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GRASSLAND RENOVATION AND RESEEDING IN IRELAND

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SUMMARY

Approximately 3% of the utilised agricultural land is sown down to grass annually in Ireland. The merits of reseeding are well documented and recent work suggests that the main niche for sward renewal is in conservation rather than in grazing regimes. Ploughing and seed bed preparation by conventional means is the most reliable method of ensuring successful establishment. In the past, most reseeding was carried out in spring, but in recent years there has been a significant movement towards autumn sowing. Poor grass establishment in autumn can be due to many reasons, frit fly attack, poor seed bed and low fertility. Recent work suggests that late autumn sowing can cause, not only poor establishment, but also poor persistency in silage swards. If, for whatever reason, land cannot be ploughed, the swards can be rejuvenated by using specialist equipment to drill seeds into the native sward. Seeds are being placed in a hostile habitat and in order to be successful this direct drilling technique needs to be conducted with extreme care. Slurry seeding is a low-cost technique in which seeds are added to the sward through the medium of cattle slurry. Recent work suggests that this technique is moderately successful in maintaining productivity in *Lolium multiflorum* swards. *L. perenne* is the predominant grass used in sward renewal and there has been a significant movement towards more usage of mid-season maturing and tetraploid types of *L. perenne*.

Key words: Reseeding, *Lolium perenne*, direct drilling, slurry seeding.

THE NECESSITY FOR RESEEDING

The productivity of Irish agriculture is largely dependant on the produce from efficient grassland farming. Tillage crops account for approximately 9% of the utilised agricultural land with the balance of 91% consisting of grassland. Permanent pastures predominate in this country and many such pastures have relatively poor botanical composition (Culleton, 1989). Frame and Tilley (1988) pointed out that quantity and quality of

secondary grass species are inferior to *Lolium perenne*. The arguments for replacing these poor species with *Lolium perenne* by renovation or reseeding are well documented (Mudd, 1971; Andries, 1987). Wilkins *et al.* (1987) suggested that permanent pastures have high animal production potential and that the large responses to reseeding in the first harvest year are rapidly lost. The merits of newly reseeded pastures over poor, old pastures, under Irish conditions have been demonstrated by Conway *et al.* (1973) and McCarthy and Cullimore (1983).

Culleton (1989) compared old pasture to newly reseeded pasture under grazing and silage swards conditions. The botanical composition of the old sward at the commencement of the trials is given in Table 1. *Lolium perenne* content was 3.5% and these plants were distributed evenly throughout the sward. Soil fertility was improved and *Lolium perenne* was sown on September 1. Establishment was successful and over the following three years, both new and old swards were rotationally grazed.

TABLA 1

Botanical composition of the old sward in year 1 and end of year 3.

Composición botánica del pasto viejo en el 1er año y al final del 3er año.

	Year 1	Year 3 Grazing	Year 3 Silage
Lolium perenne	3.5	31.5	5.0
Agrostis tenius	40.0	26.3	18.0
Anthoxanthum odoratum	1.9	2.1	2.0
Cynosurus cristatus	3.3	0.5	3.0
Festuca rubra	2.3	0.8	3.4
Holcus lanatus	2.3	0.8	3.4
Poa annua	13.8	5.0	4.1
Poa trivialis	32.4	28.5	59.5
Poa pratensis	0.3	0.2	-
Trifolium repens	1.5	5.0	1.0

The results of the grazing trial are summarised in Table 2. In year 1, the old pasture produced 75% as much output in terms of liveweight gain/ha as the new pasture. However, by year 3, there were no significant differences between new and old pastures. The *L. perenne* content in the old pasture increased to almost 32% of the sward.

The results from the silage trial are summarised in Table 2. The old sward yielded 62%, 84% and 79% of the production from the new sward in years 1, 2 and 3, respectively. Table 1 shows that the botanical composition of the old sward at the end of the trial did not improve significantly at all. This is in marked contrast to the grazing trial, where significant improvements in *L. perenne* content occurred.

TABLA 2

Liveweight gains (kg/ha) and silage yields (kg DM/ha) from new and old pastures.

Ganacias de peso vivo (kg/ha) y producciones de silo (kg MS/ha) en praderas nuevas y viejas.

	Liveweight gains		
	Year 1	Year 2	Year 3
New Pasture	1145**	1258*	1205
Old Pasture	849	1091	1118
	Silage Yields		
New Pasture	14500**	13600**	12200**
Old Pasture	9300	11540	9670

The structure of the grazing and silage swards were significantly different at the end of the trial (Table 3). In the grazing sward some 97% of the tillers in the sward were *L. perenne*, while there was 75% *L. perenne* in the silage sward. There were also significantly more tillers/m^2 in the grazing sward. Ryan (1981) reported similar results. It appears that *L. perenne* prefers a frequent defoliation (grazing) regime to an infrequent defoliation (silage cutting regime). Even with good management the silage sward deteriorated over time.

TABLA 3

Structure of grazing and conservation swards after 3 years.

Estructura de las praderas de pastoreo y de ensilado después de 3 años.

	Lolium perenne	
	% in the sward	tillers/m^2
Grazing	97	11000***
Conservation	75	5500

It can be concluded that the main niche for reseeding is in the silage swards rather than in the grazing swards.

PLOUGHING AND RESEEDING

Traditionally, farmers seeded his land to grass by undersowing to a cereal in spring (Crowley, 1985). This practice is declining (Table 4). Undersowing was generally thought to be unsatisfactory by farmers (Crowley, 1983). The practice of continuous tillage was adopted and the necessity for constant reseeding of the tillage areas lessened. However, the amount of reseeding that was carried out remained constant, because the merits of grass to grass reseeding was seen by grassland farmers. Autumn reseeding suited their farming systems better than spring sowing. Thus, the practice of autumn reseeding is becoming more widespread.

TABLA 4

Change in timing of seeding operations (tonnes of seeds).

Cambio con el tiempo de las operaciones de siembra (toneladas de semillas).

Year	1981	1985	1991
Spring seeding	3359	3371	2542
Autumn seeding	529	1848	1884
% of total carried out in autumn	14	35	43

While autumn sowing can be highly successful and reliable, incidences of failure to establish satisfactorily have been widely reported. There are many reasons for poor crop establishment. Clements (1986) suggested that attacks by frit fly can have a serious effect on plant survival. Clements and Jackson (1989) demonstrated that spraying with glyphosate can improve establishment in autumn because the glyphosate leads to improved soil moisture at sowing and also leads to reduced numbers of frit fly (Table 5).

TABLA 5

Effect of applying glyphosate before ploughing.

Efecto de la aplicación de glifosato antes de labrar.

Treatment	Soil moisture at sowing, g water 100 g dry soil	No. of tillers/m drill row	Herbage yield 80 days after sowing (t $DM/_{ha}$)
Control	12.6	103	2.83
Glyphosate 5*	13.1	105	2.91
Glyphosate 20*	15.1	131	2.92
S.E.D.	0.65	5.9	0.12

Source: Clements and Jackson, 1989

Timing of sowing in autumn can also have a significant effect on crop establishment. In a trial carried out at Johnstown Castle, there were two dates of sowing, September 3 and October 4. Rainfall and temperatures during September, October and November of that year were similar to the 12 year means for those months. Seedling emergence and tiller counts were monitored in the months after sowing. The results are summarised in Table 6. Some 73.6% of the seedlings emerged from the early autumn sown seeds, while only 55.3% emerged from the later sown seeds. The numbers of tillers in mid-March were significantly lower in the later sown crop than in the early one. Yields in mid-March were also significantly lower. Lemaire and Culleton (1990) reported similar results. Silage swards tend to have lower tiller numbers than grazing swards, mainly because of light restriction at the sward base in silage swards (Garwood, 1969). Culleton *et al.* (1988) pointed out that persistency of silage swards is influenced by tiller numbers in that swards with low tiller numbers allow an invasion of unsown species, thereby reducing overall persistency. It can

be concluded that silage swards should have high tiller numbers at the onset of the growing season and therefore, when reseeding for silage it is important that the reseeding operations be carried out early in the autumn, so that tillering can proceed during winter.

Poor seed beds and low soil fertility can also lead to poor establishment (Culleton *et al.*, 1991).

TABLA 6

Effect of date of autumn sowing on establishment of *L. perenne*.

Efecto de la fecha de siembra en el establecimiento de L. perenne.

	September 3	October 4
Seeds sown/m^2	1030	1030
No. of seedings 6 weeks after sowing	760	570
No. of tillers in following March	7190	3110
kg DM/ha in March	913	478

DIRECT DRILLING

Conventional ploughing and seed bed preparation by harrowing is the most reliable method of providing an ideal habitat for the grass seed to germinate, appear about ground and tiller successfully. However, there are many soils in Ireland that cannot easily be ploughed e.g. slope is too severe, soil is too shallow or too stoney etc. Nonetheless silage swards in many of these situations have very poor botanical composition and would benefit from the introduction of *L. perenne*. The introduction of direct drilling equipment has given the opportunity of adding *L. perenne* into such swards without ploughing (Stafford *et al.*, 1978). Direct drilling involves using specialist equipment to install seeds into the top 2-3 cm of soil, and suppressing the native sward sufficiently long to allow the seedlings to emerge and establish successfully. There is little doubt that despite the advances made in direct drilling machinery design, the seeds are being placed in a very hostile environment. It is therefore critical that the management practiced before, during and after drilling is critical if failure is to be avoided.

Before drilling, it is important that any deficiencies in soil fertility, especially phosphorus and lime be rectified (Culleton *et al.*, 1991). The native sward must be suppressed by either taking a cut of hay/silage immediately prior to drilling or by using low rates of

herbicides. Culleton and McCarthy (1989) pointed out that cultivars of *L. perenne* can differ in their weights and in their rates of establishment (Table 7) and they suggested that cultivars that establish rapidly should be used when direct drilling.

TABLA 7

Rate of seedling emergence in *L. perenne*.

Velocidad de emergencia de plántulas en L. perenne.

Perennial ryegrass type	1000 seed wg (mg)	No of days for 1st tiller to appear	Plant wt. after 17 days (mg)	Leaf length (mm) after 17 days
Early	1.3	30	1.6	83
Intermediate	1.9	33	1.3	72
Late	1.6	37	0.9	55
Tetraploids	3.2	33	2.2	96
Diploids	2.2	33	1.5	63

Results from direct drilling trials carried out at Johnstown Castle are summarised in Table 8. It is clear that ploughing and reseeding in the conventional way gave significantly higher yields than those achieved by direct drilling. However, direct drilling plots significantly out-yielded the control plots. Stafford (priv. communication) found that when he introduced *L. perenne* into pasture by direct drilling the yields were significantly increased over control plots.

TABLA 8

Yields (kg DM/ha) from direct drilling trials.

Producciones (kg MS/ha) de ensayos de siembra directa.

	Year 1	Year 2	Year 3
Plough and Reseed	14700	13600	13200
Direct drilling	13800	12200	12500
Control	9300	9600	9400
L.S.D. ($P < 0.05$)	580	954	931

SLURRY SEEDING

Slurry seeding is a low cost system of rejuvenating swards by adding seeds to the swards through the medium of slurry. Gleeson and Corr (1973/1984) found most success with the more vigorous types of seed. Culleton *et al.* (1987) found that slurry seeding was moderately successful in maintaining yields of *Lolium multiflorum* over an eight year period (Table 9). The seed of *L. multiflorum* is large, and extremely vigorous in the establishment phase. Swards of *L. multiflorum* tend to be open, due to low tiller numbers (Table 9). Thus, it is relatively easy for the seed to make contact with the soil and to establish without undue interference from the native sward. Despite this the technique was only moderately successful. The chances of less vigorous seeds like *L. perenne* establishing in high density swards like old permanent pasture would have to be deemed as moderate to poor. Culleton *et al.* (1987) also noted that the technique was very weather dependent; in that dry weather after slurry seeding almost inevitably led to failure of the seeds to establish.

TABLA 9

Slurry seeding results and establishment parameters of *Lolium multiflorum*.

Resultados de siembra con purín y parámetros de establecimiento de Lolium multiflorum.

	Year				
	1	2	5	6	8
Control (t DM/ha)	18.4	15.5	12.1	11.1	10.8
Slurry seeding (t DM/ha)	18.4	16.7	14.8	13.7	12.8

	1000 seed wt (mg)	Plant wt 17 days after sowing (mg)	Tiller No./m^2 in established sward
L. multiflorum	3.2	2.5	2000
L. perenne	1.8	1.2	5500
L.S.D.	0.6	0.5	1000

Lolium perenne constitutes some 87% of all the agricultural grasses imported into Ireland, with *Lolium multiflorum* accounting for a further 8%. *Phleum pratense* and *Tri-*

folium repens make up the balance (Culleton and Cullen, 1991). *L. perenne* cultivars are classified according to their ear emergence dates, into early, mid-season and late heading cultivars. Table 10 shows that in the last decade there has been a significant movement away from usage of early to mid-season cultivars. Gilliland *et al.* (1991) reported somewhat similar results for N. Ireland. There has also been a steady increase in the use of tetraploid ryegrasses.

TABLA 10

Changes in usage in types of *Lolium perenne* from 1981-1991, expressed as percentage of total *L. perenne* usage.

Cambios en el uso de tipos de Lolium perenne en el periodo 1981-1991, expresado en porcentage del total de L. perenne utilizado.

	1981	1984	1988	1991
Early perennial	32	25	14	10
Mid-season	22	27	34	37
Late perennial	46	48	52	53
Tetraploids	18	20	29	30

There is conflicting evidence on the relative advantages of sowing pure swards over mixtures of species and/or cultivars (Donald, 1963; Trenbath, 1974; McBratney, 1978). Culleton *et al.* (1986) found that monocultures were neither significantly better nor worse than mixtures. In each year a different monoculture gave the highest yield, while the mixtures tended to give high yields each year. Mixtures were more yield stable than monocultures.

The general recommendation made by the Irish Advisory Service on mixtures are that silage mixtures should be made up of mainly mid-season ryegrasses, the minor component being early or late maturing types, depending on soil and local management conditions. Grazing mixtures should be made up of mainly late maturing grasses, with some early or mid-season grasses as the minor component, again depending on local conditions.

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RESIEMBRA Y RENOVACIÓN DE PASTOS EN IRLANDA

RESUMEN

Aproximadamente el 3 % de la superficie agrícola útil de Irlanda se siembra de praderas anualmente. Las ventajas de la resiembra están bien documentadas y trabajos recientes sugieren que el nicho principal para la renovación de praderas lo constituyen las dedicadas a la conservación de forraje más que las destinadas a pastoreo. El laboreo y la preparación de la cama de la semilla por medios convencionales es el método más seguro para conseguir el establecimiento con éxito. En el pasado, la mayoría de las resiembras se hacían en la primavera, observándose en años recientes un cambio hacia las siembras de otoño. Las dificultades para el establecimiento en otoño pueden deberse a varias causas: ataque de insectos, cama de semilla deficiente y baja fertilidad del suelo. Trabajos recientes sugieren que siembras tardías de otoño pueden dar lugar no sólo a un establecimiento deficiente sino también a una escasa persistencia en las praderas destinadas a ensilar. Si por cualquier razón la tierra no pudiera ser laboreada, las praderas pueden ser rejuvenecidas mediante el uso de maquinaria especial que introduzca las semillas en la pradera existente. Las semillas se sitúan en un habitat hostil, por eso la siembra directa debe ser realizada con extremo cuidado. La siembra con purín es una técnica de bajo costo en la que las semillas se distribuyen suspendidas en el purín de vacuno. Trabajos recientes indican que esta técnica tiene cierto éxito para mantener la productividad de praderas de raigrás italiano (*Lolium multiflorum*). El raigrás inglés (*Lolium perenne*) es la gramínea que predomina en la renovación de praderas, observándose una tendencia significativa hacia un uso cada vez más frecuente de variedades tetraploides de precocidad (de espigado) intermedia de *Lolium perenne*.

Palabras clave: Resiembra, *Lolium perenne*, siembra directa, siembra con purín.