Improving soil fertility and protecting water quality

A guide for dairy farmers

SUPPORTING PROFITABLE AND SUSTAINABLE DAIRYING

OCTOBER 2017

Dairy Sustainability Ireland
Profitable and Sustainable Dairying

Increasing profitability is a key goal of every dairy farmer. While grass is the cheapest feed we can produce for our livestock we are not getting the most from our grassland because of poor soil fertility. Research by Teagasc has shown that only 10% of Irish farms are at peak soil fertility - if this fertility level were increased, significantly greater farm income can be achieved.

Soil fertility needs a focussed approach where nutrients are applied in a targeted way rather than as done traditionally. In this way farmers can significantly improve grass growth and significantly improve farm income.

There is an added bonus - if nutrients are applied where they are most needed on the farm, they are more readily absorbed in the soil and do not end up in streams, rivers and lakes.

Likewise, better farmyard management to prevent nutrient leakage and discharge will also protect clean water sources.

The core message is a simple one - better nutrient management will improve soil performance, and farm profitability protect local water sources and improve environmental performance.

With the publication of this guidebook, we ask that farmers apply the approaches and recommendations in relation to soil fertility improvement and better farmyard management.

“Irish dairying lays claim to the unique advantages of a temperate climate, rich soil and clean water. Together they create the perfect conditions for grasslands which feed our dairy herds.”

SOIL FACTS

ONLY 10% OF IRISH SOILS ARE AT OPTIMUM FERTILITY

62% POOR LEVELS OF PHOSPHORUS

55% POOR LEVELS OF POTASSIUM

62% WERE BELOW THE OPTIMAL pH LEVEL OF 6.2

2015 Teagasc Research
Soil Fertility

The Benefits
Better soil fertility will support milk expansion, improve farm income and enhance environmental performance on the farm.

1 MILK EXPANSION
Irish dairy farmers’ biggest cost advantage is grass. It is the cheapest feed we can produce. Our focus should be to grow as much as we can.
A deficiency in any one of the key nutrients nitrogen (N), phosphorus (P) and potassium (K) will impact grass growth and farm income.

<table>
<thead>
<tr>
<th>Average farm</th>
<th>Top 10% performing farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture growth (t DM/ha)</td>
<td>10-12</td>
</tr>
<tr>
<td>Grass utilisation (tons DM/ha)</td>
<td>8.3</td>
</tr>
<tr>
<td>Milk solids (kg/ha)</td>
<td>894</td>
</tr>
</tbody>
</table>

2 IMPROVE FARM INCOME
Figures produced by Teagasc have shown that a total annual investment of just €120 per hectare in more targeted fertiliser application and in bringing soil pH to optimum levels will result in increased yields worth €360 per hectare, per annum. This could generate increased income of over €42,000 for the average 35 hectare farm over a five year period.

<table>
<thead>
<tr>
<th>35 Ha Dairy Farm at low soil fertility</th>
<th>/ha / year</th>
<th>For entire 35 Ha farm over 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in Phosphorous, Potassium and Lime</td>
<td>€120</td>
<td>€21,000</td>
</tr>
<tr>
<td>Value of extra grass (2 tonnes /ha)</td>
<td>€361</td>
<td>€63,175</td>
</tr>
<tr>
<td>Profit</td>
<td>€241</td>
<td>€42,175</td>
</tr>
</tbody>
</table>

If the right steps are taken to improve sub-optimal soil fertility and pH, involving targeted fertiliser application and appropriate lime spreading, a 35 hectare grassland dairy farm could generate up to €42,175 in additional farm income over five years.

3 ENVIRONMENTAL PERFORMANCE
Once spread, fertiliser and manure are either absorbed by soil and plants or lost to air and water. Our goal should be to maximise the utilisation of nutrients whilst minimising losses. Correct pH with lime application will ensure that nutrients applied are better utilised.
- Avoid spreading fertiliser on wet soil or ahead of heavy rain.
- Use slurry in spring in good conditions.
- To achieve high levels of productivity while minimising losses requires that a detailed nutrient management plan be prepared and implemented.

“For every €1 invested in building up soil fertility, you can get a minimum return of €3 over 5 years.”
Teagasc has developed a simple **FIVE-STEP PROCESS** to follow to help achieve optimal soil fertility.

1. **CARRY OUT A SOIL TEST**
   If you don’t know what nutrients are in the soil you can’t know how much extra nutrient it needs. Soil testing allows your fertiliser programme to be tailored to the specific needs of the soil and grass growth. Regular analysis is critical to monitor the effectiveness of the fertiliser strategy.

   **TIP**
   For effective nutrient management, take soil samples for all your land once every 3 years.

   **SOIL SAMPLES SHOULD BE TAKEN BETWEEN OCTOBER AND FEBRUARY AND PRIOR TO FERTILISER APPLICATION IN SPRING**

   **TIP**
   Take a soil sample every 4 hectares.

2. **SPREAD LIME**
   The optimum pH level for grass is 6.3. This level will increase the microbiological activity of the soil and help maximise the nutrients applied in fertilisers. A sub-optimal pH level costs money in wasted fertiliser. Spreading lime to improve soil pH generates better grass growth and additional farm income.
CORRECT THE P AND K LEVELS

Once the pH level is corrected, phosphorus (P) and potassium (K) need correction. Aim to have P and K in all fields in Index 3. The Soil Index system divides soils into four levels and indicates the expected response to nutrients applied.

Index 1 is highly responsive while Index 4 is unresponsive. Soil Index 3 is considered the optimum index for production, as it is in this range that the soil fertility level is considered sufficient for good grass growth.

Soil Index | Index Description | Response to Fertiliser
---|---|---
1 | Very low | Definite
2 | Low | Likely
3 | Medium | Unlikely
4 | Sufficient | None

USE SLURRY WHERE POSSIBLE

Cattle slurry is a valuable source of nitrogen, phosphorus and potassium. The proper use of slurry can reduce fertiliser costs with more slurry being applied on grassland in early spring when nitrogen utilisation is highest.

Knowing the actual nutrient content of your slurry can be helpful. A once a year laboratory analysis of slurry can offer a useful guide.

Target fields with low P and K levels and high requirements like silage.

IF YOU DON’T KNOW YOUR BASE LINE SOIL FERTILITY, SPREADING FERTILISER IS A WASTE OF MONEY

BALANCE SLURRY WITH COMPOUND FERTILISER

Over-supplying one nutrient will be negated by the lack of adequate levels of another nutrient. Fertilisers should complement the remaining nitrogen, phosphorus and potassium in the soil as determined by soil test results.

On grassland farms, nutrient applications must also be adjusted for the nutrients supplied in slurry derived from silage and compound feeds.

FACT

62% OF IRISH SOILS ARE SUB-OPTIMUM FOR pH

For further information on soil testing services or nutrient and fertiliser advice contact your milk processor’s farm advisory team.
Farmyard Management

Farmers should view farmyards as a significant resource in terms of animal manure whilst also posing an environmental threat.

Animal waste or organic manure has a real value as a fertiliser and a source of nutrient on the farm. Therefore it is important for farmers to properly store organic manure to minimise nutrient loss.

Poor quality slurry storage can result in discharge into watercourses. This can result in farmers being subject to fines and other penalties as well as putting their neighbours’ livestock and domestic wells at risk.

Not only can these threats be eliminated through good farmyard practice but farmers can profit financially.

Teagasc has developed this simple five-step guide to protecting water quality.

1. **SEPARATE**
   All soiled water and slurry must be kept separate from rainwater. Ensure that all dairy washings are collected, stored and spread correctly. Make sure all gutters are working and rainfall is diverted away from soiled water/slurry. Keep soiled water/dairy washings out of slurry tanks. Keep concrete areas clean so that rainfall on these areas is not mixing with soiled water/slurry.

2. **MINIMISE**
   Keep soiled water to a minimum – reduce, reuse, recycle where you can. Keep the rain out by roofing areas that will create soiled water. Avoid soiling yards where possible by keeping livestock off them when you can. Ensure that all areas that farm machinery cross are cleaned regularly. When silage pits are in use clean these exposed concrete areas daily/weekly.

### COMPOSITION OF ORGANIC MANURE

- **N** 12%
- **P** 19%
- **K** 69%
CONTAIN

The farm must have sufficient capacity to store and manage all slurry, soiled water, effluents and manure. Ensure that all manure is contained and that no seepage can occur from defects in manure storage structures. Effluents collected on the concrete yards where cattle feed or stand before and after milking must be contained, stored and landspread correctly. Farm roadways should be cambered away from any waterbody.

MAINTAIN

Ensure there are no defects in soiled water/slurry tanks, and other manure storage structures. Silage pit floors and channels must be crack-free with all joints sealed. Drains, channels, pipes, chutes and gutters need to be kept clear and in good condition to ensure clean and dirty water are kept separate.

SPREAD CAREFULLY

Spread slurry, soiled water, effluents, manure and fertilisers accurately and evenly and in accordance with your nutrient plan and Teagasc and Fertiliser Association of Ireland guidelines.

Slurry Spreading Guidelines

Slurry should be applied at the start or during the growing season when plants require the nutrients. For hay or silage crops spread cattle slurry 33m³/ha (3,000 gals. per acre) in one application. When spreading slurry remember;

- Keep 10 metres from water courses
- Keep 100 meters from wells
- Do not spread on hedgerows
- Do not spread when heavy rain is forecast
- Do not spread when soils are saturated
- Do not spread when soils are frozen

Fertiliser Spreading

Use Teagasc recommended levels which take account of the availability of soil N. Avoid fertiliser application during extended drought periods.
Ireland’s dairy industry established Dairy Sustainability Ireland in 2016 to provide industry leadership to the issue of sustainable dairy practices.

Dairy Sustainability Ireland is a pro-active industry led, whole of sector and whole of Government partnership which is working to develop and implement new approaches to dairy farm sustainability both economic and environmental.

A Working Group on Dairy Economic and Environmental Sustainability has been established with membership drawn from the key sectoral and industry stakeholders including Bord Bia, the Co-ops, the Department of Agriculture, Food and the Marine, the farm organisations-ICOS, IFA, ICMSA, and Macra na Feirme, the National Dairy Council and Teagasc.

This guidebook offers advice in relation to the simple and low cost steps farmers can take to achieve better soil fertility and nutrient management to improve the economic and environmental sustainability.

MORE DETAILED INFORMATION ON THE SPECIFICS ARE AVAILABLE FROM TEAGASC OR YOUR DAIRY PROCESSOR.