Organic Upland Beef and Sheep Production

Canolfan Organig Cymru
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1. Background

The market for organic food has seen sustained growth since 1999. By the end of 2005, the retail value of the UK organic market had reached £1.6 billion, representing an annual growth rate of 30% compared to 2004 (Soil Association, 2006). The UK now has the third largest market for organic foods in the world. Organic meat is the fastest growing sector of the market and there have been steady increases in production since 2001. In 2005, the farm gate value of organic meat and poultry was an estimated £129 million, an increase of 59% compared to 2004. Beef production was valued at £19.7 million (up 44%) and lamb production was valued at £12.3 million (up 29%).

In Wales, agricultural production is predominantly associated with beef and sheep. Based on records in the Organic Centre Wales database, there were 647 organic producers in Wales in 2005, of which 354 were registered organic beef producers and 384 were registered organic lamb producers. As the market trend has been increasingly to source UK produce, there are opportunities to market more lamb and beef from Wales.

The upland organic unit at ADAS Pwllpeiran in mid-Wales was set up in 1993 to examine the feasibility of organic beef and sheep production in the hill situation. Pwllpeiran is a 1,300 ha ADAS research farm located in the Cambrian Mountains Environmentally Sensitive Area (ESA) of mid-Wales. The organic unit currently totals 237.5 ha. The initial 111 ha organic unit achieved full organic status in 1995 and a further 126 ha was added in 2004. The main enterprises on the organic unit are beef and sheep production. There is a suckler herd of Welsh Black cows and a breeding flock of Hardy Speckled Face ewes and Texel crosses. Climatic conditions on the farm are characterised by an annual average rainfall, at 300 metres, averaging 1765 mm, compared to over 2500 mm at 550 metres.

Between 1993 and 2001, work focused on the feasibility of organic livestock production in the hills. With EAGGF Objective 5b funding, the unit was compared with the rest of the farm in terms of grassland productivity, livestock and financial performance. Since 2001, the focus has been on key problems for organic upland farmers, particularly livestock health and welfare. Methods of internal and ectoparasite control, feeding to organic standards and maintaining the quality of forage by reseeding upland pastures have been investigated.

2. Grassland Management

Under the ESA agreement, sheep numbers and stocking rates are restricted on certain habitat areas across the farm. The farm receives payment for grazing prescriptions on areas of semi-natural rough grazing containing heather, and payments are also received for management of the mountain 'mosaics' of semi-natural rough grazing and reseeded land. Fields used for forage conservation have also qualified for 'reversion to hay meadow' management payments.

The original organic enterprise was set up to reflect the land type found on the whole of the commercial farm. The implementation of this comparative system led to blocks of land being divided into several compartments with an overall distance of ten miles from the mountain land to the lower land. The enclosures range from 200 metres above sea level (improved grassland) up to 550 metres (semi-natural rough grazing - *calluna* or *molinia* dominated - and mountain reseeds). Below, Table 1 sets out the types of grazing and conservation land and the general size of each block.

Table 1 Land area in the Pwllpeiran organic unit (hectares)

Semi-natural rough grazing	173.1
Mountain reseeds	39.9
Improved grassland	24.5
(Suitable for conservation)	(9.1)
Total	**237.5**

2.1 Soil nutrient status

Soil samples are taken regularly at the Pwllpeiran organic unit, with the aim of sampling 25% of the farm each year or sampling the whole farm every four years. Most of the manure from the organic cattle pens and lambing sheds is spread on the fields used for forage conservation, as this is where the nutrient off-take is greatest.

Cae Felin is the main conservation field at Pwllpeiran and is used for big round bale silage. The effect of the application of FYM is shown by the indices of 3 for phosphate and 2+ for potash in the table below. The pH for Cae Felin is also adequate.

Table 2 Nutrient status of the organic fields at Pwllpeiran

Sample ID	P Ext mg/l	Index	K Ext mg/l	Index	Mg Ext mg/l	Index	pH
Cae Felin	31	3	218	2+	109	3	5.9
Llechwedd Brith Organic	8	0	64	1	220	4	5.8
Parcllyn Organic	8	0	61	1	168	3	5.7
Brignant North	7	0	111	1	105	3	5.6
Brignant South	8	0	120	1	119	3	5.4
Cae Bach Brignant	13	1	85	1	101	3	5.5

Cae Bach Brignant is also used for silage but, although the soil indices are low, under ESA reversion to hay meadow management prescriptions it is not permitted to apply FYM.

2.2. Evaluating seed mixtures for weed control

Maintaining the productivity of improved pastures in upland organic systems can be difficult. Reduction in clover content, together with an increase in weeds and less palatable grasses, can lead farmers to re-assess the productivity of their fields. Options available include rejuvenation by management and renovation by over-seeding or reseeding. Although most costly, and disruptive to the farming operation, reseeding may be the best option if pasture deterioration is associated with heavy weed infestation. Particularly in the uplands, where land for forage conservation may be restricted and establishment and management of clover is difficult, the choice of seed mixtures is critical to success.

This situation occurred in 2002 in Cae Felin, the main forage conservation enclosure in the Pwllpeiran unit. The grassland had deteriorated both in terms of grazing and forage conservation due to invasion of the sward by aggressive weeds, such as buttercup and dock.

During the 2002/2003 season, a field-scale trial was undertaken to evaluate reseeding mixtures for their ability to out-compete weeds and to produce a productive ley for grazing and forage conservation. Prior to reseeding, 70% of 25 (10 x 10cm) quadrants surveyed in Cae Felin contained buttercup and virtually 25% contained docks.

Reseeding Trial - Treatments

All treatments were undersown to a spring barley crop

1. Organic Napoleon PRG (15%), Organic Rio IR (21%), Ligrande IR (15%), Total IR (17%), Polly Hybrid (17%), Merviot Red Clover (8%), Mercury Red Clover (8%).

2. Organic Napoleon PRG (15%), Organic Option PRG (21%), Aberlinnet Hybrid (16%), Aberexcel Hybrid (16%), Polly Hybrid (15%), Riesling White Clover (4%), Mercury Red Clover (13%).

3. Major Westerwolds (10%), Organic Rio IR (35%), Total IR (35%), Lemnos Westerwolds (20%).

4. Major Westerwolds (8%), Organic Rio IR (31%), Total IR (31%), Lemnos Westerwolds (18%), Oldenwalder Red Clover (12%).

Each of four treatments was found to have a weed control effect. The mixtures containing Westerwolds showed most initial vigour but where clover was included in the mixture, this was also out-competed. The short persistence of Westerwolds and the lack/poor establishment of clover were associated, in the spring period, with slowing growth rates and lower yields. Overall, it was found that a mixture of perennial and hybrid ryegrasses plus red and white clovers offered the best combination for grass-clover ley establishment, weed control and forage production. The trials also demonstrated the longer term value of red clover in the uplands. At higher altitudes and with lower air and soil temperatures, it is possible that the longevity of red clover is associated with lower incidence of clover rot and stem eelworm.

Figure 1 Percentage ground cover for the four treatments 13 weeks after reseeding has taken place

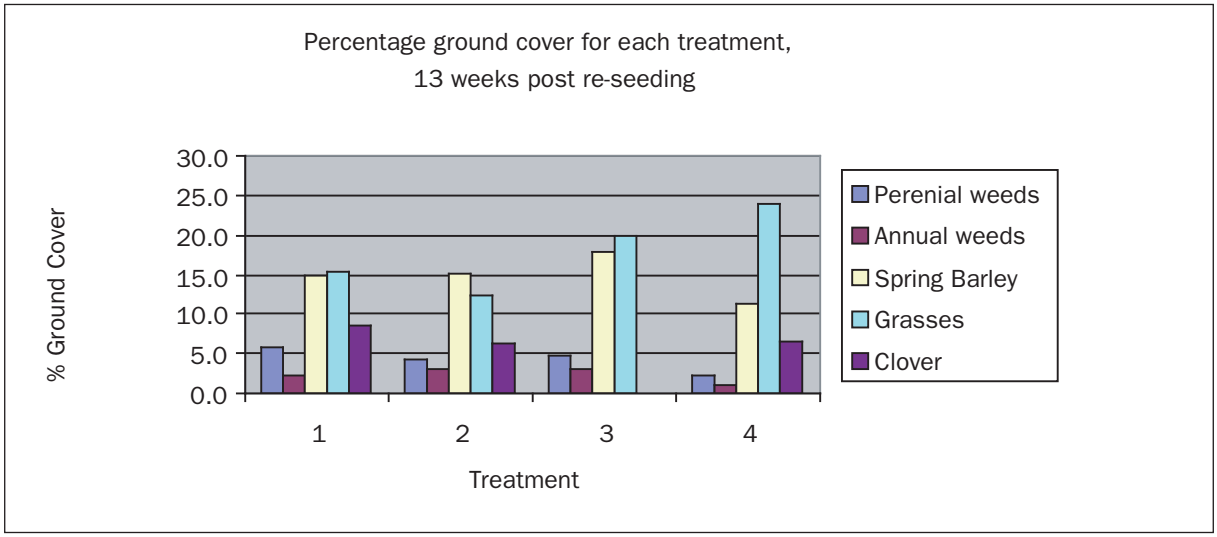


Figure 2 Percentage ground cover for the four treatments, 17 weeks after reseeding

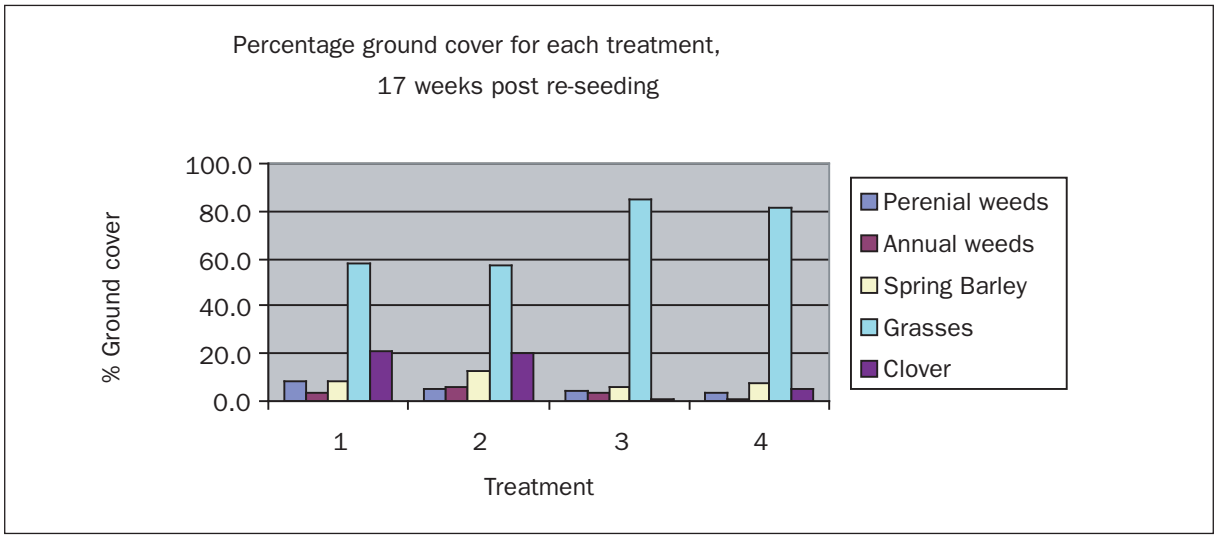
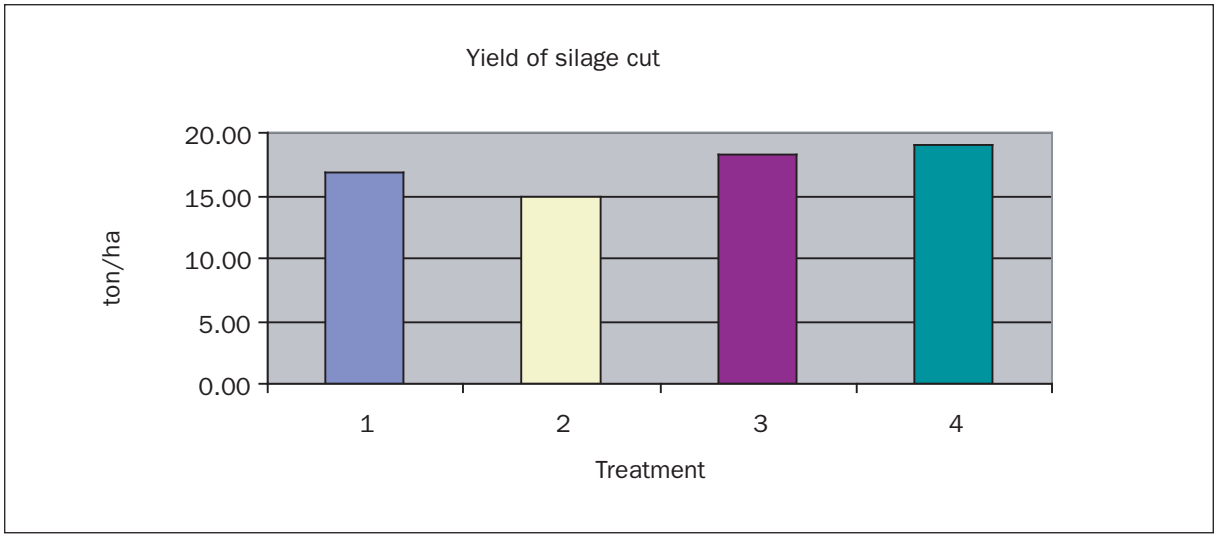


Figure 3 Silage yield of each treatment after reseeding.



3. Management and Performance of the Suckler Herd

The unit has ten spring calving Welsh Black cows with two replacement heifers. The males are castrated and sold as store cattle, while the heifers are either sold for breeding or retained on the unit as replacements.

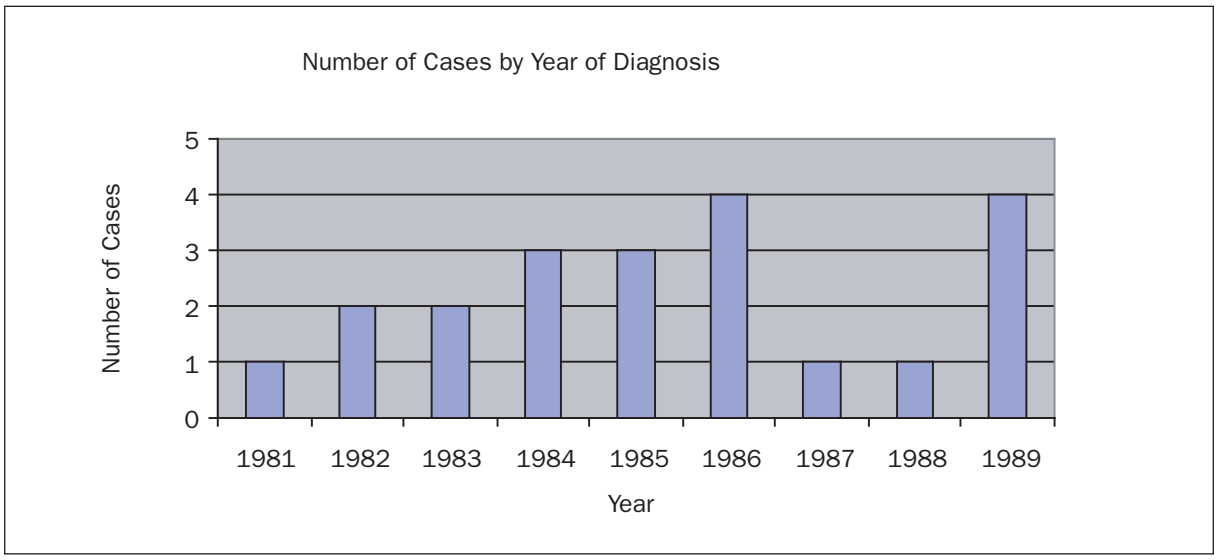
3.1. Herd health

During 2000, both the organic and conventional herds were entered into the Welsh Black Cattle Society (WBCS) Herd Health Scheme. Prior to this, the conventional herd was suffering major reproductive problems, with the proportion of barren cows averaging 21% and calf mortality averaging 12%. However, similar problems were not found in the much smaller organic herd.

The initial aim of the Herd Health Scheme was to eliminate Johne's disease within the national Welsh Black herd. Johne's disease had been a problem in the Pwllpeiran herd in the late 1970s and early 1980s (prior to organic conversion). A vaccination programme was put in place in order to control the disease and this continued through to the late 1990s, when it was halted due to the cost. When tested in 2000, a number of cows in the conventional herd were classed as positive reactors and these were removed. A number of these positive reactors were some of the last calves to be vaccinated. However, these cows had to be removed from the herd, in order to obtain Johne's free status.

Since March 2003, this measure has assured that the herd has been certified 'monitored free'. The table below shows the number of Johne's cases in the commercial herd throughout the 1980s, prior to organic status.

Figure 4 Number of Johne's cases in the commercial herd, pre-Welsh Black Society Herd Health Scheme and pre-organic status, 1981-1989



Leptospirosis was identified in the conventional herd as part of the on-going health scheme testing. It was decided to vaccinate due to the nature of the disease, as cattle only test positive for a short time after the infection and many other *Leptospira* organisms can bring back a positive result. Although Leptospirosis was identified in the conventional herd after discussions with the Herd Health Scheme veterinary surgeon, it was decided to vaccinate the organic herd as well.

The herd was certified monitored free of Bovine Virus Diarrhoea (BVD) during November 2003.

There is currently a plan in process to eliminate Infectious Bovine Rhinotracheitis (IBR) from the herds. IBR does not affect the herd performance economically to the same degree as other diseases and has not been given equivalent priority.

Since the implementation of the Herd Health Scheme, there have been improvements in terms of overall reproductive performance, with conception rates rising to 93% and calving percentage also increased to 91%. There has also been a big knock-on effect arising from the reduction of cows being culled due to Johne's disease, from the conventional herd.

After housing in the autumn, both the organic cows and calves receive a 'pour-on' for the control of ectoparasites. As cattle are in the minority on the organic unit, internal parasites have not been a problem and drenching is unnecessary.

Mineral deficiencies have been identified on the unit, and a grass nutrient enhancer has been used to alleviate mineral deficiencies. Soil tests revealed that the ground was deficient in copper which can potentially affect cows' fertility. However, there have been no issues with cow fertility within the organic unit

3.2 Cattle performance

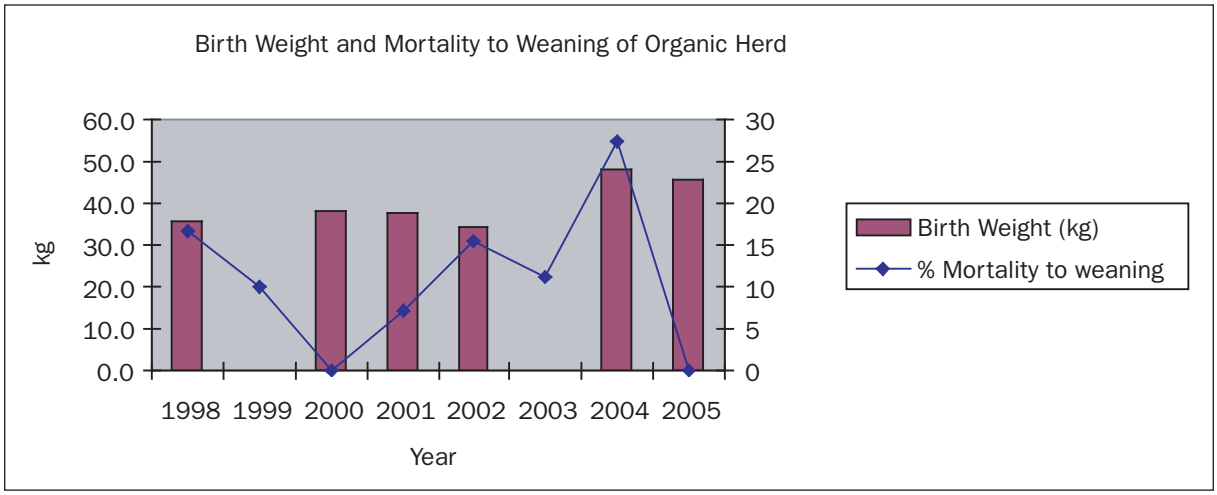
Organic livestock standards emphasise the need to select those breeds which are best adapted to the environmental conditions of the farm, and the Welsh Black is well-suited to upland organic systems. The breed is hardy and easy calving; it is genetically suited to a grass-based system and can maintain itself on the coarse, and less palatable, vegetation typically found in mountain pastures.

Cattle on the organic unit are housed in November and fed big bale silage plus approved concentrates. The herd is spring calving which has many advantages for organic beef production: it minimises conserved forage requirements and avoids the potential health problems which arise from housing young calves in winter.

The stock bull of the organic herd is put to the organic cows during June, for calving in spring. In 2005, the first cow in the herd calved on March 29th and the last calving took place on May 12th, giving a calving period of 44 days.

Calves are weaned in late January. The birth weight of the calves averaged 45.3 kg in 2005. Calves were then weighed at 126 days and 206 days old when average weights of 194.4 kg and 260 kg were recorded, respectively. This indicates a daily liveweight (LW) gain of 1.5 kg/day up to the first weighing and of 0.82 kg/day from this weighing to the second.

Figure 5 Birth weight and mortality rates of the organic herd.



In 2001 the Pwllpeiran organic herd was entered into Signets beef breeder scheme as part of the WBCS herd improvement scheme. The below table shows the EBV recordings for the breeding suckler cows and the stock bull of the organic herd.

Year	Tag no.	Gestation length	Calving ease	Birth weight	Calving value	200 day milk	200 day growth	400 day growth	Muscling score	Muscle depth	Fat depth	Beef value
Values required (+/-)		-	+	-	+	+	+	+	+	+	-	+
2001	Herd	0.3	-0.3	0.6	WB2C	0	5	11	0.2	0.0	0.1	WB13
2001	Average	0.6	-1.3	0.9	WB1C	1	8	14	0.3	0.1	0.2	WB14
2002	Herd	0.2	0.1	0.4	WB2C	0	5	11	0.2	0.1	0.1	WB13
2002	Average	0.4	-0.8	0.8	WB1C	1	9	15	0.3	0.1	0.1	WB15
2003	Herd	0.4	-0.2	0.6	WB2C	1	5	11	0.2	0.8	0.1	WB14
2003	Average	0.4	-0.7	0.8	WB1C	1	9	16	0.3	1.1	0.1	WB16
2004	Herd	0.5	-0.7	0.7	WB1C	1	4	9	0.3	0.7	0.1	WB13
2004	Average	0.5	-1.0	1.0	WB1C	1	10	17	0.3	1.2	0.1	WB16
2005	Herd	0.6	-1.9	0.9	WB1C	2	5	11	0.3	0.8	0.1	WB14
2005	Average	0.6	-1.3	1.1	WB1C	1	11	20	0.4	1.4	0.1	WB17
2004	Stock Bull	0.7	-1.6	1.3	WB1C	1	14	23	0.4	1.9	0.2	WB20

Table 3 EBV recordings for the breeding suckler cows and stock bull.

During 2005, the breeding suckler cows showed an EBV for calving of WB1C, which matched the average value for the scheme. However the EBV for beef value of the suckler cows (WB14) was much lower when compared to the scheme average of WB17.

The stock bull for the farm shows an EBV of WB1C for calving and of WB20 for beef value. While the beef value for the stock bull is much better than the average for the scheme (at WB16), the calving value is on a par with the scheme average.

The EBVs for the breeding suckler cows show an indication of improving beef value, but the values for calving seem to be decreasing. This could be due to the high beef value of the current bull, since replacements are sourced from heifers born into the herd.

4. Management and Performance of the Sheep Flock

Flock size has varied from 160 to 188 ewes which lamb during late April. In recent years, all of the sheep are housed from mid-February, after pregnancy scanning. A scanning percentage of 134% is generally expected. All ewes lamb indoors from mid-April. Single-rearing ewes are grazed on the mountain pastures and twin-rearing ewes are grazed on the improved lower hill. Lambs are weaned in late August. A percentage of ewe lambs are retained as replacement breeding stock and are away-wintered. The remaining lambs are sold as stores.

4.1 Flock health

Although many breeds of sheep have been evaluated at Pwllpeiran, it was decided in 1993 to select the Hardy Speckled Face for the organic unit. This ewe is well-adapted to wet upland conditions and has the potential to produce a larger lamb for the market than the Welsh Mountain. Since its establishment, the ewe flock has been closed. Lambing starts in the second week of April – three weeks later than the conventional flock. Late lambing means that there is more grass available to the ewe, enabling lambs to suckle more and graze less, at the time when the *Nematodirus* hatch occurs. There is still some exposure to infestation, however, but this stimulates development of the lamb's natural immunity.

To further reduce the problems associated with internal parasites, a number of management strategies are in place at Pwllpeiran. These include lambing policies, grazing management and the adoption of faecal egg counting. A safe grazing strategy has been put in place which utilises mixed grazing with the rotation of sheep and cattle in order to reduce the worm (nematode) challenge. Notwithstanding these precautionary measures, anthelmintic resistance was identified on both the organic and conventional units in 2005. This has necessitated a review of the current strategy to reduce further anthelmintic use by the adoption of alternative strategies.

Regular Faecal Egg Counts (FECs) are undertaken. This strategy means that anthelmintics are only used when required, and reduces the selection pressure for anthelmintic resistant worms. The farm team also follows the Sustainable Control of Parasites in Sheep (SCOPS) guide as closely as possible. Single lambs generally do not receive anthelmintics.

Alternative treatments to anthelmintics include use of species rich grassland, nematode trapping fungi, mineral supplementation, herbal and homeopathic remedies. Recently, the use of diatomaceous earth has also been advocated as an alternative treatment. Diatomaceous earth is the fossilised remains of diatom shells. The action of diatomaceous earth on parasites is unclear but it has been suggested that the abrasive action of the powder pierces or scratches the outer protective layer of invertebrates, including internal parasites, resulting in death by dehydration. However, diatomaceous earth is also rich in trace elements and it could be the enhanced nutritional status of the animals that has allowed them to cope with a parasite burden. In 2004, two studies were carried out at Pwllpeiran to assess the efficacy of diatomaceous earth. Animals treated with anthelmintics and groups of untreated animals were included for comparison. It was found that cattle and sheep which received a specifically chosen, diatomaceous earth supplement had low FECs for the duration of the experimental period, similar to animals in the anthelmintic groups. This suggests that inclusion of a certain grade of diatomaceous earth in the diet of grazing ruminants may offer some benefits in controlling internal parasites (McLean *et al*, 2005).

Between December 2002 and April 2003, ADAS undertook a survey of both organic and conventional sheep farmers in Wales. The survey was designed to investigate farmers' current ectoparasite control and treatment practices. The survey found, *inter alia*, that fewer organic sheep farmers use synthetic pyrethroid (SP) dips than conventional sheep farmers. Of the organic sheep farmers surveyed, 58% stated that they treated their flocks for ectoparasite infestations. Of all the organic farmers surveyed, 29% used pour-on

formulations to treat ectoparasites, 16% used plunge dipping, 11% used sheep showers and 5% used injectable products. All organic farmers who carried out plunge dipping used a SP-based product.

Sheep at Pwllpeiran are no longer traditionally plunge dipped to control ectoparasites. Blow fly strike is the biggest external parasite issue within the organic unit, and prevention is achieved by dagging. Ewes and lambs have also been protected from fly strike by the use of SP-based pour-ons which are applied during June. Initially, scab control was carried out by routine plunge dipping; however, with the lifting of the compulsory dipping order, scab control has been on a preventative basis only.

Vaccination against Clostridial disease and Pasteurella has continued on the farm due to a known problem. Ewes are vaccinated with Heptavac P+ in February, while the ewe lambs are vaccinated with Heptavac P+ in September and November.

In the early years of conversion, cobalt deficiency was associated with cases of Pine amongst lambs. Mineral deficiencies have been treated with permitted supplementation, and dressings of pastures with a nutrient enhancer containing a range of minerals.

4.2 Flock performance

The size of the Pwllpeiran organic flock averages 170 ewes, with little variation in numbers from year to year. All of the ewes are put to Hardy Speckled Face tups. After three weeks, the Speckled Face tups are removed and Texel rams are introduced. The flock then produces its own replacements, amounting to approximately 50 ewe lambs, and the remaining lambs are then sold as stores.

In 2005, the tupping date for the ewes was November 9th. At tupping, the ewes weighed 41.6 kg on average and their average condition score was 2.5 – the ideal score for an upland/hill ewe. Ideal condition scores must be between 2 and 3 for upland/hill ewes and between 2.5 and 3.5 for a lowland ewe.
In 2005, scanning of the ewes took place in mid-February. There were 7 barrens, 102 singles and 68 twin-bearing ewes, amounting to a lambing percentage of 134%. Ewes are housed after scanning and fed on big bale silage and concentrates.

Lambing took place in April. The average birth weight for twin lambs was 3.53 kg while that for single lambs was 4.21 kg. After lambing, all the ewes and lambs are put out to the middle hill which offers the best grazing land on the unit. In mid-May, the ewes with single lambs are taken to the mosaics of improved pasture and semi-natural rough grazings on the hill. Ewes with twin lambs remain on the middle hill.

In 2005, weaning took place during early September. Lamb weaning weight averaged 24.76 kg. This represented an average 0.17 kg daily liveweight gain. Fifty ewe lambs were selected to be retained as replacements. Finishing lambs were kept for another month before being sold as store lambs, weighing on average 29.28 kg/lamb. The lambs were sold at an average price of £1.20 kg, equivalent to £35/lamb.

5. Beef and Sheep Feeding Regimes

The cattle at Pwllpeiran are fed a basic ration of grass silage through the winter period. Sheep are also fed grass silage but are supplemented with organic concentrates before and during the lambing period. The analysis below gives an indication of the typical silage used for both cattle and sheep. As shown, the silage has high dry matter content and is of moderate quality.

Table 4 Typical grass silage analysis

Organic Silage	
Dry Matter g/kg	431
Energy	
D Value	59 %
Metabolisable Energy (ME) MJ/kg DM	9.5
Neutral Detergent Fibre (NDF) g/kg DM	606
Acid Detergent Fibre (ADF) g/kg DM	417
Ash g/kg DM	81
Protein	
Crude Protein (CP) g/kg DM	136

5.1 Feeding trials

Maintaining ewe performance in winter poses particular problems for organic farming in the uplands where the availability of both grazing and home-produced forage may be restricted. The use of feed blocks to improve performance of hill ewes was investigated at Pwllpeiran from November 2000 to February 2001. In this trial, 160 Hardy Speckled Face ewes were allocated to either mountain, partly improved pastures at 506 metres above sea level or middle hill, improved pastures at 400 metres, prior to tupping. These two groups were then further allocated to either a dietary supplement regime (in the form of approved non-organic feed blocks) or no dietary supplement. Ewes were weighed and their body conditions scored prior to tupping (beginning of November), at the end of tupping (beginning of January), and at pregnancy scanning (middle of February). The potential number of lambs per ewe was also recorded at scanning. Although the trial was conducted during a period of extreme weather with precipitation 60% above average, the results demonstrated that, based on the criteria of ewe productivity, changes in liveweight and body condition score, supplementation with feed blocks has a positive effect (McLean *et al*, 2002a).

In a second trial, the cost of supplementing the diet of twin-rearing ewes, post-lambing, with an approved non-organic feed block plus either a half or a full ration of commercial concentrate mix, was investigated. The trial showed that the combination of blocks plus some concentrate proved to be the most cost effective supplement in terms of the liveweight gain of lambs (McLean *et al*, 2002b). Although these studies have been superseded by the 100% organic feed regulation of August 2005, they nonetheless indicate the value of supplementary feeding for breeding ewes in organic upland systems.

6. Acknowledgements

Eifion Evans, Aldwyn Clarke and Bernard Griffiths have been responsible for collection and collation of data from the Pwllpeiran Organic Unit. Owen Davies and Barbara McLean are responsible for trial design and research and development. Thanks are also due to the farm staff involved in field operations and management of the livestock: Gareth Rowlands, Hefin Hughes, John Penrhi Jones, Nigel Roberts and Steve Richards.

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Part 2.
The Financial Performance of Organic Upland Farms

1. Background

For some time, the economic success of cattle and sheep farming in the uplands has depended on subsidy income, since the market price for livestock rarely provides enough income to cover on-farm costs and provide a reasonable profit for modest family farm units. Prior to the Single Payment Scheme (SPS), conversion to organic production involved reduced subsidy income as well as output, because of the need to reduce stock numbers – premium prices and financial support from the Organic Farming Scheme (OFS) were essential to compensate for this. With the SPS, a significant cause of income reduction due to conversion has been removed. Increasingly, organic farmers (65% of those in Wales) have also signed up to other agri-environmental schemes such as Tir Gofal and Tir Cynnal, which complement organic farming systems as well as supplement organic farm incomes, particularly in upland areas.

Market prospects for organic livestock production remain strong, with continued growth in the organic sector reported in 2005[1]. In particular, organic meat retail sales grew by 28% in 2005, taking the total headage for beef and lamb sold to 27,358 and 205,238, respectively, and representing an estimated market value of £40 million in the UK. Approximately 90% of organic meat sales occur via the multiple retailers which, in 2005, made a greater commitment to UK sourcing of organic beef and lamb supplies in order to meet consumer demand. Recent data suggests that the multiples sourced 85% of organic beef and 95% of organic lamb sold from the UK in 2005. In 2006, organic lamb was trading at 275-300p/kg deadweight (DW) and organic beef at 220-265p/kg DW.

To understand further the financial performance of organic upland farming, twice key sources of financial performance data are available for organic upland farms in Wales: one is associated with organic farms extracted from the main Farm Business Survey in Wales; the other, arises from a DEFRA-funded, four-year project that specifically surveyed the financial performance of organic farms in England and Wales. In addition, Farming Connect funded Organic Centre Wales to carry out a benchmarketing project with organic producers. From these data, it is possible to derive whole farm income, gross margin and cost of production data, in order to give an overview of the economics of organic farming in the upland areas of Wales during 2003/04 and 2004/05.

1 Soil Association (2006) Organic Market Report. Soil Association, Bristol.

2. Whole Farm Incomes

2.1 Welsh Farm Business Survey data

Data from two non-identical samples of organic upland farms were extracted from the main Farm Business Survey (FBS) data in Wales for the financial periods 2003/04 and 2004/05 (Table 1), one showing hill cattle and sheep farms and the other showing hill sheep farm types. The results for all farms (mainly conventional) in the FBS are indicated alongside the organic farm data, to provide a comparison.

a) Hill cattle and sheep farms

Two similar organic farm samples are shown for this farm type alongside FBS data for each period. From the data, average farm size is nearly 50% greater for the organic farms than in the full FBS sample. As a result, the organic farms carried more cattle and similar numbers of sheep in 2003/04 compared to the conventional farms and, therefore, it is difficult to compare the two sets of data. Nevertheless, the organic farms did perform considerably better than the conventional average at £216/ha compared to £142/ha for the conventional farms; however, they operated on some 50 additional hectares.

Average farm size and stocking levels are similar for the two organic farm samples. On comparing the two years, cattle outputs decreased in 2004/05 whilst sheep output increased. Outputs were similar for both years, although costs did increase for most categories, affecting net farm incomes (NFI) negatively in 2004/05. Overall, the organic farms achieved higher net farm incomes at £169/ha in 2004/05 compared to the average for all FBS farms of £124/ha, even though the organic farms had nearly 25% less cattle and sheep livestock units (LUs) combined and nearly 20% more land in comparison with the FBS farms. A key cost differential was conventional feed costs which were double that of the organic farms. Interestingly on a £/farm basis, the organic cattle output was on a par with that of the FBS farms; organic sheep output was proportionately lower whilst income from agri-environmental payments for the organic farms were again double that of the FBS farms.

The data indicates that the removal of the enterprise related subsidies from the output section would create negative NFI for this group, with the exception of the organic farms in 2003/04.

b) Hill sheep farms

Two different organic samples are shown for the hill sheep farm type along with the average FBS data for this type for 2003/04 and 2004/05. On organic farms, the overall number of sheep units was approximately half that of the conventional farms and, accordingly, stocking rates were lower by 0.2 LU/ha. Sheep performance figures indicate similar lamb performance data for both organic and conventional farms, at one lamb produced per ewe with 0.7 lambs finished for market.

Net farm incomes were greater for the conventional farms in 2003/04 at £131/ha, compared to the organic farms at £115/ha. For the 2004/05 data, the situation was reversed, to £171/ha for the organic farms and £157/ha for the conventional. Costs were lower for the 2004/05 organic farms in comparison with the conventional farms. Again, feed costs were more than double on the conventional farms. Interestingly for this farm type, both the organic and conventional farms received similar levels of income from agri-environmental payments on a £/farm basis. Overall, the organic farms were able to achieve similar NFIs to those of conventional farms whilst carrying much lower numbers of stock, with fewer inputs indicated by the significantly lower feed and fertiliser costs on the organic farms.

Removing the enterprise related subsidies from outputs would produce negative NFIs for this farm type, with the exception of the organic farms in 2004/05.

Table 1

Average net farm income (£/ha) for organic and conventional upland farm types, 2003/04 and 2004/05

	Hill cattle and sheep				Hill sheep			
	2003/04		2004/05		2003/04		2004/05	
Values (£/ha)	Organic	Conv	Organic	Conv	Organic	Conv	Organic	Conv
Number in survey	8	142	8	98	7	90	6	52
Cattle (livestock units)	82	58	78	93	18	20	25	34
Sheep (livestock units)	50	59	52	79	41	83	57	93
Cereals (ha)	2	1	3	1	0	0	0	0
Forage (eff. ha)	153	105	150	128	103	118	135	138
Stocking rate (LU/eff. ha)	0.8	1.0	0.8	1.1	0.5	0.7	0.6	0.8
Size (eff. ha)	156	106	153	129	103	118	135	138
Cattle output	211	163	173	212	49	40	46	70
- related subsidies	119	106	123	135	36	31	39	52
Sheep output	134	241	151	253	147	244	152	219
- related subsidies	71	115	81	129	97	151	101	161
Other output	193	128	187	131	156	127	154	132
Total outputs	*728*	*753*	*715*	*860*	*484*	*593*	*493*	*633*
Feeds	87	116	82	164	50	106	44	99
Other livestock costs	46	57	58	80	29	43	26	44
Crop costs	21	47	31	59	15	28	10	35
Whole farm margin	**574**	**533**	**554**	**561**	**389**	**416**	**412**	**455**
Labour and contract	91	91	95	121	51	58	43	64
Machinery	113	109	104	116	81	78	68	86
Other fixed costs	155	190	179	196	143	149	131	148
Total inputs	*512*	*611*	*548*	*737*	*369*	*462*	*323*	*476*
Net farm income	**216**	**142**	**169**	**124**	**115**	**131**	**171**	**157**

Source: Farm Business Survey, Wales

2.2 Organic upland farm incomes in England and Wales, 2003/04 and 2004/05

Identical samples of organic upland farms were monitored during the financial periods 2003/04 and 2004/05[2]. This financial data was recorded using Farm Business Survey methodology. In total, a two-year comparison sample of 17 upland farms in England and Wales was derived from this dataset, with 14 farms located in Wales and a further three located in Northern England.

For this sample, comparable conventional farms for each organic farm were selected on the basis of identifying an organic and conventional sample of farms with similar resource endowments (farm size, economic size unit, region, LFA status and farm type). Following this procedure, it is useful to note that average farm size was 11% higher on the organic farms compared to the conventional farms. Other system

2 Jackson, A.J., and Lampkin, N.H. (2006) *Organic Farm Incomes in England and Wales 2004/05*. Report for DEFRA contract ref. OF0189. University of Wales, Aberystwyth.

differences included lower stocking levels for the organic farms at 0.8 LU/ha compared to 1.0 LU/ha for the conventional farms. The lower stocking rate for the organic farms translates into lower stock numbers carried per farm, equating to 13.5% less stock carried with the proportion of cattle and sheep managed at 50:50, compared to the conventional farms where the proportion of cattle and sheep is 40:60. Despite these system differences, labour requirements were similar at 1.8 annual work units for both organic and conventional farms.

Table 2
Average net farm incomes (£/ha) for organic and conventional upland (LFA) cattle and sheep farms, 2003/04 and 2004/05

	2003/04		2004/05	
Values (£/ha)	Org	Conv*	Org	Conv*
Number in survey	17		17	
Cattle (livestock units)	55	50	56	51
Sheep (livestock units)	55	76	56	77
Cereals (ha)	1	1	1	1
Forage (eff. ha)	137	128	138	127
Stocking rate (LU/eff. ha)	0.8	1.0	0.8	1.0
Size (ha)	134	123	136	122
Cattle output	140	112	136	120
- related subsidies	91	77	96	83
Sheep output	125	217	129	213
- related subsidies	78	112	86	121
Other output	183	121	190	134
Total outputs	617	639	636	670
Feeds	75	96	65	90
Other livestock costs	46	48	53	50
Crop costs	18	39	24	41
Whole farm margin	**478**	**456**	**494**	**489**
Labour	59	57	69	60
Machinery	112	108	118	115
Other fixed costs	162	156	178	167
Total inputs	472	504	507	523
Net Farm Income	**145**	**135**	**129**	**147**

* Comparable conventional farms selected on the basis of similar resource endowments to individual organic farms
Source: Jackson and Lampkin, 2006

NFI decreased from £145/ha in 2003/04 to £129/ha in 2004/05 on the organic farms. Even though outputs increased slightly for the organic farms, mainly from increased sheep output, the increase in costs reduced NFI for this identical sample. Cost increases were reflected in the fixed rather than the variable costs although other livestock and crop costs did increase slightly in 2004/05. Overall, the organic farms achieved slightly higher NFI than the conventional farms in 2003/04, but this situation was reversed in 2004/05. With the removal of enterprise related subsidies, NFI would be negative for organic and conventional farms in both years.

Livestock prices stayed at similar levels for most ruminant stock categories in 2004/05, although fat cattle sold at better prices for both organic and conventional farms. Overall, organic stock achieved higher values than the conventional livestock for both years; however, conventional store cattle prices were higher than those of organic stores in both 2003/04 and 2004/05.

A key income stream for the organic farms was agri-environmental payments through the various agri-environmental measures for Wales including Tir Mynydd, Tir Gofal, ESAs and the OFS. Agri-environmental payments represented 15.1% (£93/ha) and 15.4% (£98/ha) of total output for the organic farms in 2003/04 and 2004/05, respectively, but represented between 5.4% (£35/ha) and 6.4% (£43/ha) of total output for the conventional farms.

In terms of business stability, the organic farms maintained a positive return on tenant's capital of 8.1% in 2003/04, falling to 2.7% in 2004/05 compared with 5.4% and 2.5% for the conventional farms over the same periods. However despite a positive return, the external liability status for the organic farms increased overall by 6.4% to £59,266 in 2004/05. This figure is approximately double that of the conventional farms. The greater liability status of the organic farms may, in part, reflect the additional costs of conversion to organic farming for this farm type.

3. Livestock Gross Margins

The gross margin performance for upland sheep flocks is higher under organic than conventional management in both 2003/04 and 2004/05, according to gross margin data from the Farm Business Survey. There is little difference in the physical performance of the enterprise under either management system. The output data is fairly similar on a £/ewe basis, although marginally improved sales net of purchase figures were achieved for the organic flocks in 2004/05. The main differences occur in the cost section, with lower feed, other input and forage costs resulting in improved gross margins for the organic flocks. However, the most significant aspect of the gross margin analysis is the gross margin per hectare figure. Assuming that the organic flocks were stocked at 0.8 LU/ha and the conventional flocks at 1.0 LU/ha based on whole farm data, the conventional flocks in both years would perform better than the organic flocks.

Table 3 Organic and conventional sheep gross margins, 2003/04 and 2004/05

	2003/04		2004/05	
	Org	Conv	Org	Conv
Number of flocks	16	315	15	294
Average farm area – eff. ha	132	132	145	134
Average flock size (ewes/ewe lambs)	481	784	559	792
Lambs reared per ewe	1.0	1.1	1.1	1.1
Finished lambs sold per ewe	0.8	0.8	0.8	0.8
Values (£/ewe)				
Sales net of purchases	39	39	41	39
Support payments	22	22	23	24
Total output	61	61	64	62
Feedstuffs	10	10	9	10
Other inputs	6	6	5	6
Total variable costs	15	16	15	17
Gross margin	**46**	**45**	**50**	**46**
Forage costs	4	7	6	8
GM incl. forage	42	37	44	38
Stocking rate LU/ha	0.8	1.0	0.8	1.0
GM incl. forage (£/ha)	**34**	**37**	**35**	**38**

Source: Farm Business Survey, Wales

Another important aspect to consider is the removal of the support payments from the gross margin data. Here, it is clear that both the organic and conventional gross margins will suffer, with gross margins reduced to £12-15/ha and unable to cover the inevitable rising fixed costs of production, such as labour, machinery, rent, finance and general farm costs.

The FBS gross margin data for cattle indicates that organic cattle achieved higher gross margins compared to conventional in both 2003/04 and 2004/05. In 2004/05, the cattle gross margin per head is nearly £100 more than conventional. More organic cattle were finished whereas more conventional cattle were

sold as stores. Subsidy payments per head were also higher, presumably due to the additional second claim through the Beef Special Premium Scheme at the time. Overall, organic input costs were higher than conventional in 2003/04, but lower than or similar to the conventional in 2004/05.

Table 4 Organic and conventional cattle gross margins, 2003/04 and 2004/05

	2003/04		2004/05	
	Org	Conv	Org	Conv
Number of herds	15	228	13	216
Average farm area - eff. ha	136	131	157	137
Average herd size (breeding cows)	34	40	40	43
Values (£/cow)				
Sales net of purchases	633	436	501	440
Support payments	367	297	363	323
Total output	1000	733	864	764
Feedstuffs	135	114	125	131
Other livestock costs	85	75	104	96
Total inputs	219	190	229	227
Gross margin	**781**	**543**	**635**	**536**
Forage costs	96	104	82	115
GM incl. forage	685	440	553	422
Stocking rate LU/ha	0.8	1.0	0.8	1.0
GM incl. forage (£/ha)	**548**	**440**	**442**	**422**

Source: Farm Business Survey, Wales

Assuming a stocking rate of 0.8 LU/ha for the organic farms and 1.0 LU/ha for the conventional farms, the organic farms performed better on a £/ha basis for the cattle enterprise in both years, with a smaller differential observed in 2004/05 at £442/ha for the organic compared with £422/ha for the conventional farms. Again, the removal of the support payments reduces margins significantly, with the organic cows achieving just £79/ha and the conventional cows maintaining slightly higher margins at £99/ha.

4. Costs of Production

The cost of producing a kilogram of beef and lamb is an important consideration for the financial performance of organic upland farms. Through the Defra-funded Organic Farm Incomes project, the Welsh Farm Business Survey and Organic Centre Wales' Farming Connect benchmarking project, it is possible to show cost of production data for organic lamb, suckler stores and finished beef produced in upland areas, including variable, forage and fixed costs, as well as imputed costs of production including unpaid labour (farmer/spouse/other), imputed rent (rental equivalent) and interest on tenant's capital (the interest on capital items such as livestock, machinery and buildings).

The lamb cost of production results are taken from 25 organic upland farms for 2004/05. Total costs to produce a kilogram of lamb were 242p/kg LW, nearly double that of the average recorded lamb sale price at 124p/kg LW. Despite this large differential of -118p/kg LW, the overall margin of production was -64p/kg LW with the inclusion of other related income sources such as livestock support and environmental payments.

For store beef production, the average cost to produce a kilogram of beef was 403p/kg LW, a figure derived from 23 organic upland farms in Wales. This figure is nearly four times greater than the average price received on a pence per kilogram basis for beef stores. Again, this differential was reduced to -129p/kg LW with the addition of other related income such as livestock support and environmental payments.

The trading cattle results reflect the cost of producing a kilogram of beef for finished beef animals based on weight gains from weaned or purchased cattle through to finishing. The total costs, including imputed costs, were 348p/kg LW. Overall, the margin of production achieved was 112p/kg LW. In effect, it can be assumed that the trading beef enterprise on farm helps to offset the negative margins associated with the suckler store enterprise.

These results for both organic lamb and organic beef enterprises indicate that the costs of production are far greater than the returns that can be gained from the market place.

Table 5 Average costs of production for lamb, suckler store and trading beef cattle (2004/05)

Cattle and sheep production costs - 2004/05 - pence per kg LW	**Lamb**	**Suckler store**	**Trading cattle**
Number of farms	**25**	**23**	**24**
Feed	20	12	34
Veterinary and medicines	7	8	4
Other livestock costs	9	18	76
Forage	10	18	11
Total variable costs	*46*	*55*	*126*
Herd/Flock replacement	**19**	**9**	**0**
Labour	10	12	8
Power and machinery	28	56	38
Buildings	5	11	7
General farm costs	23	47	32
Rent	8	15	10
Finance	6	10	4
Total overhead costs	*81*	*151*	*100*
Total costs	**145**	**215**	**226**
Margin	**-64**	**-129**	**112**
Average livestock sales output received (LW)	119	110	150
Unpaid labour	56	114	75
Imputed rent	12	26	19
Interest on tenants capital	29	47	27
Total imputed costs	*97*	*187*	*122*
Total costs including imputed costs	**242**	**403**	**348**

Source: Farm Business Survey, Wales; Organic Centre Wales and Jackson and Lampkin, 2006

5. Conclusions

There is now significantly more data available to determine the financial performance of organic farming in the upland areas of Wales. The data based on the financial periods 2003/04 and 2004/05 indicates that the profitability of organic cattle and sheep farming in LFA areas at that time was no more or less profitable than conventional production. Indeed, the net farm income results show slight increases/decreases between the organic and conventional farmers, between 2003/04 and 2004/05. However, a key difference indicated by the data is that organic farms in the uplands support less livestock whilst maintaining similar levels of income through organic price premiums and increased uptake of agri-environmental schemes. The increased uptake of agri-environmental schemes is also reflected by Welsh data, which suggests that 65% of organic farmers in Wales have also signed up to other agri-environmental schemes in Wales including Tir Gofal and Tir Cynnal.

Despite the ability of organic farms to increase incomes via agri-environmental schemes or other farm diversification projects, there is a need to focus on the organic price premiums achieved for organic stock as well as the efficiency of the primary production enterprises. The gross margin data suggested that improved conventional prices for lamb, seen during 2003/04 and 2004/05, resulted in higher gross margins for conventional lamb production on a £/ha basis. However, the margin gained from organic beef production was greater on both a £/head and £/hectare basis in comparison with the conventional. With increasing consumer demand for organic produce pulling organic lamb and beef prices upwards, it is likely that the organic price premiums achieved in 2005/06 will widen the gap between organic and conventional gross margins and therefore, potentially increase the profitability of the organic farms in comparison to conventional farms.

The cost of production data generated some challenging results, particularly given the large sample size available, in that the total costs of production for lamb, suckler calf and finished beef production far exceeded the value of the average sales output received. As a result, the process of calculating costs of production and engaging in the process of benchmarking can only be actively encouraged. It is clearly a useful method of addressing livestock production systems to improve margins as well as highlighting price requirements to maintain business viability.

In summary, the organic data derived from the Farm Business Survey, the Defra-funded Organic Farm Incomes study and Organic Centre Wales' Farming Connect benchmarking project produce mixed results on the performance of organic farming in the uplands. Overall, profitability appears to be similar to conventional farms, particularly when signed up to an agri-environmental scheme, and this fits in well with the organic concept and enhancing the image of farming in the uplands. In future, the level of profitability for organic farmers may improve with the increasingly buoyant organic market reported for the 2005/06 season. Therefore, it is possible and reasonable to suggest that the combination of organic farming along with the adoption of agri-environmental schemes or other diversification projects, such as direct sales avenues or tourism, is an alternative to conventional farming in these areas – but an organic price premium is essential to maintain economic parity with conventional farmers.

6. Abbreviations

FBS: Farm Business Survey
LU/ha: Livestock units per hectare
NFI: Net farm income
The full Organic Farm Income reports are published on the DEFRA (http://statistics.defra.gov.uk/esg/index/list.asp?i_id=130) and Organic Centre Wales (www.aber.organic.ac.uk) websites. Farm Business Survey data are available via the Institute of Rural Sciences (www.irs.aber.ac.uk/fbs/) website.

Organic Centre Wales has developed a benchmarking programme to calculate gross margin and cost of production information for farm business' in Wales. If you would like to benchmark your farm business and receive results that are compatible with the data shown here, then please contact Organic Centre Wales at organic@aber.ac.uk or tel 01970 622100

Part 3. Case Studies

1. Blaen y Nant

1.1 Farm profile

Location: Bethesda, Gwynedd.
Farm Size: 302 ha in the mountains of Snowdonia National Park; in addition, approximately 64 ha of arable lowland is rented.
Livestock: 300 Welsh Mountain sheep with followers; a pedigree herd of 24-25 Welsh Black cattle with followers.

Blaen y Nant in Snowdonia lies at the head of a glacial valley, rising from small fields on the valley floor (300 m) to the highest point (920 m). The average rainfall in the area is 100 inches. The farm, owned by the National Trust, has been held by Gwyn Thomas since 1996 and conversion to organic status was completed in 1997. The farm is registered with the Soil Association and has been in the Tir Gofal scheme for five years. The farm is also designated a Site of Special Scientific Interest. Drystone walls and hedges were restored under Tir Gofal scheme and the farm is also in the Tir Mynydd scheme.

1.2 Cropping and feeding strategy

Ninety-nine per cent of the land area at Blaen y Nant is semi-natural vegetation and the remainder (5 ha) is cultivated. The cultivated area provides turnips/swede and grass/clover for silage. The rotation followed is: 1 year turnip (or swede); 2-3 year ryegrass/red clover; and 7 years ryegrass/white clover/timothy/ fescue/wild herbs. Silage is cut once per year and the aftermath is grazed by the lambs and sheep.

A further 64 ha of arable lowland are rented in and provide extra silage. This area also hosts the majority of animals during the off-farm wintering period (15 cattle stay on farm). The same crop rotation is applied to the rented land. During the summer period the sheep and cattle graze extensively on the semi-natural vegetation and they are fed silage during the winter.

Clover rich pastures plus sheep and cattle FYM provide nutrients for the soil. Lime is applied occasionally, as necessary. There are some problems with rushes on the farm and these are controlled by grazing with Shetland ponies.

1.3 Livestock performance

The flock comprises Welsh Mountain ewes which are put to bought-in Bluefaced Leicester rams to produce Mules; the Bluefaced Leicester is chosen for its composition and fat percentage. Lambing percentage at Blaen y Nant increased, with more twins born, when the change was made to off-farm wintering at a lowland farm. Lambs are weaned at 4.5 months and all lambs are sold as finished; they are sold at 6.5-7 months old, at an average of 17 kg DW.

The herd comprises Welsh Black cattle. All cows are bred to a Welsh Black bull which has been bought in to ensure pure bred calves. In the last eight years, two Welsh Black bulls have been purchased. The calves are weaned at nine months and calf mortality is low, at less than 5%. Spring calving has been replaced by an autumn calving regime. The beef cattle are finished on grass and sold after 26-30 months; bullocks weigh 520-620 kg when slaughtered and the heifers, slightly less.

1.4 Livestock health and fertility

There are few health and fertility problems with the cattle. However, the herd has not been treated for external and internal parasites during the past ten years and no problems with mineral deficiencies have been noted. As the herd is autumn calving, the cows calve over a six-week period between September and mid October.

The flock lambs in March over a period of one month and the lambing percentage is 130-140%. Reduced flock size, the provision of silage during off-farm wintering and rotational grazing during the winter months have helped to increase this percentage. Good husbandry has resulted in few problems with diseases in the sheep flock and no vaccinations have been applied for ten years.

1.5 Nutrient budgets

Although no soil testing has been undertaken, according to Gwyn Thomas there are no problems associated with low N, P and K status. Soil fertility on the lower fields is maintained by the application of FYM and by N-fixing clover in the swards.

1.6 Marketing

The majority of sales occur between August and December when all animals are finished off grass. The beef is mainly marketed direct to a small group of customers (5-6 cattle per year). Surplus beef is sold via a producer in Anglesey who sells the meat at farmers' markets. The lambs are sold to a multiple retailer (Tesco).

1.7 Key challenges

The farm receives subsidy via Tir Mynydd which contributes to farm income. Diversification, in terms of tourism and added value activities such as direct marketing, is necessary for the financial viability of the farm. Gwyn Thomas cautions producers interested in converting to organic beef and sheep production: *"don't do it for the wrong reasons because it is not easy to make a living"*.

2. Cannon Farm

2.1 Farm profile

Location: Cannon, Llanerfyl, Welshpool, Powys
Farm Size: 215 ha unimproved hill, 114 ha improved pasture and 11.6 ha semi-improved hay meadow; in addition, 28 ha of rented land and 109 ha of forestry and shelterbelts.
Livestock: 40 Highland cattle, 23 Welsh Black cows and 1,000 Welsh Hardy Speckled Face breeding ewes and followers; the ewes will be reduced to 500 in 2006/7.

Cannon Farm has a number of land types including blanket bog and upland heath. It is located in a high rainfall area, at around 75 inches per year. Conversion started in 1991 and the farm is certified by the Soil Association. It is also in the Tir Gofal scheme through which the farmer, Nigel Elgar, has fenced 700 metres of land in order to create a streamside corridor to provide a secure resting place for passing otters.

2.2 Cropping strategy

Sixty-six per cent of the land area is unimproved grassland. Additional arable land was rented, providing wheat, triticale, oats and spring beans, but this situation has now changed and the rented land has been given up. Feed will be bought in through the Graig Farm Producer Group, which has a number of advantages and provides feed at a reduced price with adequate quality control.

Rushes and bracken are a problem on the grassland and the sward is topped twice a year to control rushes. However, Tir Gofal scheme prescriptions which restrict grazing density to 0.05 LU/ha mean that the bracken is difficult to control on bog land. The clover content of the sward in silage fields has increased as a result of the late shutting-up of fields. This has reduced the competition to clover in early spring from other grass varieties by keeping them tightly grazed.

2.3 Herd performance

There are two herds of cattle on the farm: a herd with 23 Welsh Black cows and a fold with 18 Highland cattle being put to the bull. Both Welsh Black and Highland bulls are kept on own farm, but there have been some changes in the use of bulls. Originally, a Welsh Black bull was used on the herd, but some years ago the decision was made to change to a Limousin bull, with better conformation but a more difficult temperament. Now, however, a Welsh Black bull is again used because they are better adapted to the system, and because of the Herd Health Scheme measures to prevent Johne's disease in the Welsh Black herd.

After conversion in 1991, a number of changes were made. Cattle were finished instead of being sold as stores and the overall stocking rate was reduced by taking on more land. However, cattle will be sold as stores again as a result of the current scaling back of the business.

The herd has been predominantly spring calving up until now but a choice has been made to return to purely spring calving due to the lower labour and housing requirements.

Highland cattle have also been introduced to manage moorland grazing and for an area managed specifically to encourage Black Grouse populations, in partnership with RSPB Cymru.

2.4 Flock performance

All 1,000 Speckled Face sheep either have electronic identification as boluses or are tagged at birth, and the flock is in a Sire Reference scheme. Since entering the scheme, high index rams are bought in and average lamb weights have increased. High value rams are also used for crossbreeding with Meatlinc. All breeding stock is scrapie genotyped but, according to Nigel Elgar, this is a secondary trait and overall performance is more important.

2.5 Herd health and fertility

Calving occurs over a period of three months at present, but in the future it will be planned within a six-week period to concentrate the labour requirement. Welsh Black cattle have had problems with Johne's disease and, consequently, at Cannon Farm they are now tested and culled if necessary. No vaccines are used for the cattle. Welsh Black cattle (but not the Highland cattle) have had selenium and copper deficiencies and receive an organic permitted bolus. Highland cattle need treatment to control fluke and are treated for lice, but no vaccines are used.

2.6 Flock health and fertility

Sixty per cent of the ewes are put to a Hardy Speckled ram and 40% are put to a Meatlinc ram. Lambing takes place over a two to three-week period between the end of March and mid-April. The lambing percentage at scanning is around 130%. All barren ewes are sold after scanning. The only vaccine used on the flock is Toxovax to prevent Toxoplasmosis. There is some selenium deficiency and the sheep are drenched prior to tupping and lambing. The sheep can also have problems with foot-rot when housed and they are treated at housing with a footbath and trimming if necessary. They are also drenched against liver fluke. According to Nigel Elgar, sheep scab is a serious problem in the area and SP dips have been used for both scab and lice. However with the change of regulations, an alternative has to be found. Breeding ewes can be injected but fattening stock would have to be sold as non-organic because of the withdrawal period for injectable products.

2.7 Nutrient budgets

The main problems are on the land used for silage. On average, soil tests are conducted every two years and the main problem is low potassium levels. FYM is applied along with permitted sources of potassium; ground limestone and Gafsa rock phosphate are also applied when necessary.

2.8 Marketing

All produce is sold through the Graig Farm Producers Group, which involves around 240 organic farmers across Wales and the borders who work together to market their produce.

2.9 Key challenges

At Cannon Farm, two key challenges are the adequacy of labour supply, and waterlogging on the land. Nigel Elgar stresses, however, that beef and sheep enterprises have to be financially viable. He points out that a the benchmarking exercise undertaken by Graig Farm Producers and Organic Centre Wales showed that without the Single Farm Payment and environmental payments, prices received at present are not sustainable. In this context, membership of a marketing group helps producers to get a good price for their products.