Building a bill of quantities

Teagasc Dairy Specialist Team launched a Dairy Bill of Quantities (BoQ) tool in November 2024 to help dairy farmers benchmark their inputs and put more focus on the costs of producing milk

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Have you ever thought about the number of individual items that are bought each year to keep a dairy farm running?

From the big-ticket items like feed and fertilizer, to services paid such as insurance and accountant fees, to the "bits and pieces" picked up in the local merchant's on a Saturday morning – fence posts, milk filter socks and the like.

That's all before bank repayments, labour and depreciation are considered! It adds up to hundreds of individual direct and indirect transactions each year and, when the euros are counted, it also determines a farm's annual cost of production.

Over the last three to four years production costs have jumped significantly on dairy farms from around 27 cents to 35 cents per litre.

In real terms this equates to an extra €42,000 in annual costs for the average milk producer, or €813 per week to be covered by the milk cheque.

From analysis of over 1,000 farm Teagasc Profit Monitors each year; however, we also see a consistent and very wide range in milk production costs among farms. Some of this is structural e.g. loan interest, but much of it also comes from routine inputs like feed and machinery costs.

To get to grips with costs it is vital to look not only at the unit cost/price inflation side, but also to examine the input usage levels on a line-by-line basis.

In response to the significant cost differences between high margin and low margin dairy farms, the Teagasc Dairy Specialist Team launched a Dairy Bill of Quantities (BoQ) tool in November 2024.

This simple tool helps dairy farmers benchmark their inputs and put more focus on the costs of producing milk. Cost categories are broken down into variable and fixed costs under the same headings as the Teagasc Profit Monitor.

The BoQ itemises the quantity of each input used across the year e.g. tonnes of purchased concentrate, number and type of vaccine shots used, hectares of silage made by contractor, milking parlour detergent used, and electricity kwH consumption etc.

Level of inputs for each item are based on Teagasc best-practice protocols. Annual feed budgets are balanced for stocking rate, annual pasture growth and level of milk solids production. For the purpose of this exercise, the following assumptions were made:

1. 120 cow herd with 25 replacement units
2. 60 ha farm – 40 ha owned, and 20 ha leased
3. Overall Stocking Rate of 2.42 LU/ha
4. Planned milk production of 472kg of Milk Solids (MS)/cow delivered
5. 11 t/ha of grass DM utilized

Examples of variable costs

This typical spring calving herd has 120 cows plus 25 replacement units delivering 472kg of (MS). This BoQ itemises each of the category costs into unit type, unit rate, units per cow, cost per unit and €/cow.

If we take a category like Animal Health and Vet for example as outlined in Table 1, this section goes through all the veterinary items needed for the animals in this herd.

There is also a distinction made between vet general and vet vaccines. When the total cost of all items are added together, it amounts to €109 per cow per year.

Table 1: Veterinary items needed for the animals in herd

Category	Line Item	Unit type	Usage units	Units/cow	Totals	€/cow
Total Vet					€ 13,085	€ 169.0
Vet General	Vet call outs	Visit	6	0.05	€ 360	€ 3.0
Vet General	Antibiotics	Bottle	10	0.08	€ 300	€ 2.5
Vet General	Lactating cow tubes	3 Tubes Per Case	90	0.75	€ 234	€ 2.0
Vet General	Dry cow tubes	Per Tube	400	3.33	€ 880	€ 7.3
Vet General	Teat sealers	Per Tube	480	4.00	€ 682	€ 5.7
Vet General	Calcium (Milk Fever)	Bottle (400ml)	10	0.08	€ 115	€ 1.0
Vet General	Flutter valve & needle set	I unit	1	0.01	€ 22	€ 0.2
Vet General	Syringes and needles	Multiple	1	0.01	€ 20	€ 0.2
Vet General	General farm disinfectant	Litres	5	0.04	€ 75	€ 0.6
Vet General	Milk & Blood Sampling	Per Sample	10	0.08	€ 300	€ 2.5
Vet General	Hoof Pairing	Per Cow	48	0.40	€ 1,200	€ 10.0
Vet General	Foot Bath Solution	Litres	374	3.12	€ 2,431	€ 20.3
Vet General	Faecal Sampling	Pooled Sample	5	0.04	€ 145	€ 1.2
Vet General	Worm Dose Injection	Litre	0.5	0.00	€ 24	€ 0.2
Vet General	Worm Dose Oral	Litres	3.5	0.03	€ 60	€ 0.5
Vet General	Fluke Dose	Litres	2.5	0.02	€ 225	€ 1.9
Vet General	Poron (Lice)	Litres	10	0.08	€ 600	€ 5.0
Vet General	Worm dose	Litres	0.5	0.00	€ 9	€ 0.1
Vet General	Fluke dose Cows	Litres	15	0.13	€ 240	€ 2.0
Vet General	I box of Electrolytes (48sachets)	Box	1	0.01	€ 140	€ 1.2
Vet General	Arm length gloves	Box	2	0.02	€ 40	€ 0.3
Vet General	Iodine	Litres	2	0.02	€ 24	€ 0.2
Vet General	Calving Disinfectant	Litres	2	0.02	€ 20	€ 0.2
Vet General	Calving Superlube	Litres	2.5	0.02	€ 13	€ 0.1
Vet General	Calving Jack Ropes (Pair)	Pair (2 Ropes)	1	0.01	€ 8	€ 0.1
Vet General	Herd Test	Annual	1	0.01	€ 850	€ 7.1
Vet Vaccines	Salmonella	Shot	170	1.42	€ 1,071	€ 8.9
Vet Vaccines	BVD	Shot	170	1.42	€ 612	€ 5.1
Vet Vaccines	Lepto	Shot	170	1.42	€ 408	€ 3.4
Vet Vaccines	IBR	Shot	170	1.42	€ 408	€ 3.4
Vet Vaccines	Rotavirus Vaccine	Shot	120	1.00	€ 936	€ 7.8
Vet Vaccines	Calves RSV-PI3 intranasal	Shot	25	0.21	€ 138	€ 1.2
Vet Vaccines	Calves IBR Live injection	Shot	50	0.42	€ 120	€ 1.0
Vet Vaccines	Calves Clostridial	Shot	50	0.42	€ 50	€ 0.4
Vet Vaccines	Calves RSV-PI3 Injectable	Shot	50	0.42	€ 325	€ 2.7

Another category under the variable costs section is purchased concentrate.

This accounts for all concentrate fed to cows and replacement stock. It also includes the cost of dry cow minerals and the cost of two silage samples taken annually for analysis.

The allowance of concentrate per cow is 800kg fresh weight and this figure is calculated based on utilizing 11t DM/ha of grass (growth of 12.9 ton DM/ha at 85% efficiency). The total calculated figure for this category is €332 per cow per year.

Examples of fixed costs

Under the fixed costs section, for example, Machinery Running and Repair. All costs associated with machinery were included here, for instance a tractor service plus a front and rear tractor tyre replaced annually.

The total average cost for machinery running and repair amounted to €59 per cow per year.

Machinery Depreciation is the next example that is outlined under fixed costs.

In order to work out a realistic figure for a farm of this size, a list of machinery that would be typical on a farm of this size and their net values were compiled,

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showing a depreciation value of 10% deducted each year. If any machinery is brought going forward, this will also be added in. The machinery depreciation figure works out at €94 per cow per year for this herd.

How can dairy farmers make use of the BoQ?

It is important to say that the figures generated in the BoQ, Bill of Quantities, are not 'target' levels per se, but are a reference point for individual farmers to start looking at their own input costs. Some years will understandably see higher repair costs for example, but the figures generated by the BoQ give a good approximation based on several years.

The first step in utilising the BoQ tool therefore is that dairy farmers compile their own figures for their farm and input them into the Teagasc Profit Monitor system.

This can be completed by the farmer's advisor or the farmer themselves. A number of different reports can then be generated.

The Consolidated Dairy Report is one such report and this can be used to benchmark and compare your figures with the BoQ figure on a per cow basis.

The BoQ may not be exactly right for your farm but can be used as a guide or an indicator. The comparison can be made on usage units, units per cow and €/cow.

If your figure is higher or lower than the BoQ figure, you can drill down and explore the differences. Is it unit rate or price?

The BoQ may also create a good discussion around category costs between you and your advisor or within a discussion group setting.

For example, under Breeding and Artificial Insemination (AI), the comparison can be made between using all AI as opposed to using AI at the start of the breeding season and then using a bull to mop up. How much straw is used for bedding? How do contractor charges compare?

Future developments

The BoQ tool will be updated annually in the autumn of each year to reflect the prevailing market price per unit of each item. By and large, the usage units should remain static unless there are policy changes e.g. change with the derogation.

This will allow the effect of price changes to be disaggregated from changes to input levels, creating a dairy inputs price index over time.

It is also planned to work on other scenarios, where the farmer is contract rearing replacements for example, or for a fully leased farm with 100% paid labour; the same process will help show how these situations impact on overall costs.

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Table 2: Purchased concentrate

Category	Line Item	Unit type	Usage units	Units/cow	Totals	€/cow
Total Concentrates			**103.5**	**0.86**	**€ 39,810**	**€ 331.8**
Dairy Concentra 14% Dairy		Tonnes	96	0.80	€ 35,520	€ 296.0
Youngstock Con Replacements		Tonnes	7.5	0.06	€ 2,625	€ 21.9
Dairy Concentra Dry Cow Minerals		Tonnes	1	0.01	€ 1,500	€ 12.5
Dairy Concentra Standard Silage sample		Samples	2	0.02	€ 70	€ 0.6
Dairy Concentra Mineral Silage Sample		Samples	1	0.01	€ 95	€ 0.8

Table 3: Machinery running and repair costs.

Category	Line Item	Unit type	Usage units	Units/cow	Totals	€/cow
Total Machinery running					**€ 7,044**	**€ 58.7**
Machinery Running	Tractor Sercice	Annual	1	0.01	€ 700	€ 5.8
Machinery Running	Tyre Repair & Call Out	Per call out	2	0.02	€ 226	€ 1.9
Machinery Running	Rear tractor tyre	Tyre	1	0.01	€ 730	€ 6.1
Machinery Running	Front tractor tyre	Tyre	1	0.01	€ 470	€ 3.9
Machinery Running	Car trailer tyre	Tyre	2	0.02	€ 210	€ 1.8
Machinery Running	Grease cartridges	Per Cartridge	5	0.04	€ 29	€ 0.2
Machinery Running	Quad service	Annual	1	0.01	€ 300	€ 2.5
Machinery Running	Petrol for Quad	Litres	480	4.00	€ 835	€ 7.0
Machinery Running	Disc blades for disc mower	Per disc	12	0.10	€ 24	€ 0.2
Machinery Running	Vacuum Pump Oil	Litre	10	0.08	€ 50	€ 0.4
Machinery Running	Tractor Insurance	Annual	1	0.01	€ 550	€ 4.6
Machinery Running	Fuel	Litres	1200	10.00	€ 1,200	€ 10.0
Machinery Running	Repairs	Annual	1	0.01	€ 500	€ 4.2
Machinery Running	Quad Insurance	Annual	1	0.01	€ 220	€ 1.8
Machinery Running	Machinery Maintenance	Annual	1	0.01	€ 1,000	€ 8.3

Table 4: Depreciation

Machinery (net of salvage)		Depreciation @ 10%	Depreciation / Cow
Tractor with Loader (100hp)	45000		
Slurry Tanker	14000		
Slurry Agitiator	5500		
Fertilizer Spreader (1 Tonne)	5000		
Disc Mower (8ft)	7000		
Trailers (Cattle Box 12ft x 6ft)	6000		
Trailers (Bale 24ft)	6500		
Trailer (Twin Axle Jeep Trailer, 8ft x 4ft)	3000		
Quad	6000		
Sprayer	3000		
Other Equipment - Bale Handler	1300		
Other Equipment - Shear Grab	2000		
Other Equipment - Post Driver	2000		
Other Equipment - Tractor Loader Fork	1000		
Other Equipment - Tractor Loader Bucket	1000		
Other Equipment - Generator (New 33KVA	5000		
Total	€ 113,300.00	€ 11,330.00	€ 94.42

Conclusions

The BoQ is a tool that lists all of the inputs and costs for a typical dairy herd run to best practice protocols. It separates the effect of price and usage rates for each input to allow farmers compare their own situation on a per cow or per litre basis. To make the most of the BoQ, the farmer should have their own figures completed for their farm and then benchmark these figures against the BoQ with the help of their advisor. If there is a large variance, then the farmer and the advisor can do a comparison of the actual inputs the farmer is purchasing against what is required. It should also create a platform for a good discussion in a discussion group setting. For further information contact your local Teagasc advisor.

Grazed grass drives profitability

Input costs have risen dramatically in recent years. Rates of use vary greatly between farms. The result is a wide range in the profitability of dairy businesses. The more profitable producers are better at utilising grass

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From 2014 when quotas were abolished to 2020, year-to-year variability in farm profitability was mainly determined by the milk price/litre. Costs were more or less static; agri-inflation very low.

This changed abruptly in 2022 driven primarily by the economic shock resulting from the illegal Russian invasion of Ukraine. Costs jumped by more than one-third (34%) to record high levels in a single year. This much-changed cost structure continued through 2023 and into 2024.

While production costs have risen for all farms, the variability in costs and profit between individual dairy farms has also increased significantly. Farmers responded to the new cost level and regulation pressures in different ways.

Let's take a look at the drivers of costs and profit using Teagasc Profit Monitor results from 2023 and 2024.

Trends in dairy costs 2023-2024

The profit trends shown are based on data from a cohort of 780 farmers within the Teagasc Profit Monitor system, who have multiple years' data completed, and had full variable and fixed cost data submitted for 2023 and 2024.

Note that the average costs and margins for this group should not to be taken as representative of national averages, however the objective is to illustrate trends and relationships for the wider dairy farm population.

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Farms were ranked based on net profit per hectare (whole farm) and the top 10% and bottom 10% were grouped together for comparison (i.e. 78 farmers per group).

Figure 1 shows the variation in profit between the top 10% and bottom 10% of farms.

For a standard 40Ha farm the difference in profitability between the top 10% and the bottom 10% is €127,400 or €3,185/Ha. As already mentioned, the degree of profit variability across farms has grown as costs and milk price have increased.

From a business planning perspective, using 'average costs' is no longer sufficient. It is essential for individual farms to complete their own cost benchmarking to establish their performance relative to the average and range.

So, what physical characteristics underpin these differences? The lowest-profit farmers were less heavily stocked on a whole farm basis compared to the top 10% but had similar stocking rates on the milking platform (Table 2).

Annual concentrate feeding was similar across the high, average and low profit categories; however, the top 10% profit farms delivered 90kg MS/cow more than the bottom 10%.

Increasing grass utilized per hectare through more pasture intake per cow drove productivity on the top 10% farms. With no additional feed cost, more grass utilised delivers increased profitability.

This gross output benefit from grass accounted for 68% (more than two-thirds) of the profit difference between the top and bottom 10% (Figure 3). This was higher than in 2023 when gross output accounted for 52% (just over half) of the variation in profit, reflecting higher milk prices received in 2024 compared to 2023. This trend is likely to continue into 2025.

It is important to avoid a potentially misleading conclusion from this data. Namely that 'higher output drove higher profit'.

On the contrary, when we examined the direct relationship between output and profitability, it accounted for only 3-4% of farm-to-farm differences in profit. It's how the higher output is achieved which is key.

The differences between high and low profit farms were delivered entirely from additional pasture consumed. The top 10% herds consumed an additional 576 kg of grazed grass per cow, or 1.57kg DM/cow/day.

This is reflected in both the grass utilized per hectare and the net pasture per cow (Figure 2). It is essential that output of milk solids is driven by maximizing pasture eaten.

Relying on purchased feed supple-

Table 1: Cost changes from 2020 to 2024 on a cent per litre basis

Year	Gross Output	Supplement Feed	Contract	Fert	Total Dep	Land Lease	Total Costs	Net Profit
2020	39.1	5.7	2.5	2.5	2.3	1.3	26.1	13.0
2021	45.3	6.4	2.5	2.7	2.5	1.4	28.2	17.0
2022	65.4	9.0	3.1	5.2	2.8	1.5	36.4	29.0
2023	48.8	9.2	3.5	3.8	3.0	1.8	37.6	11.1
2024	57.8	9.3	3.8	3.0	3.0	2.1	37.9	19.9
Ave 24-20	**51.2**	**7.9**	**3.1**	**3.4**	**2.7**	**1.6**	**33.3**	**18.0**

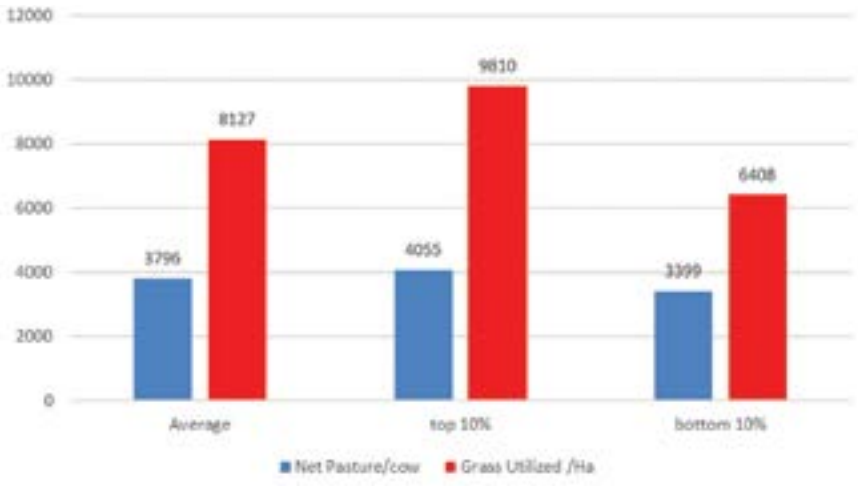
Figure 1. Profit comparison for 2024 based on profit ranking per ha

Table 2: Physical performance of dairy farms ranked by margin per hectare.

	Farm Stocking Rate (MPSR*)	Cows	Milk Solids kg/cow	Milk Solids kg/ha	Conc. fed €/Cow	Conc. fed Kg cow	Forage purchase €/cow
Average	2.14 2.89	154	485	1,040	483	1,274	47
Top 10%	2.43 2.92	152	522	1266	478	1,259	45
Bottom 10%	1.90 2.71	134	431	819	475	1,251	62
Diff	0.53 0.21	18.8	91	447	3.09	8.13	-17.0

Milking platform stocking rate

Figure 2. Net pasture and grass utilized per ha



ment (concentrates) to boost output will adversely change cost structures, limiting or reducing profitability.

Cost control remains a significant issue on dairy farms. While there will always be differences between farms based on their stage of development and structures, the average difference in costs between high and low margin farms in 2024 was €387/cow or €38,700 per 100 cows.

This range in costs must be examined and any significant variances explored. To aid in establishing what the appropriate cost structure may be for a given farm, Teagasc has developed a cost model that quantifies levels of inputs across each cost item on farm. This 'bill of quantities' can be used in conjunction with a farm's own profit monitor reports to identify and address cost issues (see also article by Padraig O'Connor, page 18).

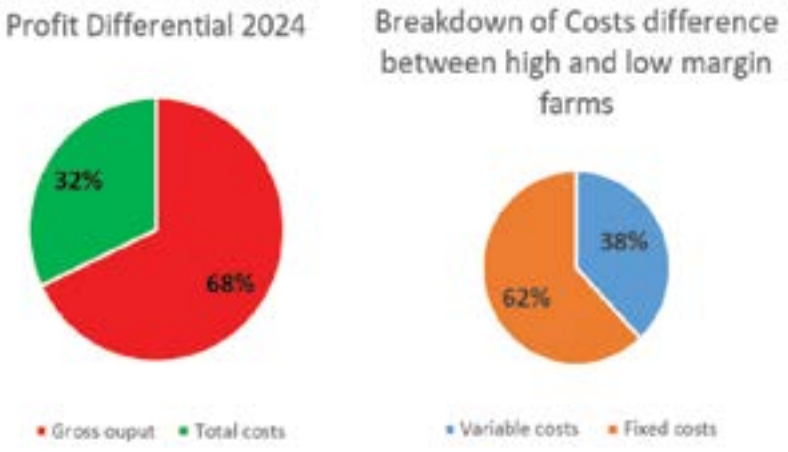
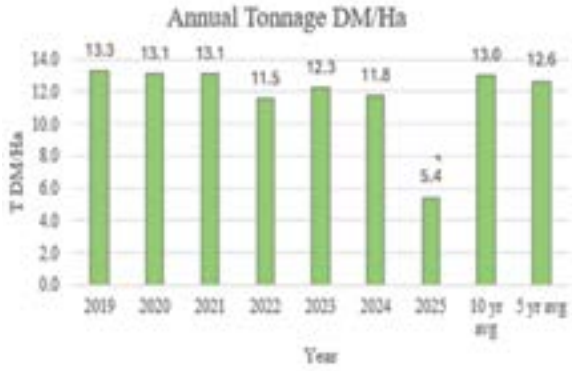


Figure 3. Source of difference High v low margin farms



Conclusions

More pasture utilised, converted to improved levels of milk solids production, and aligned with good cost control, will deliver better financial returns for dairy farmers.

Consistent with many previous studies, the data show that concentrate feeding level, and indeed milk output per cow per se, are relatively poor predictors of farm profit.

For extra milk solids to contribute to higher margins they must come from better pasture intake in the paddock, and not simply additional concentrates. On that basis, the details on how better pasture utilisation and cost control are achieved tactically (day-to-day decisions) and strategically (annual farm system decisions) should be in constant focus to drive cost competitiveness and profitability.

More farms can and should conduct close examination of costs and inputs usage on a line-item basis.

> Relying on purchased feed supplement to boost output will adversely change cost structures

Summary

- The rate of increase in farm input costs has accelerated in recent years, driven by unit price increases and greater input usage on dairy farms
- Feed budget costs have increased significantly while pasture utilisation has been declining (see grass growth chart). Given the strong link between pasture utilisation and farm profit, this trend must be reversed
- Compared to farms with low net margins, higher margin farms utilise more pasture to produce extra milk sales for no increase in supplement fed.
- Higher margin farms have lower variable and fixed costs indicating better cost control across a range of categories. Differences in labour costs were minor.

Grass growth in 2022, 2023 and 2024 was, on average, below the 10 year figure. This contributed to reduced grass utilisation. Grass utilisation is a key driver of profitability. Fortunately, grass growth in 2025 is already ahead of long-term averages.