Grassland Renovation

This paper looks briefly at the issues which need to be considered when adopting grassland renovation programs using direct drilling, slot seeders and overseeding harrows. It looks at assessing the sward condition, a field’s suitability to renovation and the issues to consider before proceeding with any renovation technique.

Farmers know that maintaining a high percentage of productive species in the sward is critical to optimising the efficiency of forage production. Full reseeds are not always practical due to soil type, economics, time pressure or limitations of soil type and structure.

Over the last 20 years machinery manufacturers have developed a range of machines suitable for renovating grassland, this has greatly increased the area sown using surface seeding and direct drilling techniques. To give an example of the potential, recent trials produced a 34% increase in yield at 1st cut in the season following the overseeding of a four year old sward immediately after 1st cut season the previous year.

These systems are not as reliable as conventional reseeding and are only effective if done well, as part of a planned approach. Other than potential yield improvements, there are many potentially attractive benefits:-

- Reduced establishments cost.
- Less risks of soil erosion.
- Reduction in time out of production.
- Some drills will work when it is too dry to plough.
- You can establish grass while maintaining good soil structure on unstable soils, such as heavy clays & organic soils.
- Ideal for shallow or rocky soils.
- Re-established sward is more poaching resistant.

1.0 SWARD HEALTH CHECK

It is vital to identify the reasons behind old sward deterioration before deciding to reseed or overseed. Many things may contribute towards the deterioration. These need to be identified and rectified before going further. There are a number of factors to consider:

- % of Productive Grasses
- % of Weed Species
- Soil Structure
- Soil pH & Nutrition
- Original Mixture Sown
- Original Establishment
- Pests & Disease
1.2 PERCENTAGE OF PRODUCTIVE GRASSES

It may seem obvious, but it is surprising how often fields under perform yet contain an appropriate proportion of cultivated species and even retain good sward density. If sward composition is dominated by productive species (>70%), then over seeding or direct drilling as part of a renovation program is unlikely to rectify poor sward performance - Other causes for poor production need to be investigated, though it may well be appropriate if you are trying to redress the balance between grass and clover, where one species is out of balance in the sward. - Where productive grasses or clovers are in a minority, seeding should be considered.

1.3 LEVEL OF WEED SPECIES

Analysis of sward composition can also highlight other problems: The presence of competitive perennial grass weeds like Couch Grass, Black Bent can seriously limit the success of establishing seedlings by direct drilling or surface seeding. In these cases sward destruction is necessary.

High populations of some invasive broad-leaved weeds like Creeping Buttercup, Docks, Thistles and Chickweed need to be destroyed prior to over seeding.

CAUTION There is normally a period after spraying when seeds cannot be sown due potential interaction between the herbicide and establishing seedlings. Check herbicide manufacturer’s recommendations.

1.4 SOIL STRUCTURE

The soil is a growing medium made up of air, water and nutrients - The nutrients are in the form of soluble and insoluble minerals from both the soil mineral content and the organic matter. The availability of air, water and nutrients to plants is strongly affected by soil structure. More yield potential is probably locked up by poor soil structure than by any other cause - Compacted soil structure is the equivalent to having your jaw wired up.

Ploughing, cultivating and poaching, all cause major damage, but each can be corrected. To check soil structure, use a ‘Compaction Meter’ or dig a hole. The levels that are, most difficult to dig through, will be compacted. They also present, as predominantly horizontal fracturing in a dry profile. Healthy soil structure appears well fissured, both vertically and horizontally. Looking at the root depth will also be an excellent indicator of problems, shallow roots showing poor penetration of the soil.

Improving soil structure will improve drainage, increasing the amount of air in the soil. This accelerates activity of soil flora and fauna improving the availability of nutrients. Root growth is enhanced allowing plants access to more nutrients and drought tolerance is radically improved. Appropriate machinery to rectify soil structure problems is detailed below. – Effective aeration releases about 25 Kg N/Ha.

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Table 1 Methods of Improving Soil Structure

<table>
<thead>
<tr>
<th>Depth Of Problem</th>
<th>Symptoms</th>
<th>Action</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>0-2cm</td>
<td>Hard Surface or Capping Sod Pulling</td>
<td>Harrow Comb</td>
</tr>
<tr>
<td>Shallow</td>
<td>0-10 cm</td>
<td>Hard Surface, Poaching Sod Pulling</td>
<td>Spike Aerator</td>
</tr>
<tr>
<td>Deep</td>
<td>0-25 cm</td>
<td>Poaching/Shallow Plough Pan</td>
<td>Tined Aerator</td>
</tr>
<tr>
<td>Deep</td>
<td>20-40 cm</td>
<td>Plough pan</td>
<td>Subsoiler/Flat Lift</td>
</tr>
</tbody>
</table>

* Tined Aerators & Subsoilers are most effective when the subsoil is dry. In wet conditions, little fracturing takes place because the soil is plastic. Both methods may be effective in dry springs.

1.5 SOIL NUTRITION

Sowing grass mixtures is a long-term investment. A fields’ nutrient status should be analysed prior to any operations. The surface layer, key to renovation techniques, is often the most ‘acidified’ especially where high rates of fertiliser N have been used. pH and any nutrient deficits should be corrected prior to sowing.

Traditional ‘Major Nutrient’ analysis must be done as a key diagnostic tool. More detailed broad spectrum analysis and ‘Albrecht’ type analysis should be seriously considered especially where sward composition and soil structure appears to be good, but productivity is still disappointing. This type of analysis, in conjunction with expert interpretation can give detailed information on nutrient availability and identify appropriate nutrient levels for the soil type as well as the risk of restricted nutrient availability due to imbalances of minerals in the soil.

1.6 ORIGINAL MIXTURE

It is important to keep records of the mixtures sown in any field. Poor production may be caused through selecting a mixture that was inappropriate for the field current use. The varieties sown may lack persistence or exhibit other problems: Palatability, summer growth, rust resistance. – The wrong mixture may have been chosen, but often farm strategy may have changed and field use altered, for example: from silage production to extended grazing.

1.7 ORIGINAL ESTABLISHMENT

The original establishment, especially if there were problems, may also influence the longevity and quality of the sward. This will normally present as a high proportion of weed grasses. It is very rare for a poor reseed to come good at a later date.

1.8 SWARD HEALTH CHECK – SUMMARY

If all the above factors have been considered, pasture renovation can be considered. It is important at this stage to plan what should be done and when. To help with this process it is important to understand the pitfalls:
2.0 THE PIT-FALLS OF GRASSLAND RENOVATION

There are challenges in establishing grass into existing swards all methods require similar, perfect conditions for optimum success:

- Weather
- Soil Conditions
- Sward Conditions

2.1 WEATHER

All renovation methods are strongly influenced by soil moisture and temperature, they all require similar conditions. Drilling and slot seeding are slightly less dependent on surface soil moisture than overseeding with a comb harrow. Weather is therefore a strong influence.

2.2 SOIL CONDITIONS

Good seed:soil contact is imperative. All the drills rely on creating a mini tilth for the seed. This requires moist friable soil. In normal conditions it can be beneficial to roll the field firmly after sowing, though with the Moore Drill and some others, the drill coulter is followed by its own individual press wheel. Rolling in certain conditions can close the slot too much, preventing emergence.

**Avoid all methods in sticky soil conditions and extreme dry periods.**

3.3 SWARD CONDITIONS

All the techniques rely on an open sward which has either been recently cut, or very tightly grazed. **Ideally with sheep** – Not a species some dairy farmers welcome, but the recommendation emphasises how tight the grazing needs to be. None of the machines can drill through grass significant grass covers.

3.4 SWARD COMPETITION

Do not allow the existing sward to swamp the establishing seedlings. To allow the seedlings the best access to light:

- Do not apply nitrogen fertilizer in the preceding month.
- Graze for 7-10 days after drilling then withdraw stock as the seedlings emerge.
- Ideally, allow the grass to grow for a further 5-7 weeks then cut for silage or graze with cattle, if it is leafy autumn growth. Be very cautious grazing with sheep before the roots are well established, they can pull up the seedlings, especially of clovers, which they selectively graze.

3.5 PESTS

Established grass swards feed not only livestock, but also a wide spectrum of bugs which live in and on the soils surface. In most cases grass and clover have the ability to reproduce and grow much faster than the pests that eat them. These bugs also tend to feed mostly on the tender young shoots. **Sowing grass and clover as part of a pasture renovation programme is essentially risky.** You are establishing seedlings in an environment already populated by the species most likely to attack them. It is therefore important to understand the life cycle and feeding habits of these pests so that they can be avoided or the sward can be treated with chemicals which will limit the damage.

3.5 PESTS Continued
This section is divided into two: **Pests in Sward Deterioration** and **Avoiding Pest Damage when Reseeding**

### 3.5.1 PESTS IN SWARD DETERIORATION

In the UK there is one main pest, which causes radical sward deterioration, the Leather Jacket, larvae of the Crane Fly. There are others like Chafer Grubs, but they are less likely to be a serious problem.

In some seasons, massive populations of Leather Jackets can occur, grazing large patches in fields of established grassland in the spring. There are may sub species of Crane Fly, which lay eggs over a period from August to November. They favour long grass to lay their eggs on. For this reason, problems are less likely to occur where grass is grazed tight through the late summer & autumn period. Damage is most dramatic where compaction or poor drainage may cause shallow rooting. If overseeding pasture, that has been devastated by leather Jackets. Many farmers use a precautionary insecticide to limit further damage. Depending on the season and sub species of Crane fly, Leather Jackets keep feeding well into May after which the larvae will pupate and risk of damage is greatly reduced. It is clear that Organic Farmers are not safe to repair damaged swards until late May.

### 3.5.2 AVOIDING PEST DAMAGE WHEN RESEEDING

The best method of avoiding pests which hit seedlings is to do the job as well as possible and to avoid the time of year when high populations of the pests occur. This is again a particular issue for Organic farmers. In this situation, spring and early summer are the ideal periods for sowing. The table below details the species, the problem period and the species, which are effected. Conventional farmers can consider chemical control, especially of Frit Fly and Sitona Weevils in the August-October period. In damp conditions, slug control is a key issue, especially when using slot seeders and direct drills. **The slugs use the slot as a convenient roadway.**

<table>
<thead>
<tr>
<th><strong>Table 2</strong></th>
<th><strong>Main Problem Period</strong></th>
<th><strong>Species Effected</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slugs</strong></td>
<td>Cool we conditions particularly autumn &amp; winter</td>
<td>Clovers &amp; Grasses</td>
</tr>
<tr>
<td><strong>Frit Fly</strong></td>
<td>July – October</td>
<td>Italian &amp; Perennial Ryegrass</td>
</tr>
<tr>
<td><strong>Sitona Weevils</strong></td>
<td>July – October</td>
<td>Clovers</td>
</tr>
<tr>
<td><strong>Leather jackets</strong></td>
<td>March – May</td>
<td>Grasses &amp; Clovers</td>
</tr>
</tbody>
</table>
3.0 SEEDING METHODS

The objective of any seeding method is to facilitate effective soil seed contact to encourage access to moisture and nutrients, producing, rapid establishment. Slot Seeding, Direct Drilling and Overseeding all introduce seed into a challenging environment. The most important thing is planning, time and a good machinery operator. Main Methods of Introducing Seeds:

<table>
<thead>
<tr>
<th>Slot Seeder</th>
<th>Direct Drill</th>
<th>Harrow Comb Drill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aitcheson Seedmatic</strong> also Duncan Ec-Seed, Cross Slot Drill etc</td>
<td><strong>Moore Unidrill</strong> also Vredo, Kockeling, John Deere. Vaderstadt etc</td>
<td><strong>Fiona</strong> also Einbock, Opico etc.</td>
</tr>
</tbody>
</table>

Table below indicates a range of factors, which may influence which method is adopted:

Table 3 **Suitability of Seeding Methods**

<table>
<thead>
<tr>
<th></th>
<th>Slot Seeder</th>
<th>Direct Drill</th>
<th>Harrow Comb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Sward</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★</td>
</tr>
<tr>
<td>Thick Sward</td>
<td>★★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Uneven Ground</td>
<td>★★¹</td>
<td>★★¹</td>
<td>★★★</td>
</tr>
<tr>
<td>Stony Ground</td>
<td>★★</td>
<td>★★</td>
<td>★★</td>
</tr>
<tr>
<td>Fast establishing grass species</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
</tr>
<tr>
<td>Slow establishing grass species</td>
<td>★★</td>
<td>★★</td>
<td>★★</td>
</tr>
<tr>
<td>White Clover</td>
<td>★★</td>
<td>★★</td>
<td>★★★</td>
</tr>
<tr>
<td>Red Clover</td>
<td>★★★</td>
<td>★★★</td>
<td>★</td>
</tr>
<tr>
<td>Operating cost</td>
<td>£££</td>
<td>£££</td>
<td>£</td>
</tr>
<tr>
<td>Fool Proof</td>
<td>★</td>
<td>★</td>
<td>★★★</td>
</tr>
<tr>
<td>Slug Risk</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

It is appropriate to mention two other methods which are sometimes used:

3.2 SLURRY SEEDING

Pour seed into slurry before spreading. - It is potentially successful, especially with clover which is difficult to spread at low seed rates through drills. Research done in N.Ireland in the 1980s suggested that plant and tiller density of grasses greatly increased when seed was sown in slurry, but yield was not improved, possibly because there was no cultivation of the soil surface and seedling roots were

¹ Depending on machine available.
unable to penetrate the capped surface. If practiced, it should therefore be done in conjunction with either spike aerators or aggressive use of a harrow comb. - **Slurry does provide a moist medium for germination!**

### 3.3 INTRODUCING SEEDS INTO FEED

This has been successfully adopted by some farmers using sheep. Clover is included in feed when grazing. Two-three weeks later, stock are withdrawn having passed the seed through their ‘system’ and trodden in the seed. **Care must be taken not to graze with sheep again until the plants are well established.** It may also work with cattle, but the dung pats would need to be well spread with harrows, even then it would be in clumps!

### 4.0 MIXTURES FOR PASTURE RENOVATION

#### 4.1 GRASS

Because of the challenging nature of establishing seeds in pasture renovation systems, there is a temptation to only use very fast establishing Italians Ryegrasses or Hybrid Ryegrasses. These work well, but they tend to be relatively short-lived and therefore unsuitable long-term solutions. They are particularly non persistent under hard sheep grazing and very difficult to manage in cattle grazing systems.

It is most appropriate to sow mixtures, which are designed for the longer-term requirements of the field. So if you need a 5-year grazing mixture, that is what should be sown. The only restriction would be on the inclusion of slow establishing species, like Meadow Fescue and Timothy which are unlikely to establish in these more challenging situations.

If you are unsure of the duration of any particular grass or clover species, discuss your requirements with a seed specialist or refer to the chart ‘**Key Grass & Clover Species – Range of Persistence**’ at the back of this paper.

#### Grass Seed Rates for Pasture Renovation:

- <50% Ground cover of productive species in the sward sow 14 kg/acre (35 kg/Ha).
- >50% Ground cover of Productive species in the sward sow 10 kg/acre (25 kg/Ha)

#### 4.2 CLOVER

White Clover, though relatively slow to establish, are often effectively sown using pasture renovation techniques, particularly the Harrow Comb drills. Red Clover is more effectively established with direct drills & slot seeders.

It is important to allow an appropriate time for the crop to establish before introducing the grazing animal, especially sheep. They will selectively graze the establishing clover and kill it.

#### Clover Seed Rates for Pasture Renovation:

<table>
<thead>
<tr>
<th>Species</th>
<th>Clover % in Existing Sward</th>
<th>Sowing Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Clover</td>
<td>0-10%</td>
<td>1-1.5 kg/acre (2.5-3.75 kg/Ha)</td>
</tr>
<tr>
<td></td>
<td>&gt;10-30%</td>
<td>0.5-1.0 kg/acre (1.5-2.5 kg/Ha)</td>
</tr>
<tr>
<td>Red Clover</td>
<td></td>
<td>2.0-3.0 kg/acre (5.0-7.5 kg/Ha)</td>
</tr>
</tbody>
</table>
4.3 TIMING OF SOWING
Assuming adequate moisture and soil conditions for sowing, each species of grass or clover has an ideal sowing period. If you are unsure of the ideal sowing period of any particular grass or clover species, discuss your requirements with a seed specialist or refer to the chart ‘Ideal Sowing Dates - Key Grass & Clover Species’ at the back of this paper.

5.0 SUMMARY
This paper identifies areas to consider when adopting a pasture renovation programme. Firstly you must recognize the reasons for a swards deteriorated condition, rectify any soil problems which caused the problem and sort out any weed problems. Pasture renovation can be successful, but there are extra elements of risk associated with seeding into existing swards which must not be under estimated. If you plan well ahead and have a good understanding of when conditions are right results can be excellent. The key message is: ‘Do it properly or not at all’.

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