Information Sources and Contacts

The following publications provide more details on Aber grass and clover varieties and are available from British Seed Houses (England and Wales) and David Bell Seeds (Scotland).

High Sugar Grass - the definitive guide to the new 'Aber' varieties developed by IGER for more efficient meat and milk production.

AberHybrid Ryegrass - pioneering varieties that harness together the best traits of Perennial and Italian Ryegrass.

AberClover Blends - a guide to 'Aber' white clover varieties bred by IGER.

Seed Mark and Seed Mark Organic - top quality grazing and silage mixtures including AberHSG, Aber Hybrid Ryegrass and other IGER-bred varieties for conventional and organic systems.

Acknowledgements

Major sponsors of IGER grass and clover research include BBSRC, DEFRA and the EU.

Animal response work in relation to High Sugar Grasses was progressed as part of a sustainable livestock production LINK programme, funded by DEFRA, Meat and Livestock Commission, Milk Development Council and Germinal Holdings.

Other data in this publication was reproduced from NIAB and SAC recommended lists.

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ABER® GRASS & CLOVER VARIETIES

British Seed Houses Ltd
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IGER

Contents

Achieving Modern Grass Breeding Objectives

The emphasis of IGER's grass breeding programme changed in the 1980s with the realisation that the nutritional quality offered by new varieties would become as important as dry matter yield, as Britain's livestock farmers looked to continue improving the efficiency of production from homegrown forage. Environmental issues have also become more important and now have a far greater bearing on the direction of grassbreeding at IGER.

As a result characteristics such as sugar content and digestibility became primary objectives, alongside other important targets such as extending the grazing season and improving dry matter production per unit of nitrogen.

Twenty years later the emergence of the first AberHSG varieties offering significantly higher water soluble carbohydrate content and increases in milk and meat production potential as a consequence, is evidence that the change of emphasis was both correct and effective. These varieties also make more effective use of nitrogen, addressing a key environmental objective. The fact that these varieties have also kept pace with more traditional breeding objectives including dry matter yield, persistency, cold tolerance and disease resistance is testament to the overall success of the breeding programme and underlines the relevance of these developments to the farming industry.

Most encouraging of all is the knowledge that the improvements in nutritional quality seen so far are just the beginning. Whilst the intermediate diploid AberDart HSG, for example, has been recognised as the outstanding herbage variety of its generation, it is certainly not a one-off. There are now recommended AberHSG varieties in late diploid and hybrid ryegrass categories, and the next generation offering even greater potential is now emerging.

The ability to integrate grass breeding programmes with animal performance trials has long been a major strength of IGER and this has certainly been key in recent years, as improved nutritional value has become an objective. This integrated approach will remain vitally important as future objectives are fine-tuned, with parameters such as the consistency of protein content, the stability of desirable fatty acids (such as linoleic acid) and other quality traits come into focus.

Dr Pete Wilkins
Manager of Grass Breeding, IGER

The Development of Aber High Sugar Grass

The Established Facts

There is now a bank of reserach evidence showing the significant animal performance benefits that High Sugar Grasses offer livestock farmers. Milk yield and meat production responses are a function of improved intakes and digestibility, plus the superior utilisation of grass protein that results from the higher readily available energy content of AberHSG grasses.

HIGH SUGAR GRASS FOR MILK PRODUCTION

- 6% more milk per cow over grazing season
- Dry matter intakes up by 2kg/head per day
- 3% improvement in diet digestibility
- 24% less feed nitrogen lost in urine

HIGH SUGAR GRASS FOR BEEF PRODUCTION

- Dry matter intakes increased by around 25%
- Higher forage intakes
- 20% higher daily liveweight gains
- Environmental benefit from reduced nitrogen pollution

HIGH SUGAR GRASS FOR LAMB PRODUCTION

- Higher forage intakes
- 20% higher liveweight gains
- 20% higher carrying capacity of HSG sward

Further details on these trials are contained in the booklet 'High Sugar Grass'.

Reference: SLP LK 0615

The Development of Aber High Sugar Grass

Strengthening the Case - Grazing

Data that strengthens the arguments in favour of the AberHSG phenomenon continues to emerge. The latest and arguably most comprehensive report yet comes from the jointly sponsored Sustainable Livestock Production, LINK programme, which features season long grazing trials conducted at IGER research farms using beef steers, lambs and dairy cattle.

Liveweight Gain (kg/d) in Beef Steers

Liveweight gain	AberDart	Control
First Year	1.12	0.95
Second Year	1.13	0.84

In dairy grazing trials the AberHSG variety AberDart produced very high mean milk yields, (31.7 kg/day of milk) from limited concentrate use (3 kg/day). The control variety in this trial showed similar levels of WSC and therefore produced a similar milk yield (31.6 kg/day). The control variety was the same in all three trials, but only showed this similar level of WSC in the dairy trial.

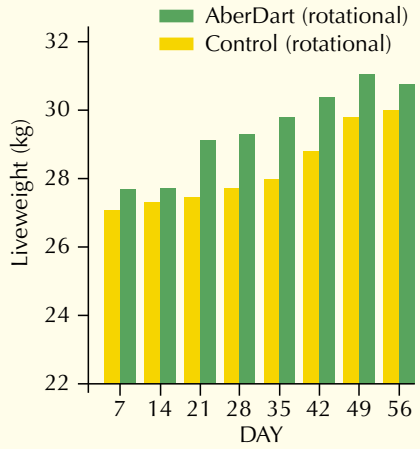
Strengthening the Case - Silage

Whilst the LINK study concentrates on the performance of AberHSG in a grazing context, other studies address the impact of High Sugar Grasses when ensiled. Recent research at IGER with beef cattle shows improvements in intakes and increases in the efficiency of rumen microbial protein synthesis when High Sugar Grass silage is fed.

Residual WSC in the HSG silage was 9.0% while that of the control variety was 5.5%. The higher WSC levels in the HSG silage led to the improved efficiency of feed N incorporation into microbial protein giving the potential to improve animal performance and reduce nitrogen excretion into the environment.

Reference: SLP LK 0638

Liveweight Gain (kg) in Lambs



Effects of Ensiled HSG

	HSG	Control
Intake		
Dry Matter (kg/d)	4.29	3.60
Organic Matter (kg/d)	3.95	3.33
Total Nitrogen (g/d)	93.1	91.3
Duodenal Flow		
Dry Matter (kg/d)	2.14	1.82
Organic Matter (kg/d)	1.67	1.34
Total Nitrogen (g/d)	96.2	74.9
Microbial Nitrogen (g/d)	63.2	41.7

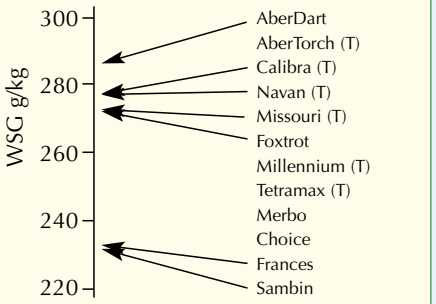
Source: Merry, IGER, 2003

AberHSG: Intermediate Perennial Ryegrass Varieties

AberDart HSG

AberDart HSG was the first AberHSG variety to appear on the NIAB, DARD and SAC recommended lists. In 2003 it became the first grass variety to win the prestigious NIAB Variety Cup for its outstanding improvement in quality. AberDart HSG is the highest yielding diploid ryegrass (NIAB 2003/4) with very good early spring growth, exceptional aftermath digestibility and Grazing D-Value, good ground cover and sound disease resistance.

Average sugar content of perennial ryegrass varieties under simulated grazing

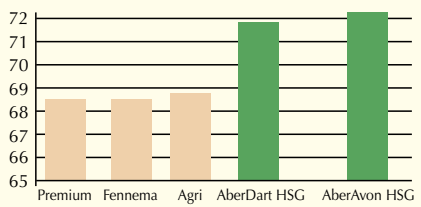


Source: Gilliland et al, 2002

A comprehensive review of trials conducted at IGER, DARD, DSV, Hunsballe and Peter Cates involving diploid and tetraploid perennial ryegrass varieties shows the superiority of AberDart HSG in terms of WSC content.

The significant improvement in AberHSG Grazing D-Values shows some correlation to the higher levels of WSC in these varieties under grazing management.

Grazing D-Value



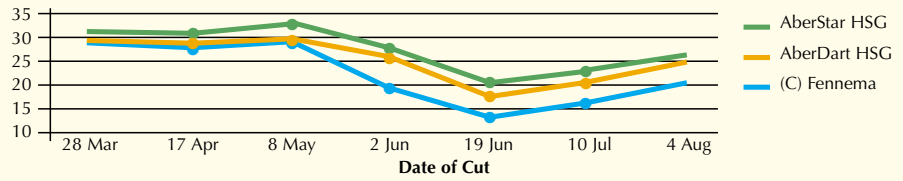
Source: NIAB R.L. 2003/04

THE NEXT GENERATION

AberStar HSG

AberStar HSG will be the next intermediate diploid to emerge from IGER's HSG breeding programme. A step forward on AberDart HSG for all the traditional characteristics, AberStar HSG offers another significant improvement in WSC content. Currently out-performing all other varieties in national list trials, AberStar will be considered for acceptance on to the recommended lists in 2005. In these trials it shows an increase in grazing dry matter of over 12% on existing varieties. Subject to national listing AberStar will be available in British Seed Houses mixtures from harvest 2004 onwards.

WSC Comparisons (%)



Source: IGER Pre-National List Trials, 2003

AberHSG: Late Perennial Ryegrass Varieties

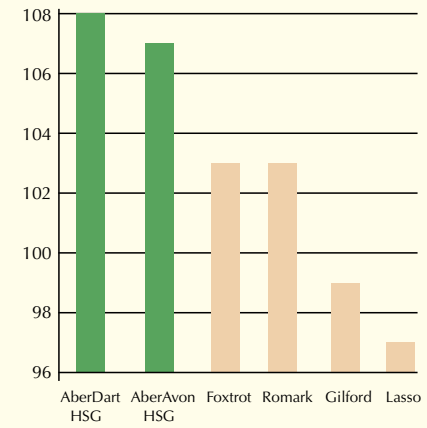
AberAvon HSG

AberAvon HSG is a high yielding late diploid offering a similar WSC content to AberDart HSG. It has the highest Grazing D-Value of all (72.23) perennial ryegrass varieties on the NIAB Recommended List 2003/4.

AberAvon HSG also excels in terms of dry matter yield. In the second harvest year in NIAB's simulated grazing trials, AberAvon HSG recorded a yield 7% higher than the control variety Fennema and is above all other late perennial ryegrass varieties on the recommended list.

AberAvon has shown an increased WSC content at every cut over a NIAB recommended tetraploid control variety.

Grazing DM Yield (% of control)



Source: NIAB R.L. 2003/04

WSC in AberAvon HSG and in Tetraploid Control Variety (g/kg)

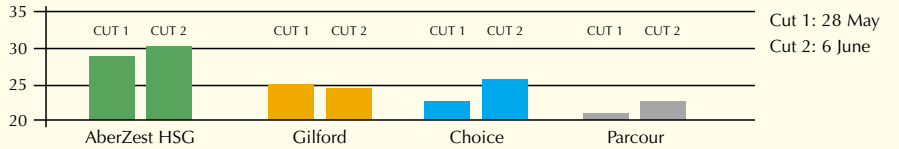
Variety	Cut 1 23 Mar	Cut 2 27 May	Cut 3 28 Jun	Cut 4 19 Jul	Cut 5 18 Aug	Cut 6 22 Sep	Cut 7 29 Oct	Mean
AberAvon HSG	112	242	299	315	236	210	234	236
Control (Tet)	111	235	275	287	214	188	220	219

Source: IGER Long Term Trial, 2002 Harvest Year

AberZest HSG

AberZest HSG is the latest late diploid to emerge from the IGER breeding programme. It is comparable to AberAvon HSG in terms of WSC content and offers superior ground cover to this variety. *Both AberAvon and AberZest are currently available.*

WSC (%)



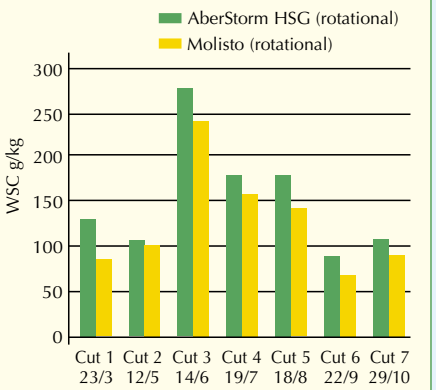
Source: IGER. 1997 Sowing. 1998 Harvest Year

AberHSG: AberHybrid Ryegrass Varieties

AberStorm HSG

AberStorm HSG was the first AberHybrid HSG variety. Earlier heading than the successful intermediate Hybrids AberLinnet and AberExcel, AberStorm HSG is high yielding for grazing and conservation and provides outstanding early spring growth at 148% of the control.

WSC (g/kg) of AberStorm and Molisto

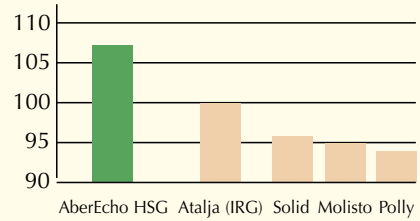


Source: IGER

THE NEXT GENERATION

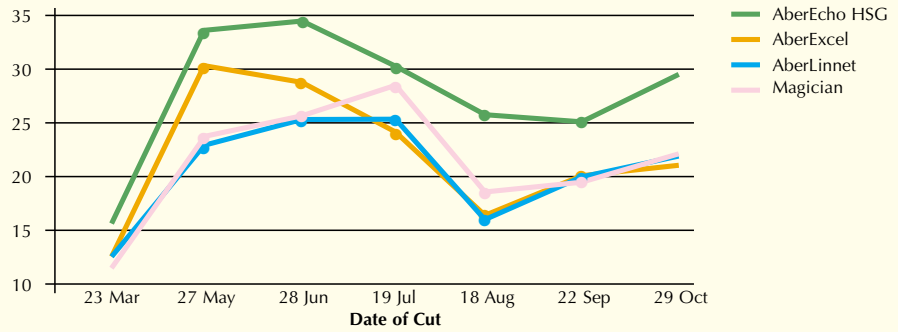
AberEcho HSG is the latest AberHybrid HSG variety from the IGER breeding programme. It is the highest yielding Hybrid Ryegrass variety available, out-yielding all the Hybrids and even the Italian ryegrasses listed by NIAB (2003/4) in the first harvest year. It has all the advantages of the AberHybrids and will persist in rotational grazed and cut leys for up to five years (twice as long as Italian ryegrass). AberEcho HSG also shows excellent disease resistance and mid season quality.

Mean DM Yield%



Source: NIAL R.L. 2003/04

WSC Comparisons (%)



Source: IGER Long Term Trial, 2002 Harvest Year

Maximising the Aber Advantage

Great progress is being made by IGER's grass breeding programme in terms of the nutritional quality of new ryegrass varieties. The breakthrough has come with the emergence of perennial ryegrasses such as AberDart HSG, AberAvon HSG, and AberStorm HSG. Already the next generation is showing a further significant step on, with varieties like AberStar HSG and AberEcho HSG Hybrid Ryegrass coming to the fore. These varieties show a significant increase over AberDart. The improvements are set to continue, as over twenty years of focused breeding comes to fruition.

The potential benefits for livestock farmers from these improved grass varieties are real and highly significant. Tangible performance increases in terms of milk yield and liveweight gain have been demonstrated in trials, and forward-looking farmers are already seeing positive results for themselves.

100% ABER MIXTURES

In order for the farmer to gain full advantage it is important not to dilute the potential. This means using mixtures that are made up entirely of the appropriate AberHSG varieties and are not compromised in any way with lesser conventional inclusions. This is now possible, due to the range of superior varieties coming through the IGER breeding programme.

Dilution of mixtures with non AberHSG varieties will certainly reduce the benefits. Animal studies on AberHSG varieties at IGER have in general shown that in order to generate a significant animal performance benefit, a grazing sward must provide a minimum increase in the level of water soluble carbohydrate of four percentage points. However, for silage production bigger differences may be required in the standing crop.

Hence, a farmer growing Mixture B instead of Mixture A may not reap any tangible animal performance benefits, despite using a mixture with an AberHSG component.

Mean WSC Content (%)

HSG Mixture (14kg)	WSC (%)	AberDart + Non HSG (14kg)	WSC (%)
3kg AberAvon (Late PRG Dip)	24.90	3kg Control (Int PRG Dip)	21.24
5kg AberEcho (Hybrid Tet)	27.90	3kg Control (Late PRG Tet)	21.87
3kg AberStar (Int PRG Dip)	24.90	5kg AberLinnet (Hybrid Tet)	20.71
3kg AberDart (Int PRG Dip)	23.28	3kg AberDart (Int PRG Dip)	23.28
Average WSC (%)	**25.63**	**Average WSC (%)**	**21.62**

WSC data based on IGER Long Term Trial, 2001 sowing, 2002 harvest.

This extrapolation of data from variety trials shows the importance of maintaining a full complement of AberHSG varieties in a mixture.

Achieving Modern Clover Breeding Objectives

The emergence of new varieties offering higher yields, greater versatility of use and – perhaps most importantly – increased reliability is changing traditional perceptions and underpinning a significant new role for white clover in sustainable livestock production.

No longer is white clover associated solely with low input / low output and/or organic systems, but is increasingly central to the most progressive forage based enterprises. As a companion to modern grasses in swards for either grazing or conservation, it is a species that addresses many of the modern farmer's priorities – from the cost effective provision of homegrown protein to reduced reliance on fertiliser nitrogen.

Eighty years of clover breeding at IGER have helped drive this revolution, and – as new objectives ensure continuing progress – this programme is set to maintain an essential role in future development.

Reliability has been an Achilles heel for white clover in decades past, but optimum targets of a 30-35% contribution to total sward dry matter are now being achieved under a variety of management systems – and with unprecedented levels of consistency. This is due in part to IGER being focused on key breeding objectives, such as winter hardiness, pest/disease resistance and nitrogen tolerance.

Working closely with modern grass breeding is vital for the clover breeder to ensure a level of compatibility that will allow optimum sward composition. This is a major strength of the IGER programme and a key factor in the emergence of white clover in modern livestock production.

A close affinity with agricultural practice remains a strong feature of IGER's work. Selection and testing takes into account performance in the silo and in the rumen, as well as in the field under simulated farm conditions. This is only possible because of the strong links with IGER's animal scientists and such cooperation will become all the more important as breeding objectives become more focused on improving feed quality and reducing environmental impacts.

Michael T. Abberton.

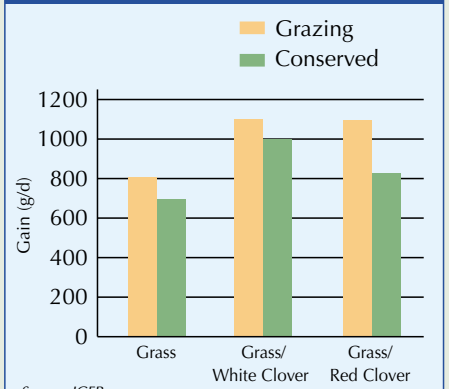
Dr Michael Abberton
Head of Clover Breeding, IGER

Forging an Effective Combination

The benefits of combining grass and white clover in swards for both grazing and conservation are long established and well proven. The most important benefits can be summarised as:

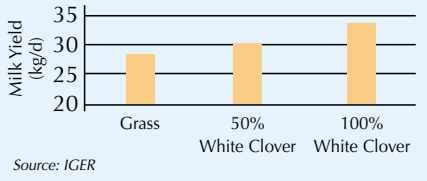
- improved forage quality and feed value due to a boost in digestibility, intake potential, and protein and mineral content of the sward
- reduced reliance on fertiliser due to nitrogen fixation
- "soil structuring" by white clover root systems that can help to overcome problems of soil compaction

Liveweight Gains on Clover



Source: IGER

Milk Yield



Source: IGER

Accumulated experience and scientific evidence indicate that the optimum balance is achieved with a clover content of 30-35% of the total annual dry matter yield of the sward.

In reality, the clover content of a mixed sward will vary from a low level in the spring (as low as 5% of total dry matter) to as high as 60% in July/August. This level of variability in the clover content is not ideal from the perspective of managing the feeding value for livestock and can also cause deterioration in sward quality over time. Hence, greater compatibility between grass and white clover varieties is vital in order for livestock farmers to gain maximum benefit.

Breeding for compatibility

A compatible grass/clover mixture is one with a clover content that is sufficiently large to optimize the nutritional and nitrogen fixing attributes of the clover when growing with a high yielding companion grass.

Grass and clover varieties differ in their aggressiveness towards each other due to their abilities to compete for nutrients, water and light. At IGER, breeding for general compatibility is high on the agenda and varieties are routinely tested for this attribute.

Evidence of the progress that takes clover into a new era of utilisation is summarised by three key areas:

- Annual clover contributions of 30% or greater from IGER-bred varieties have been proven experimentally and are now being seen on the farm
- Compatibility with modern Italian, AberHybrid and high yielding perennial ryegrass varieties
- Evidence from long-term experiments showing effective levels of clover being maintained in swards for many years under high and low N regimes

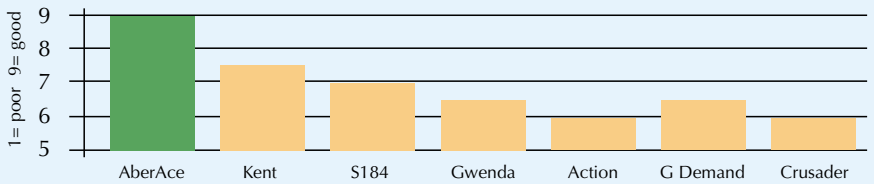
Aber White Clovers: Small Leaved Varieties

AberAce
This new variety has the smallest leaf size of any on the recommended lists and was bred specifically for continuous sheep grazing in lowland and upland conditions. It has an exceptionally dense network of stolons and will persist well under the most rigorous of sheep grazing systems.

AberCrest
Productive under sheep grazing as well as under rotational grazing by dairy cows. Bred from wild populations collected in Switzerland, AberCrest's major attribute is its good cold hardiness and stolon survival. It possesses a thick stolon compared with other small leaved varieties and shows more rapid regrowth following cutting or grazing in spring.

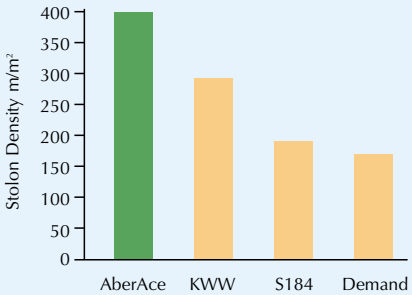
AberPearl
High yielding small leaved variety. Bred from a gene pool of 8 small and medium leaf size varieties showing early recovery after winter (greenness of stolon and leaf). Extremely persistent under rotational or continuous sheep grazing. Excellent ground cover.

Autumn Ground Cover Rating



Source: NIAB R.L. 2003/04

AberAce Stolon Density



Source: IGER, Bronydd Mawr

White clover varieties being assessed for persistence by sheep at IGER

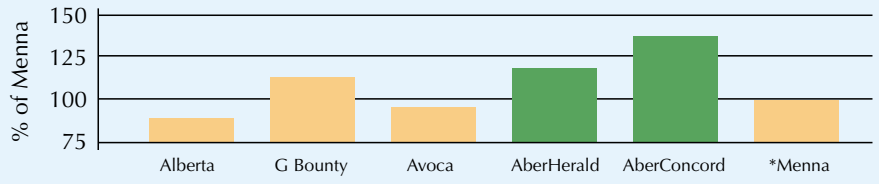
Aber White Clovers: Medium Leaved Varieties

AberHerald
With a relatively small leaf size, this variety is high yielding and has excellent winter survival combined with the ability to regrow rapidly in spring. AberHerald is also tolerant of nitrogen, and has been maintained in swards at 25% with inputs of 380kgN/ha. This variety is suitable for rotational sheep and cattle grazing systems, and can also be cut for silage.

AberDai
This variety was bred from winter hardy material to provide flexibility in response to various management regimes. It offers high yields and survives well in systems ranging from continuous sheep grazing to rotational grazing by cattle or sheep.

AberConcord
A new medium leaved variety producing yields as great as some large leaved clovers and gives good performance over a wide range of N inputs (0-450kg/ha). This trait contributes to a stable clover yield over several years by allowing clover to tolerate the build-up of nitrogen in the soil. AberConcord also provides good winter survival and spring growth, regrowing rapidly following cutting and grazing, and is suitable for a range of management systems, from rotational grazing by sheep and cattle to conservation.

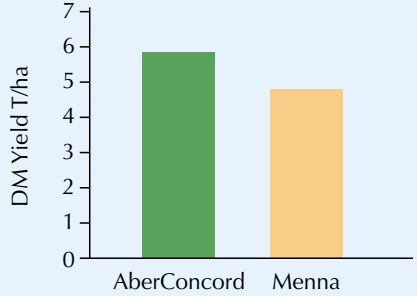
Relative DM Yield (3rd Harvest Year)



Source: NIAB R.L. 2003/04

*(*Yield of Menna = 2.93 t/ha)*

Annual DM Yield (150kg/ha/N/yr)



Source: IGER

Response to Grazing Management

	Annual Dry Matter Yield (t/ha/annum)	
	Continuous sheep grazing	Cutting
Olwen (large)	2.0	7.5
Menna (medium)	3.7	5.1
AberDai (medium)	4.1	6.9

Source: IGER

Scotland: Jim Reid

Yield Boost For High Performing Holsteins

Jim Reid was one of the first producers in Scotland to sow a significant acreage of AberHSG and now has around 120 acres of leys that contain AberDart and AberAvon at Bengal Farm near Lockerbie.

Grass reseeds on the 750-acre mixed farm are expected to last 5 years and must be capable of top performance under cutting and grazing to match the demands of the high yielding dairy herd and followers. A flock of 500 ewes and their lambs also graze the farm's pasture.

The first AberHSG leys were sown under barley in 2000, but it was in the aftermath of foot and mouth in 2001 that a major reseeding programme took place creating the opportunity for widespread improvement of pastures.

The sowing of AberHSG leys coincided with the arrival of a new herd of dairy cows – so direct comparisons are difficult - but cows have certainly performed very well, sustaining a current average yield of 9,200 litres/cow. Jim Reid reckons that an improvement of around 500 litres per animal can be attributed to the better quality of the new leys over the past two seasons, which represents a yield boost of 5.7% and is very close to the 6% figure recorded by IGER in dairy trials.

"The sheep also find the new pastures very palatable," he says. "Ewes and lambs graze more vigorously. There is lower wastage and the high sugar grass leys require less topping. Most of the homebred lambs finished off grass last season, but it's difficult to compare the old and new leys precisely because lambing was around two months later than normal in 2002, due to readjustments following restocking.

"Silage quality from the new leys is well above average. Dry matter yields have been good and we hope that the higher sugar levels of the new varieties will continue to play a part in producing silage of consistently better quality to complement the high starch, fermented whole-crop cereals that we also conserve for winter rations."

Worcestershire: Geoff Probert

AberHSG Gives Ram Rearer Added Muscle

High Sugar Grass is boosting performance on a sheep farm in Worcestershire, while reducing reliance on bought-in feed.

Since planting his first 62 acres of AberHSG varieties Geoff Probert has cut back concentrate feeding to his pedigree rams significantly, yet still turns out Charollais and Texel tups in top condition to average well in excess of £425 this year.

Farming 480 acres at Northingtown Farm, Holt Heath near Worcester Geoff Probert runs 300 pedigree Texel and Charollais ewes plus 1200 Mule cross Texel commercial ewes and aims to maximise production from home-grown grass and fodder crops.

"We are producing breeding rams to sell to the best commercial sheep producers and we want to have customers returning to us year after year for more," said Geoff.

"Commercial sheep farmers need their tups to last so it's no good feeding a pedigree tup with expensive coarse mix for them to get on to a customer's farm and just melt."

The first 62 acres of AberHSG mixtures were planted in September 2002 and Geoff was impressed by their vigour. The leys produced an early spring flush of grass and then continued throughout the summer, recovering well after the drought on the sharp loam land at Holt Heath. A contented flock at grass was one of the first signs that convinced Geoff of the value of his AberHSG investment.

The mixture includes the AberHSG varieties AberDart, AberEcho, AberAvon and AberStorm, with clover being oversown at a later stage.

The spring flush of quality grass helps to finish 1000 or so spring lambs from the mid-January lambing commercial flock and then, to boost the grass lull in a dry July and August, kale provides a quality fresh bite for the stock. After that turnips and swedes come into their own, and then it's back round to spring grass again.

"You have to be prepared to take on new ideas," concludes Geoff. "I'd followed the research on High Sugar Grass at IGER and realised it was a way of producing quality rams without the costs getting out of hand."