping stage.

This stage involves setting objectives and conducting a SWOT analysis. There were four objectives identified for the Greenfield Farm, Kilkenny. These were:

- To demonstrate the design and set up of a large grass based dairy farm.
- To demonstrate the profitable operation of a large scale grass based unit.
- To give confidence to farmers considering large scale expansion.
- To identify the risks and demonstrate the risk management strategies associated with dairy expansion.

A SWOT analysis involves identifying the strengths and weaknesses (generally your own or internal) and the opportunities and threats (generally 'what if's or external).

The following key questions must be answered during this stage:

- What will define the completion of the project?
- What outcome do you require from the project?
- What range of activities has to be completed?
- What is your timeline for the project?
- What activities have to take place first? What activities can take place in parallel?
- What is your capital budget for the project?
- To what standard must the outcome be completed?
- Who has to be notified regarding the project?
- What risks are associated with this project?
- What level of contingency or 'what if' should be built into the project?
- Have you the required skills to manage this project?

Key message: scoping the project

If you don't know where you are going, how can you possibly know how to get there or if you have arrived?

Hindsight will show you that you underestimated the resources required, so it is essential to include a contingency figure for resources in the project. An issue to be addressed before starting the project is an assessment/evaluation of the skills which you can contribute to the project. This can help identify skills gaps that may need to be filled. If you do not have the required project management skills, should you consider employing a person that does? There is a certain kind of toughness required for this role; make sure that you are up to the job. The outcome of the scoping process should be a short written document which will help to describe what the project will look like.

Lessons from Greenfield Farm, Kilkenny: scoping the project

- You cannot start scoping the project soon enough.
- The planning phase needs to be completed by early/ mid summer – to allow construction be completed before the autumn. Scoping needs to take place before this.
- During this stage, you must visit other 'conversion farms' and talk to other farmers who have undertaken a similar project in the past.
- Take the opportunity to milk in other milking parlours so that you know what you want when it comes to the planning stage.
- Watch out for 'scope creep' – sticking to clearly defined objectives will ensure that the scope of the project isn't extended.

(2) Planning the project

There are two parts to the second stage of the Project Management Cycle: considering the options and recording the plans. This stage will also involve prioritising the resources required and deciding on the order in which tasks will be completed. Your project will have a defined, and limited, budget. You will have to decide where it is necessary to invest your money to get the best return rather than where it would be nice to spend. You will be required to make ruthless decisions during the planning stage, and stick with these decisions during implementation.

Options need to be considered under the following headings:

- Stock
- Grazing infrastructure
  - *Soil fertility*
  - *Reseeding*
  - *Water*
  - *Roadways and paddocks*
- Milking parlour, dairy and associated facilities
- Statutory obligations i.e. slurry storage, isolation sheds
- Other facilities i.e. winter housing, calf sheds, handling facilities

Remember the Pareto principle (or 80:20 rule); this can help to identify where your efforts, and resources, should be diverted. You must also answer the following two questions in relation to each of the above items:

- What do I need? (This will not be the same as what you want)
- What can I afford? (You must know your overall budget to answer this question)

An alternative method for prioritising your investment is to divide your overall expansion budget into these three categories: 'must have', 'like to have', and 'nice to have'. Which ever method you choose, you must prioritise. You will be faced with making difficult choices but they have to be made.

The purpose of planning is to clarify your thoughts to improve communications with others. The outcome of this second stage will be a written document listing your decisions on each of the headings listed above. You also need to identify how you will allocate your budget to each of these categories; you must ring fence a portion of your overall budget to each category before you start spending. You must take the time to hunt down savings on specific components and set up a tender process for elements of the overall project. Check if contractors have taken on similar projects previously. A main contractor may have a preference for working with, or may recommend, a particular sub-contractor, for a part of the

project. Talk to other dairy farmers who have undertook similar projects. Remember to build in a contingency factor to all your calculations. Ten per cent of the overall budget should be set aside as a contingency fund and not allocated as a part of the expansion budget.

Key message: planning the project

Careful planning is required if you are to successfully implement your expansion project. Make sure that you build milestones into your plan, to enable you to check progress on the project as it is implemented.

It is a good idea at this stage to create a timeline for your project. An example of a timeline for a dairy farm expansion project is shown in Table 1. It is possible to represent the timeline for the project visually using a Gantt chart. A Gantt chart is a graphical representation of the duration of the tasks and activities of a project against the progression of time. As such it is a useful tool for planning and scheduling projects and for monitoring a project's progress.

Table 1 shows an indicative timeline for a dairy farm conversion project. The timeline assumes that a suitable block of land is available of has been secured. If not, then securing a suitable block of land becomes the first step; this can take a significant amount of time (years in some cases).

Lessons from Greenfield Farm, Kilkenny: planning the project

- Planning takes longer than you think.
- Begin with the end in mind…develop your project timeline with the date on which the milking parlour becomes operable as your end point.
- Infrastructure development, from planning to finally being fully operational, ALWAYS takes longer than expected so allow extra time.
- Plan to carry out weather sensitive works, especially site works, during typically good weather months.
- The time taken to find potential animals, properly check their health status, and negotiate a deal takes several weeks.

Table 1. Indicative timelines for dairy farm conversion project

Item	Time/ Date	Action
1. Financial	Feb 2010	First meeting with bank manager to outline project proposal and request funds
	Apr 2010	Agree loan facility with bank
	Dec 2010	Draw down funds
2. Permissions	Dec 2010	Apply for herd number (Appendix 1)
	Jan 2011	Purchase milk quota under Milk Quota Exchange or
		Submit application for New Entrants Milk Quota Scheme to
	Mar 2011	DAFF
		Obtain milk supplier number (Appendix 2)
	Jun 2011	First meeting with engineer re plans/ planning permission
	Nov 2010	Pre-planning meeting with County Council staff – planning and environment
	Feb 2011	Submit planning permission (Appendix 3)
		Planning permission granted
	Mar 2011	
	Jun 2011	
3. Stock	Jan 2011	Plan for stock purchase (number, quality and budget)
		View potential stock
	Jul 2011	Purchase stock
	Sep 2011	Stock arrive onto farm
	Jan 2012	
4. ESB	May 2011	Contact ESB re installation of 3-phase electricity (Appendix 4)
	Sep 2011	Power to switchboard
5. Water	Oct 2011	Drill well on farm and connect to water system
6. Soil fertility	Jan 2011	Soil sample entire farm
	Mar 2011	Apply lime, P and K as per recommendations
7. Reseeding	Feb 2011	Reseeding plan agreed
	Aug 2011	Paddocks reseeded
8. Roadways, paddocks and water	Mar 2011	Plan for farm roadways, paddocks and water system agreed
		Roadways begun
	Apr 2011	Roadways completed
	Sep 2011	Paddock fencing begun
	Oct 2011	Paddock fencing completed
	Nov 2011	Water system installation begun
	Apr 2011	Water system installation completed
	Sep 2011	
9. Site work	Jun 2011	Farmyard site marked out and work begun
	Jun 2011	Site works completed
10. Lagoon, stand-off pad and feed face	Jul 2011	Construction work begun
	Sep 2011	Construction work completed
11. Milking parlour, dairy and associated facilities	Sep 2011	Construction work begun
	Oct 2011	Concrete work completed
	Oct 2011	Steel work begun
	Nov 2011	Steel work completed
	Dec 2011	Plant installation begun
	Dec 2011	Plant installation completed
	Jan 2012	**Milking parlour ready to use**
	Apr 2012	Snags fixed

(3) Implementing the plan

Planning the work is one thing; working the plan is another. The key is to take the time to scope and plan the project and then to stick to the plan in so far as is possible. This stage involves applying the plan, monitoring progress at identified milestones and resolving problems as they occur.

It is likely that you won't be implementing the project on your own. Communication and team work will be the key to success. Ensure decisions are agreed and understood. Take on board suggestions for improvements to the plan. Be prepared to adjust the plan if necessary, provided that the plan can be brought back on track again following the adjustment.

Key Message: implementing the project

All activities that are part of the expansion development must be closely monitored and recorded. This includes loads of stone, loads of concrete, contractor hours, depth of concrete, quality of material from quarries etc.

Keep everyone involved informed of progress; this is a necessary activity of plan implementation. The emphasis should be on highlighting events which are significantly different from expectations. The project manager must prepare a monthly update of actual development costs against budget. This requires contractors and suppliers to provide monthly invoices unless they are delivering to an agreed total cost.

Do not be tempted to sneak in additional work that is not expressly itemised in the expansion budget. A little bit here and there, all for the best reasons, will blow out the budget and be very hard to explain to the bank.

Lessons from Greenfield Farm, Kilkenny: implementing the project

- Start site works in spring and construction in summer; plan to finish before the autumn.
- Managing contractors is a full-time job – it leaves you with very little time for other tasks.
- The impact of uncontrollable factors, especially weather, on planned timelines can be dramatic.
- Be prepared to adjust the plan if necessary but make sure to get back on track following the adjustment.
- Watch out for budget creep

(4) Evaluating the project

The review of the plan will have begun during the previous phase (implementation). At the end of the project, you will want to see if the implementation of the project has had the desired effect/impact. Or in other words, have the objectives which were set at the outset met? You may also learn some important lessons which can apply to similar projects in the future.

Key Message: evaluating the project

The two biggest risks associated with green field expansion are financial viability and the purchase of stock with infectious diseases.

The Greenfield Farm, Kilkenny commenced milk production in February 2010 after two difficult months of farm yard construction. Three quarters of the farm was newly reseeded from the previous autumn and the remainder was still under maize stubble. Two hundred and twenty cows had been purchased and arrived on the farm in late January. A further 65 were purchased in mid May and 35 more in September.

Lessons from Greenfield Farm, Kilkenny: evaluating the project

- The overall project took much longer than anticipated.
- Project management of the conversion of a green field site to a working dairy farm, over a very short timeframe, is very demanding and can lead to significant capital overrun if not managed properly.
- The project manager must be 'on the job' full time.
- Cash flow management during conversion and first season production is very difficult but critical to the success of any new dairy business.

Conclusion

The conversion of a green field site to a working dairy farm is a significant project. Failure to manage this project will result in an unsatisfactory outcome including additional costs, missed deadlines and increased stress for the farmer. Following the simple, four-stage process outlined in this paper will increase the likelihood of successfully completing the project on time and on budget. A number of project management lessons have been learned from the Greenfield Farm experience which can help other farmers as they become involved in dairy farm conversions.

The author wishes to acknowledge Adrian Van Bysterveldt and Eoin O'Riordan for the supply of ideas and materials for this article.

Appendices

Appendix 1. Applying for a Herd Number

Obtain and complete Form ER1. This is available from your local District Veterinary Office (DVO) or online at *http://www.agriculture.gov.ie/media/migration/animalhealthwelfare/registrationofpremisesanimals/ER1Form050710.doc.* The following information will be required: personal details (PPSN, date of birth), milk supplier number, proposed stock numbers, details of veterinary surgeon for new herd, and the details of the land on which the proposed new herd will be kept (including maps, folio number and lease if applicable).

Forms ER1.BD and ER1.1 should be completed if you wish to avail of a direct credit facility from the Department of Agriculture, Fisheries and Food (DAFF) and if the new venture involves a partnership or company respectively.

Once the application is made, a representative of DAFF will visit the proposed site for the new venture. Animal handling facilities have to be available at the time of this inspection.

The entire process of applying for a herd number may take up to a month

Appendix 2: Applying for a milk supplier number

Complete a 'Milk Supply Agreement Contract' between you and your milk processor.
Establish a new Milk Account with the milk processor.
Your milk processor will allocate you a milk supplier number; you will require this for the completion of the ER1 application form for a herd number.

Between April 2011 and April 2015, you will need to obtain a milk quota if you wish to supply milk to your milk processor. Milk quota can be acquired through the New Entrants Milk Quota Scheme, family transfer or purchase (with land or through Milk Quota Exchange). Successful applicants to the New Entrants Milk Quota Scheme will be granted a Milk Supplier Number by their milk processor once they are allocated milk quota.

EU milk quotas cease to exist on 31st March 2015.

Appendix 3: Applying for planning permission

The first step in this process is to engage a competent engineer (it would be best if he/ she has handled a similar planning application). It is recommended that you have a pre-planning meeting with both the Planning and Environmental staff in your local County Council.

Time spent in gathering information and completion the Planning Permission application will pay off by increasing the likelihood that permission will be granted without further problems.

Appendix 4: Applying for an ESB connection

Step 1: Get an Ordnance Survey map and a site plan
Step 2: Download application form NC3 *http://www.esb.ie/esbnetworks/en/commercial-downloads/NC3.pdf* and submit to ESB Network Services Bureau, PO Box 29, Garrycastle, Athlone, Co. Westmeath.
Step 3: Receive an acknowledgement
Step 4: Receive a quotation and connection agreement
Step 5: Return payment
Step 6: Going live (1) register with an electricity supplier of your choice (2) your electrical contractor must submit the ETCI wiring certificate.

Connection takes place 12 weeks from payment or consent, whichever is the latest.

See the ESB Networks website
http://www.esb.ie/esbnetworks/en/business-customers/single_commercial.jsp
for further details.

Financing Dairy Expansion

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Irish dairy farming is now entering a period of significant expansion. The Food Harvest 2020 report from the Department of Agriculture, Fisheries and Food sets ambitious targets for the dairy sector and details the roadmap for the future. The phasing out of milk quotas in 2015 presents Ireland with the first real opportunity for over 30 years to realise the potential of the dairy sector and fully utilise the advantage we have in our grass based production system.

With the impending abolition of the milk quota system many dairy farmers are expanding, or are planning to expand, output on their farms. There is also interest from dry stock and some tillage farmers in converting to a dairy enterprise. Rigorous pre-expansion analysis and ongoing financial monitoring during the project are a pre-requisite to making any expansion venture a success. While some farmers will seek to fund their expansion from cash flow many will require additional bank finance to assist with their farm development plans.

Accessing bank finance

To access bank finance, your farm must be able to generate sufficient funds to service interest and proposed loan repayments, while continuing to provide a return sufficient to meet the needs of the business and provide for adequate household drawings. Bank finance is an investment in the future and as such farmers must be able to show that their business can survive in the medium to longer term.

Financial institutions require a certain amount of information to process an application for finance. A well prepared proposal, supported by a good business plan, is key to ensuring that a farmer's lending proposal receives the most favourable and speedy consideration by the bank.

Key information required by the Bank to assess funding proposals:

1. Background

Details of the farm business, including farm programme (land farmed, production system, livestock, and milk quota), direct payments, labour costs and farm machinery details.

2. Purpose & vision

Give an outline of why your farm needs credit finance now. Outline past

achievements such as improvements in gross margin and technical efficiency, management of cost base, and/or enterprise diversification activities. Clear future objectives for the business should be provided, both for the short and long terms.

3. Risks

Show you understand the risks that affect the farm business and outline the steps your business takes to reduce/mitigate these risks. It's important to address both internal risks (relating to farm activities/enterprise mix, e.g. super levy) and external risks (e.g. regulation, and commodity price fluctuations).

4. Financial information

Provide the following financial information, as appropriate:

- **a.** Audited accounts for the last three-five years (existing business) and farm budget for the current year. This will provide the lender with an overview of the farms performance over a period of time and allows for a year when the farm may have performed particularly well or particularly poorly
- **b.** Cash flow forecast for the relevant period/medium term and details of the supporting assumptions. These should be stress tested against changes in input and output prices.
- **c.** Aged list of debtors/creditors
- **d.** Confirmation from the Revenue Commissioners that all personal and business tax affairs are in order
- **e.** Total assets/liabilities (personal and business)
- **f.** Other information relevant to your particular business

If you are developing a new farm business or have not previously banked with the financial institution the following may also be required:

- **g.** Forecast Trading Profit and Loss Accounts for the next three-five years
- **h.** 12 months accounts for any previous business and/or personal bank statements
- **i.** Business plan (ideally prepared with your accountant, farm consultant or Agri/Teagasc Adviser).

5. Business plan document

The Business Plan for the farm business presented to your financial institution when you seek bank finance should include complete detailed costings for the proposition as well as the relevant information outlined above, laid out clearly and concisely. It may be beneficial to seek professional advice from your accountant, farm consultant or Agri/Teagasc Adviser and/or solicitor when preparing the business plan.

6. Financial requirements

Set out exactly what you require from your bank, including the amount and purpose of the borrowing. If you seek bank finance to fund part of the cost of a project, it is important to include the total cost and details of how you will fund the balance. It is important to include a detailed budget which is in line with your business plan. Ensure that you have costed your development accurately and made provisions for delays and overruns.

7. Repayment

It is critical to demonstrate how your farm business will repay the finance facility sought. Be clear about the source of repayment and include potential alternatives in the event of the expected source failing. Your budget and cash flow forecasts should reflect realistic business expectations for the period of the facility. It is important to stress test budgets and cash flow projections against increase in input costs, decrease in output prices and rising interest rates.

In a seasonal business such as farming it can be possible to tailor your repayments to suit your farms cash flow cycle. When setting out your repayment plan, you should ensure that your new investment will not cause short-term cash flow problems particularly if the productive capacity of the asset will not be immediately realised.

Sample repayment analysis table (to be used in conjunction with financial accounts)

	Year 1	Year 2
Net profit		
Plus depreciation[(i)]		
Plus bank interest & charges[(ii)]		
Plus adjustments		
Cash available for living, tax & bank repayments		
Less drawings		
Less financial repayments		
Net surplus/deficit for capital investment		

(i) Note: Depreciation is added back to net profit as it is a non-cash item, (ii) Note: Bank interest and charges are added back to allow one to calculate the cash generated by the farm before any financial repayments. Full financial repayments are then deducted to calculate net surplus.

8. Security

Provide details of any security you are offering to support your application – for example assets, a personal guarantee, Letter of Pledge or Letter of Lien. Ultimately the lending decision will be based on the capacity of the business to repay the finance, irrespective of any security you may provide.

Compiling the above allows the farmer to examine the proposition in detail – enabling it to be altered or improved before it is presented to a bank. In some cases this information will identify key weaknesses at an early stage which may highlight that the proposition is not viable for the farm.

If a bank says no to a request, it may be the correct response at that time for the business. It is always good advice to review the proposition if it has been declined. Borrowers including SMEs, sole traders and small and medium-sized farm enterprises that have had an application for credit of up to €250,000 declined or reduced, or have had credit facilities withdrawn, by a bank participating in the NAMA scheme, and feel that the bank's decision is unjustified, can appeal to the Credit Review Office. The Credit Review Office has been established to conduct an independent and impartial review of banks decisions. The Credit Review Office review process will operate after the borrower has unsuccessfully appealed through the bank's own internal appeals process.

We asked AIB's Agri Advisers to consider what the best lending proposals have in common.

The customers concerned have:

- up-to-date information – current bank balances and latest set of accounts;
- a full understanding of their business – e.g. actual costs of production and the implications on their trading accounts – and they can comment on any items that might be out of the ordinary (e.g. high feed costs, land maintenance or drawings);
- in many cases management accounts such as a profit monitor which may show that a farmer has made money from a similar proposition in the past;
- quotations for the work being carried out (from a number of suppliers) and have room in the budget for over-runs. In general projects take longer and cost more than have been planned for;
- full and accurate details of the tax implications of propositions and have costed these in the proposal, and
- analysed the repayment capacity of the proposition and are putting an element of their own capital (equity) into the proposal.

Managing volatility in your farm business

The increasing level of commodity price volatility has now highlighted the need for greater financial planning at farm level. Volatility is likely to be a greater feature of Irish farming in the future than it was in the past, albeit at a higher average price range. Our advice to farmers is not to over react to the high or low prices. View the farm performance over a five-year period and to build up a buffer fund 'in good years' in the expectation that markets can change. Farm expansion plans need to take account of these cycles and should not be too

heavily based on high prices at the top of the cycle. With more volatile prices it will become important to capitalise on the good times and, if possible, build up a buffer fund for a downturn. This will be a new way of thinking for many Irish dairy farmers, who previously have received a relatively stable milk price. Putting something away for a rainy day was an old maxim that was forgotten by all of us in recent times but which has much relevance now.

Managing your bank account

Managing farm finances and bank account performance is now equally as important as managing the farm to as high a standard as you can. Bank account performance is a key indicator of how a business is managing its cash flow. We encourage farmers to take control of their current account management and adhere to their agreed bank account limit. It is important to talk to your bank on a regular basis to ensure they are fully up-to-date on your business and can plan in advance for your financial requirements. Our advice to farmers is to plan their cash flow requirements at the beginning of each season and stress test these against changes in input and output prices. Farmers who follow that advice will be best placed to approach their bank at an early date if significant changes in output or input prices occur. Where short-term cash flow problems arise, it is important to approach your bank at an early stage.

Conclusion

The abolition of milk quotas in 2015 will present Irish dairy farmers with the opportunity to expand production levels and capitalise on the competitive advantages of our grass based production system. Well planned expansion can give a significant positive return to Irish dairy farmers. If approaching your bank for finance it is important to provide full, accurate and up-to-date information to support your proposal. Budgets and cashflow forecasts should reflect realistic expectations and should be stress tested against increases in input costs and decrease in output prices. Providing sufficient understanding of the farm business and detail of the proposition helps customers convey to the bank that they have thoroughly analysed the proposition. Good preparation is the key to ensuring that a farmer's lending proposal receives the most favourable consideration by the bank. AIB has had a long association with the agriculture sector. We remain strongly committed to continuing the partnership we have with our farming clients through supporting them in the management and development of their farms. We look forward to supporting farmers in what is shaping up to be an exciting decade for the dairy industry.

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