The effectiveness of agri-environment schemes for farmland birds: a European perspective

Agri-environment schemes are widely seen as a solution to the problem of the loss of wildlife through agricultural intensification over the last 50 years. A symposium in August looked at the effectiveness of agri-environment schemes in restoring and maintaining populations of farmland birds in Europe. Peter McGregor reports from the 24th International Ornithological Congress in Hamburg.

Why a two-tier scheme in England?

Environmental Stewardship (ES) in England has Entry Level (ELS) and Higher Level (HLS) to reflect the differing needs of widespread v. localized farmland species. Widespread species such as Skylark benefit from a widely applicable entry level scheme (that therefore has to be cheap to run) and options in ELS (including skylark plots) achieve this. Stone Curlews were probably never widely spread or numerous – in the 1930s there were about 3000 pairs – but they have fallen to 180 pairs in 2 locations. The needs of this species are more complex and the more complicated land management (through a range of HLS options) has to be targeted to the right location. So although the cause of the decline of these two species is the same, assisting their recovery needs different mechanisms – hence the two-tier ES scheme in England.

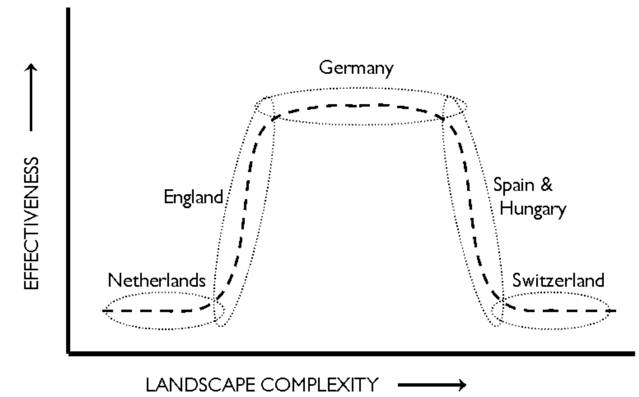
An agri-environment scheme in a non-EU country

Switzerland has intensive agriculture in its lowlands and about half of its farmland birds are on the Red List (see the article on the status of farmland birds in this bulletin). In response, an agri-environment scheme was introduced in 1993. This required farmers to set aside 7% of their farmland as ecological compensation areas (ECAs) managed for biodiversity conservation. Despite an increase to 8.8% as ECAs in 2004, farmland bird populations have generally continued to decline (generalist species, see Bulletin article, have declined less rapidly than specialists). The reason for this agri-environment scheme having little effect seems likely to be due to the poor quality of 75% of ECAs, which in part is due to poor management advice.

The bigger picture: schemes & landscape structure

A number of talks at the symposium dealt with differences in the effectiveness of agri-environment schemes between European countries. Pinning down the reason for these differences is complicated by the fact that different countries have different schemes. However, a common feature of agricultural intensification is the simplification of landscape structure, e.g. the increase in field size and associated removal of field boundaries. It has been suggested that such landscape simplification is more responsible for reductions in biodiversity than the impoverishment of environmental conditions within fields. One of the talks in the symposium reported that there is an interaction between effectiveness of agri-environment schemes and landscape structure at the field level (Fig. 1). Schemes have been most effective in Germany which covers the middle range of complexity and ineffective at the extremes of landscape complexity (extensive, uniform fields in the Netherlands, small, diverse fields in Switzerland). The range of landscape complexity over which the effectiveness of schemes changes from ineffective to effective is small (giving the steep shoulders of Fig. 1) and probably explains the patchy success of schemes in England, Spain and Hungary, where complexity spans these transition ranges.

Figure 1. A conceptual model of the interaction between the effectiveness of agri-environment schemes and landscape complexity (dashed line). Dotted ellipse shows country range.



A common message from the symposium was that more needs to be done to monitor the effectiveness of agri-environment schemes and also to better understand take-up and implementation of schemes and the options within them.

Postscript: the German house sparrow story

The conference logo was a House Sparrow – a farmland species that has shown severe declines over much of Western Europe. It was used as the logo for the conference held in Germany because it has gone from being regarded as a pest with a bounty on its head to a Red List species. For 300 years German sparrows were killed and farmers were required to provide sparrow heads in proportion to the acreage of the farm. Killing has been banned from the 1960s. A farm's sparrow head count now has a very different meaning for farmers - generally, the more the merrier.

References

Schodde, R. 2006. Abstracts from the 24th International Ornithological Congress. *Journal of Ornithology* 147, Suppl.1.

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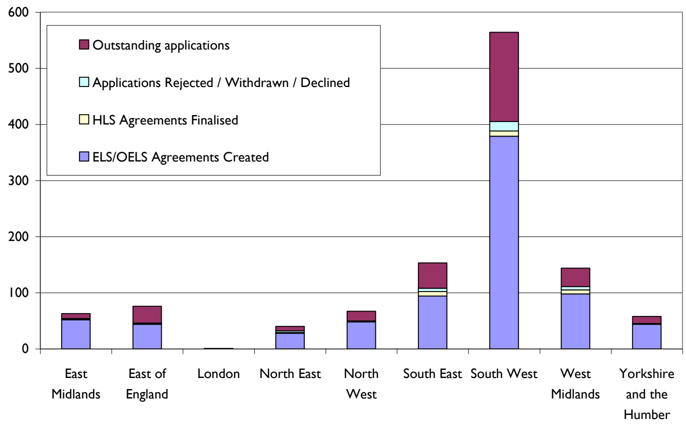
Environmental Stewardship: patterns of applications and take up of options

Environmental Stewardship, introduced in 2005, is the most recent scheme designed to move European support for agriculture in England away from subsidies and towards agri-environment and wider rural development measures. Several hundred applications for Environmental Stewardship have now been received by the Rural Delivery Service (RDS). Peter McGregor looks at the patterns emerging at national, regional and county level from these applications and at which options feature in Cornish OELS agreements.

Environmental Stewardship (ES) in England

The latest figures show that over 93,000ha in England are under Entry Level (ELS) or Organic Entry Level (OELS) agreements, with over 1,300ha under Higher Level Stewardship (HLS). Almost half of the 1,166 English applications for ES came from the southwest region. About the same proportion (48%) of ELS/OELS agreements concluded are in the southwest, as are a third of the HLS agreements (Figure 1).

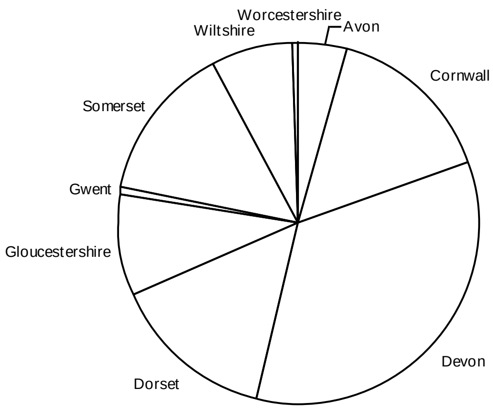
Figure 1 Environmental Stewardship by regions (RDS, July 2006)



OELS in the Southwest

In the southwest there have been 183 OELS applications. Figure 2 shows that over 1/3rd of these came from Devon (34%) and a further 44% came from Cornwall, Dorset and Somerset (15%, 15% and 14% respectively).

Figure 2 OELS applications by county (RDS, July 2006)

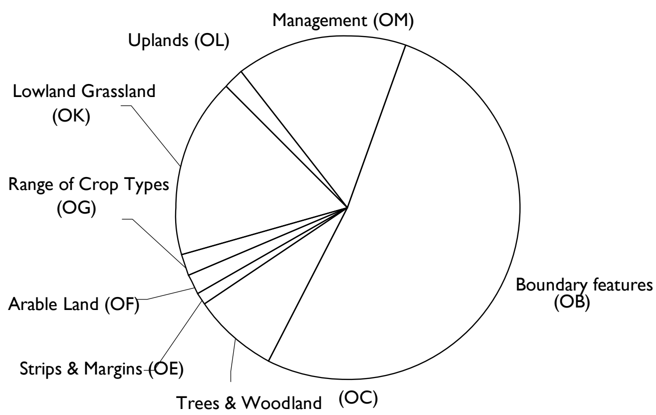


On average, 72% of OELS applications in England were accepted. Cornwall had the highest success rate of applications with 86% accepted, followed by Devon (71%), Somerset (69%) and Dorset (67%). The total value of accepted applications is £3.27M covering 9,299ha (in Cornwall the values are £0.57M and 1,635ha).

Take up of OELS Options in Cornwall

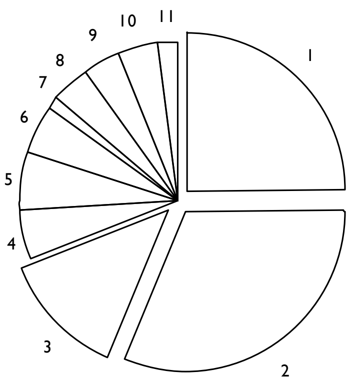
The most recent information on the take up of OELS options in Cornwall is based on 89 agreements in the county. As expected, all agreements featured a Farm Environment Record (option OA1) and Organic Management (option OU1). Figure 3 shows that over half of the options chosen fell into the OB (Boundary Options) grouping. Lowland Grassland (OK) and Management (OM) options were the only other relatively common choices (17% and 16% respectively).

Figure 3 % OELS options in Cornwall (RDS, July 2006)



Within Boundary Options, hedgerow management on one side (OB1) or both sides (OB2) of the hedge accounted for over 50% of OB choices (Figure 4). The only other option accounting for more than 10% of choices was enhanced hedgerow management (OB3).

Figure 4 % OB options in Cornwall (RDS, July 2006)



Looking to the future, research by organizations (e.g. RSBP) on grassland management practices that can deliver wildlife benefits may result in more ES options for grassland when the scheme is next revised.

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Status of wild farmland bird populations: UK, EU & the Big Three in Cornwall

The latest indicators of wild bird populations have been published by Defra. The indices show changes in the breeding and wintering populations of common native bird species grouped by habitat, with prominent attention being paid to farmland birds. The 2005 population index for farmland birds in the UK is about 60% of its 1970 value but has remained fairly stable since the early 1990s, leading Defra to conclude that the decline in farmland bird populations has now been halted. Peter McGregor considers the details and reports on Farming & Birds for Cornwall, *an advice day on how environmental stewardship schemes can best help farmland birds.*

Birds as indicators

Bird populations are considered to be a good indicator of the state of wildlife and countryside because birds occupy a wide range of habitats and tend to be near or at the top of the food chain. They are also one of the few groups of animals for which there are long-term data, i.e. spanning several decades. Wild bird population indicators contribute to assessment of two key strategies. First, they are one of the 20 'UK Framework indicators' (also referred to as 'quality of life' indicators) which cover key impacts and outcomes of the Government's Sustainable Development Strategy. Second, the progress of the England Biodiversity Strategy (EBS) is measured with the help of wild bird population indicators, reported as farmland, woodland, wetland, towns and gardens, coastal and seabirds. A 2004 update of the full set of EBS indicators is due for publication in November 2006. Farmland bird populations in England are particularly important because of their role in Defra's Public Service Agreement (PSA) target to reverse the long-term decline in the number of farmland birds by 2020.

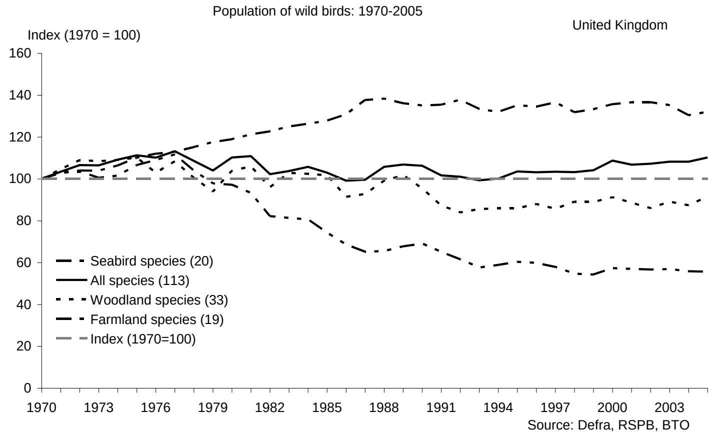
Where the data come from

The indicators are compiled in conjunction with the Royal Society for the Protection of Birds (RSPB), the British Trust for Ornithology (BTO) and the Joint Nature Conservation Committee (JNCC). They are considered to give reliable medium to long-term trends but due to the nature of the data each index point has an estimated margin of error of ±5% (for details see the web address below). The index is derived by modelling and shows the annual changes in abundance of species since 1970. Each species is given equal weighting, and the annual indicator figure is the geometric mean of the species indices for that year. The information for farmland birds comes principally from the Common Birds Census (1970 to 2000) and Breeding Bird Survey (1994 to 2004), conducted by about 5,000 volunteers nationally. This is the longest running and most rigorous national data set in the world.

All bird species

The 2005 all-species indicator contains two new seabird species (Razorbill and Black Guillemot), bringing to 113 the number of species considered. All are breeding birds that are native to the UK, none are introduced or rare species. The average of all 113 species shows a rise of 6% per cent over the last decade. However, Figure 1 shows that the indices for farmland and woodland birds have generally declined, while seabirds have tended to increase. The all-species indicator also masks major differences between species, with some upland and wetland species doing well (e.g. Buzzard and Gadwall) but others in severe decline (e.g. Curlew and Sedge Warbler).

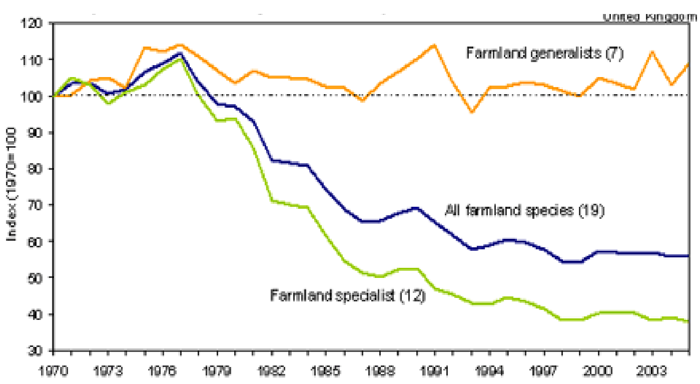
Figure 1. Change in bird populations 1970-2005 shown relative to 1970 (horizontal grey line). Solid mid line: all 113 species; upper line: 20 seabird species; lower line: 19 farmland species; dotted mid line: 33 woodland species (RSPB, BTO, Defra 2006)



Farmland birds in UK

The farmland bird population index in the UK halved between 1977 and 1993, and since then it has remained at about 55-60% of its 1970 value (Fig. 2). However, the combined pattern for all 19 farmland species (middle line in Fig. 2) obscures an important difference between farmland generalists (7 species, of which Woodpigeon is an example) and farmland specialists (12 species that breed or feed mainly or solely on farmland, e.g. Skylark). Generalists have generally maintained population size whereas specialists have declined dramatically since 1970 (cf. upper with lower line in Fig. 2),

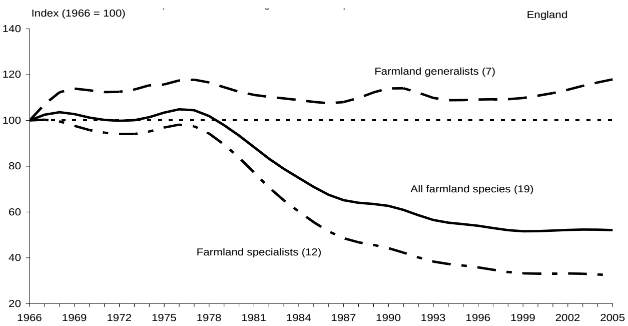
Figure 2 Change in UK farmland bird populations 1970-2005. The index is shown relative to 1970 (RSPB, BTO, Defra 2006)



Farmland birds in England

The index of farmland bird populations used to measure progress against the Government's farmland birds PSA target (see above) is somewhat different from the index discussed in the previous paragraph. Apart from the obvious difference in geographic coverage (it is an index for England), it differs from the UK index in that it is relative to 1966 levels (rather than 1970). However, the major difference is that the indicator is based on smoothed individual species' indices. Smoothing removes the short-term peaks and troughs due to weather and any sampling error. Nevertheless, it shows a similar pattern (Fig. 3) to the UK (Fig. 2) of a steep decline between the mid-1970s and mid-1990s followed by no significant change in the last decade and a striking difference between generalist and specialist species. Once again, declines mostly affect farmland specialist species. Some of the species that have experienced major declines over the last three decades, such as Grey Partridge, Turtle Dove and Starling, continue to decrease. However, others, including Reed Bunting and Tree Sparrow, may be showing signs of recovery. Generalists, including Woodpigeon and Stock Dove, may have benefited from changes such as increased oilseed rape production.

Figure 3 Change in England's farmland birds 1966-2005. The index is shown relative to 1966 (RSPB, BTO, Defra 2006)



Farmland birds in the southwest

Regional data on patterns of population change of farmland birds is only available to 2004 (Fig. 4). In the South West the index is based on 16 species (as Tree Sparrow, Turtle Dove and Yellow Wagtail are too rare in the region). Of the 16 species, 7 showed a decrease of 10% or more, with Lapwing populations faring particularly badly. Overall, the index decreased by 8% - in line with the national trend.

Wild bird population indicators in Europe

The success of wild bird population indicators in the UK led to the development of such an indicator for Europe. This is considered to be the first policy-relevant indicator of biodiversity for Europe and the farmland bird indicator is used by the EU as a Structural and Sustainable Development indicator. At present 18 countries contribute to the indicator, with this number set to grow as monitoring schemes become established in other EU states. The species composition for Europe is different from that for the UK, with Woodchat Shrike and Black-tailed Godwit appearing in the list of 19 farmland bird indicator species alongside Skylark and Linnet. As in the UK, farmland bird populations in Europe fell in this period (by 28%, Fig. 5), with the greatest decline between 1980 and 1990 reflecting widespread intensification of farming during this time. The figures for 1980-2003 show a marked east-west difference with farmland bird populations falling by 57% in west Europe and rising by 5% in the east.

Figure 4 Change in England's farmland birds by region 1994-2004 (Defra 2006)

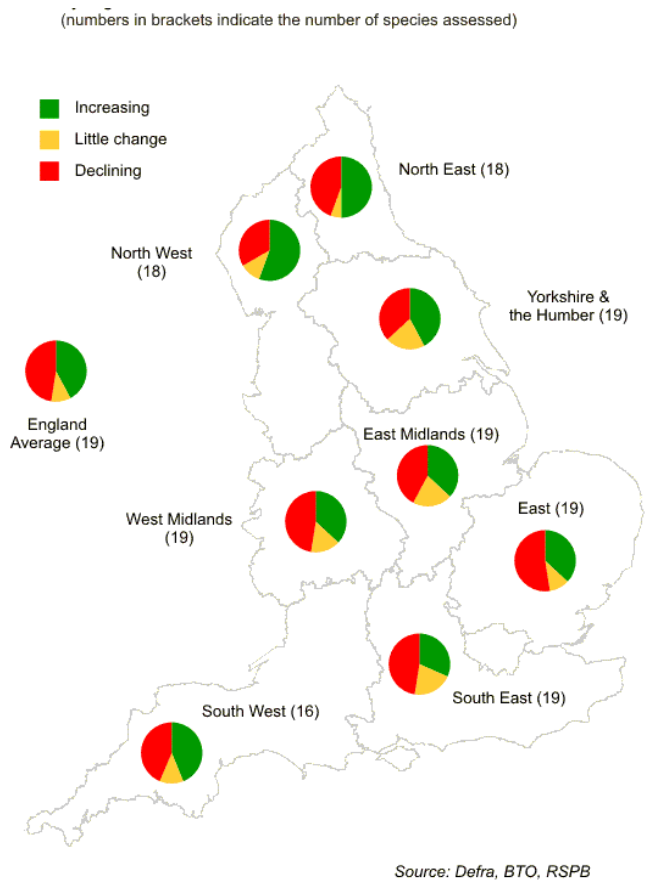
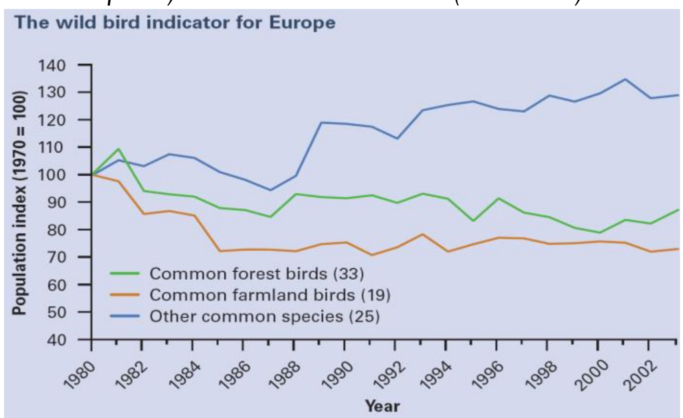


Figure 5 Wild bird indicator for Europe 1980-2003 (lower line: 19 farmland species; mid line: 33 forest species; upper line: 25 common species) all shown relative to 1970 (RSPB 2005).



Farming and Birds for Cornwall – the Big Three

This was the title of an event held on 22nd June at Duchy College, Stoke Climsland. It was organized by the Rural Business School through the ESF-funded SIAZ project in partnership with the RSPB. Specialists from the RSPB, Defra/RDS SW, the Game Conservancy Trust and English Nature (Cornwall & Isles of Scilly Team) explained how Environmental Stewardship schemes can best benefit farmland birds in Cornwall. This advice is neatly summarized by the "Big Three" for farmland birds:

I. Nest sites (Spring) – provided through sympathetic management of hedges and crops.
II. Insect food (Summer) – provided by low intensity arable and grassland.

III. Seed food (Winter) – provided by winter stubbles, wildlife mixes and forage crops.

It was clear from the information presented that many farmland species in Cornwall need help. Six of the 16 farmland bird indicator species in Cornwall are "red listed" as are 8 other farmland species that are not indicators (red listing means rapid (i.e. ≥50%) declines in breeding populations and/or ≥50% contraction of breeding range over the last 25 years). A further 2 indicator species are "amber listed" as are 6 other farmland species (amber means showing moderate (i.e. 25-49%) population decline and range contraction).

The specific environmental stewardship (ES) options that could provide the Big Three for a selection of farmland specialist and generalist species in Cornwall were identified. For example, safe nest sites for Corn Buntings (a specialist now restricted to a small section of the north coast) could be provided through sacrificial mixes (Options EF2, EF3, HF12, HF14) and spring-sown cereals (EG1, HG7). Another example is that summer food for Skylarks can come from beetle banks (EF7, HF7) and skylark plots (EF8, HF8).

Four actions that would further enhance farmland bird populations locally were introduced as the Farmland Bird Challenge:

1. focus on what is missing from the Big Three for the species present on the farm
2. for each 100ha of arable and temporary grassland, establish 1ha of wild bird mix or 10ha of extensive arable (winter stubbles, stubble turnips, etc)
3. have 1km (2ha) of field margins / corners per 100ha of farmland
4. manage extensively all grazed or cut semi-natural habitat

There is a hint that things are getting better, at least for some farmland birds in some parts of Cornwall. Recent RSPB surveys have found some local increases (e.g. Linnets on the Lizard and Bodmin Moor, Reed Buntings on Bodmin Moor) and reasonable populations (e.g. Linnets in West Penwith).

General information on how to farm to help farmland birds can be found on the RSPB website and the Volunteer & Farmer Alliance may be able to give assistance with surveys to find out which species are present (see below).

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Wild Bird Populations, Defra, 2006
http://www.defra.gov.uk/news/2006/061019a.htm
Wild bird indicators for the English regions: 1994 – 2004, Defra, 2006
http://www.defra.gov.uk/environment/statistics/wildlife/research/download/wdbrds200603.pdf
A BTO report on the estimation of confidence intervals for indicators can be found at: www.defra.gov.uk/environment/statistics/wildlife/kf/wdkf03.htm.
The State of UK's Birds 2005
http://www.rspb.org.uk/birds/sotukb/index.asp
The State of Europe's Common Birds 2005
http://www.ebcc.info/
RSPB, Helping Farmland Birds
http://www.rspb.org.uk/countryside/farming/advice/birdsonfarms/index.asp
Volunteer & Farmer Alliance
http://www.rspb.org.uk/countryside/farming/vandfa/index.asp

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Science and the Agri-environment

Climate change, migratory species & biodiversity

A UK-funded international report on the impacts of a changing environment on wild animals was launched at the UN Framework Convention on Climate Change in Nairobi in mid-November. It makes clear that climate change is already affecting wild animals: many species have moved towards the poles (on average 6.1km per decade) or to higher elevations (1m per decade), while spring events like flowering and leaf flushing are occurring on average 2.3 days earlier per decade. The report was produced by the Convention on Migratory Species and it points out the special role of migratory species as a biological barometer on the effects of global climate change. It also emphasizes the close link between climate change and biodiversity; climate change affects biodiversity and the loss of biodiversity contributes to climate change. Biodiversity is a tool for coping with global climate change; for example, natural carbon sinks, like swamps, bogs and forests can slow down climate change if such habitats are conserved. Biodiversity is also important because many people depend on wildlife for their livelihoods and many more have vital environmental services like soil quality, flood control and water regulation safeguarded by healthy wildlife populations.

The report can be found at:
http://www.cms.int/publications/pdf/CMS_CimateChange.pdf

NZ agriculture more efficient

Food miles are increasingly used as an indicator of the environmental impact of food production. Simple geography means that produce from New Zealand will always fare badly in food mile comparisons with European produce. However, a different picture of the impact of New Zealand agriculture emerges from a recent report (Saunders et al., 2006). This report compared energy use and CO_2 emissions associated with a production system in NZ with that in the UK and included the cost of transport to the UK border.

The report shows that dairy production in NZ is twice as efficient as the UK and four times as efficient in the case of lamb. Apple production in NZ is more energy efficient even though some energy and other data were not available for the UK. Although onion production in the UK is more energy efficient than NZ, the picture is reversed when storage costs for UK onions are included.

Report's values for dairy (milk solids) production

	Energy (MJ/Tonne)		**CO_2** ($kgCO_2$/Tonne)	
Item	**NZ**	**UK**	**NZ**	**UK**
Direct	9,558	14,482	384.5	847.1
Indirect	11,331	32,877	739.2	1,949.80
Capital	2,023	1,009	173.9	123.8
Total (incl shipping)	**24,942**	**48,368**	**1,422.50**	**2,920.70**

Reference

Saunders, C. Barber, A. & Taylor, G. 2006. Food miles – comparative energy/emissions. Performance of New Zealand's agriculture industry. Research Report No. 285, Agribusiness & Economics Research Unit, Lincoln University, New Zealand. This report can be found at: http://www.lincoln.ac.nz/story_images/2328_RR285_s6508.pdf
The River Cottage Forum discussion on this topic is at: http://forum.rivercottage.net/viewtopic.php?t=19933

Spring triticale varieties: 2006 OSC trial results

Whilst winter triticale is a common organically-grown crop in the south-west of England, accounting for approximately 25% of all organic cereal crops, until now varieties suited for spring drilling have not been readily available. As a consequence, their potential as a viable organic crop is not clearly understood. Further, the performance of the commercially available varieties is untested under both organic conditions and the unique Cornish climatic conditions. Initial investigations, conducted as part of The Organic Studies Centre spring cereal variety trials (2004 and 2005), gave a strong indication that these varieties are comparable in performance to other organic cereal crops. A more recent trial involved the comparison of five spring varieties. A summary of results is provided here and full details of the results can be obtained from the Organic Studies Centre.

Whereas traditional crop variety trials involve growing crops in small controlled plots, the trial described here involved each of the varieties being grown on a commercial scale on each of six farm sites located throughout Cornwall. This provided an opportunity to test the performance of crop varieties under a range of conditions.

Method

Farmers known to be involved in the production of organic cereal crops were contacted and asked whether they would be prepared to take part in the trial. Farms were also selected according to their geographical location, so as to enable a broad coverage of the region. Six farms were selected to participate.

Participating farmers were supplied with sufficient seed to cover approximately 0.25 acre of each of the following varieties: Logo, Legalo, Bienvenue, Nilex and Trimour. The varieties Logo and Legalo were from an organically certified seed source. Due to a shortage of supply, the other varieties were from an un-cleaned, non-organic source. Derogations were received from the appropriate organic certification bodies enabling the use of these non-organic seeds.

Each farmer was requested to grow each variety in adjacent plots of approximately 1000m² (equivalent to 1/10 ha or ¼ ac) as at least single drill-width strips using the same seed rate for all varieties. Plots were individually marked with coloured coded canes indicating the precise location of each variety. A seed rate of 200 kg/ha was recommended but the actual seed rate used on individual farms was left to the discretion of the participating farmers. Soil analyses were undertaken prior to drilling. The results of the analyses are presented in Table 1.

Table 1 Soil characteristics of trial farm sites

	Site 1	2	3	4	5	6
Soil type	Medium	Heavy	Medium	Medium	Heavy	Heavy
Clay content %	28	40	33	34	47	45
Organic matter %	4.2	3.8	3.4	4.9	4.0	5.0
Calcium mg/kg	1863	3738	1766	1887	1743	2562
pH	5.7	7.1	6.6	6.2	6.1	6.3
Mineral P-reserve (mg/kg)*	93.5	59.5	79.9	132.5	105.1	98.9
Potash mg/kg	55.9	210.4	113.1	107.8	143.6	146.7
Magnesium mg/kg	108.7	214.2	81.1	89.3	81.5	118.9
Iron mg/kg	693	255	272	464	344	507
Manganese mg/kg	136.3	215.4	95.3	91	118.7	101.7
Zinc mg/kg	14.7	13.5	8.2	10.2	10.5	8.9
Copper mg/kg	4.6	13	1.5	1.7	3.5	4.5

* sum of sodium acetate, double acetate and citric reserve measures

Seed rates and dates of drilling were recorded as were crop management inputs (see Table 2). During the growing season, all trial sites were visited regularly and key observations were recorded reflecting crop growth and health. At harvest, three random 1m² quadrats were cut within each variety plot (harvest plots). The total weight of each quadrat was recorded. Straw length was measured by recording the length of 10 randomly selected plants from each harvest plot (i.e 30 plants for each variety at each trial site). Grain yield was estimated for each quadrat by weighing grain removed from the harvested material using a hand held harvester (Minibatt®). Laboratory analyses were conducted on a sample of grain from each quadrat in order to establish measures of moisture content (DM%), specific weight (kg/hl) and crude protein (g/kg) as well as the weight of screening and admixture. (N.B. measures completed for Site 1 were on a single mixed sample of each variety rather than for separate quadrats). Estimates of grain yields per hectare (adjusted to 15% moisture content) were made from measures of total quadrat grain weight and moisture content.

Table 2 Drilling date, seed rate and previous cropping at six spring triticale variety trial sites

Site	Drilling date (2006)	Seed rate equivalent (kg/ha)	Previous cropping
1	April 9th	165	Spring cereals
2	April 13th	200	Vetch followed by brassicas
3	April 18th	185	Over-winter stubble and sheep
4	April 10th	185	Spring cereals
5	April 10th	184	Mustard & sheep
6	April 13th	200	Unsuccessful cereals (ploughed in)

Grain yield

Estimates of grain yield for each harvest plot are presented in Table 3. Table 4 ranks, according to mean adjusted yield, each of the varieties at each of the sites to give a general indication of the better performing varieties. Trimour was the best performing variety at three of the six sites. Trimour and Bienvenue tended to perform consistently well whilst Logo and Legalo were perhaps the poorest performing. Nilex was less consistent in its performance ranking. However, although at some sites varietal differences were large, some caution should be applied in applying the variety ranking as variety was shown to be not a statistically significant factor influencing yield across sites.

There was no real evidence to show that any particular variety was suited to a particular site, with the worst and best performing site being the same for all varieties. There was evidence of site and variety interaction effects ($p<0.05$).

Site proved to be a highly significant factor influencing yield ($p<0.001$). Site 2 was consistently the best performing, whilst Site 3 invariably produced the lowest yield. This is clearly demonstrated in Figure 1, as is the variation in yields for each variety at different sites. The variation in yield between sites for all varieties was much greater than differences observed at any of the individual sites, ranging from 2.72t/ha to 6.02t/ha, with an overall trial mean yield of 4.49t/ha.

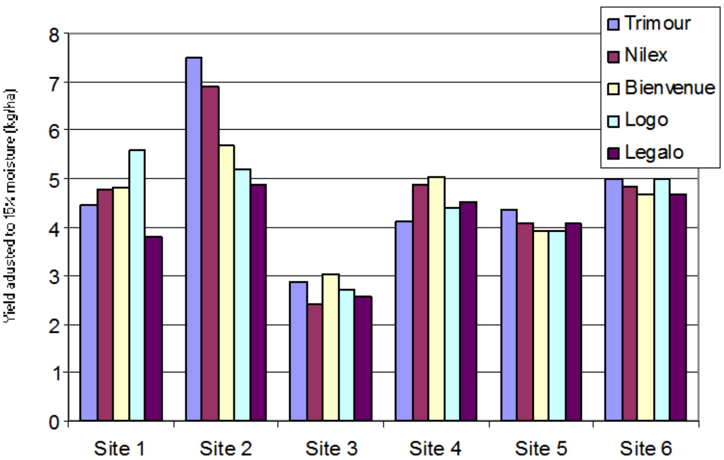
Table 3 Mean adjusted yield (t/ha at 85% DM) of spring triticale varieties at each of six trial sites

	Site						
	1	2	3	4	5	6	All
Logo	5.61	5.17	2.71	4.38	3.91	5.00	4.47
Legalo	3.79	4.88	2.56	4.51	4.08	4.67	4.08
Nilex	4.79	6.90	2.39	4.86	4.07	4.84	4.64
Trimour	4.47	7.48	2.86	4.13	4.38	5.00	4.72
Bienvenue	4.82	5.69	3.05	5.04	3.91	4.67	4.53
All	4.69	6.02	2.72	4.58	4.07	4.83	4.49

Table 4 Ranking of varieties by adjusted yield (85% DM) at each of six trial sites (highest yield receiving highest rank)

	Rank				
Site	1	2	3	4	5
1	Logo	Bienvenue	Nilex	Trimour	Legalo
2	Trimour	Nilex	Bienvenue	Logo	Legalo
3	Bienvenue	Trimour	Logo	Legalo	Nilex
4	Bienvenue	Nilex	Legalo	Logo	Trimour
5	Trimour	Legalo	Nilex	Bienvenue	Logo
6	Trimour	Logo	Nilex	Legalo	Bienvenue

Figure 1 Adjusted yield (t/ha@85%DM)of five spring triticale varieties at six farm sites



Straw length

There were statistically significant differences in mean straw length between varieties (p<0.001) and between sites (p<0.001). Mean values for all varieties at all sites are presented in Table 5. There was evidence of strong site and variety interactions (p<0.001). In some situations, the varietal difference was large e.g. at Site 2 straw length ranged from 94.3cm (Logo) to 107.5cm (Trimour) and at Site 5 from 75.5cm (Bienvenue) to 92.0cm (Legalo).

Although for most varieties Site 2 produced crops with the longest straw length, interestingly this was the only site that Legalo did not produce the longest straw. Expectedly, the lower yielding varieties tended also to be the longer straw varieties. Straw from the variety Legalo was consistently the longest (at five of the six sites), whereas Bienvenue tended to have the shortest straw (Table 6). Nilex also tended to be a long straw variety. Logo and Trimour were less consistent in this respect.

Table 5 Mean straw length (cm) of spring triticale varieties at each of six trial sites

	Site						
	1	2	3	4	5	6	All
Logo	83.7	94.3	76.2	89.3	83.8	90.4	86.3
Legalo	88.7	97.8	80.4	99.6	92.0	98.9	92.9
Nilex	83.8	106.6	78.6	95.0	85.1	88.3	89.6
Trimour	82.4	107.5	73.1	91.4	78.3	88.9	86.9
Bienvenue	78.5	99.9	73.8	88.8	75.5	88.0	84.1
All	83.4	101.2	76.4	92.8	82.9	90.9	88.0

Table 6 Ranking of varieties by mean straw length at each of six trial sites (longest variety receiving highest rank)

	Rank				
Site	1	2	3	4	5
1	Legalo	Nilex	Logo	Trimour	Bienvenue
2	Trimour	Nilex	Bienvenue	Legalo	Logo
3	Legalo	Nilex	Logo	Bienvenue	Trimour
4	Legalo	Nilex	Trimour	Logo	Bienvenue
5	Legalo	Nilex	Logo	Trimour	Bienvenue
6	Legalo	Logo	Trimour	Nilex	Bienvenue

Crude protein

Overall, the mean crude protein value of the tested varieties was 10.91% (Table 7). Site 1 was not included in the statistical analysis, as only one measure of protein was taken for each variety. Whilst there were large differences across all other sites (ranging from 9.02% to 12.25%), variety was not a significant factor influencing this variation. There were, however, statistically significant site effects (p<0.001) and indications of interactions between sites and varieties (p<0.05). At some sites, the range of mean values between varieties was large (e.g at Site 2 the range was 2.40%) whilst at others, such as Site 5, the range between varieties was only 0.72%. Part of the explanation for this effect can be related to the large between harvest plot difference for some varieties e.g. at Site 2, the mean crude protein content of Legalo ranged from 9.72% to 12.43%.

Table 7 Mean crude protein content (g/kg) of spring triticale varieties at each of six trial sites

	Site						
Variety	1	2	3	4	5	6	All
Logo	11.23	12.07	10.18	11.36	10.85	10.49	11.03
Legalo	12.10	11.30	9.78	11.40	10.33	11.13	11.01
Nilex	11.70	11.39	10.34	10.72	10.51	11.26	10.99
Trimour	11.46	12.25	9.02	11.47	10.64	10.73	10.93
Bienvenue	11.59	10.65	9.11	11.79	10.13	10.34	10.60
All	11.62	11.53	9.69	11.35	10.49	10.79	10.91

Given that variety was not an influential factor, variety ranking has not been applied to crude protein measures, and unlike the other performance parameters, there was little consistency in variety performance across sites. Perhaps the only trend that emerges is the appearance of Logo with the lowest CP value at three of the six sites. There were large variations in crude protein content across sites for some varieties, with measures for Trimour ranging from 9.02% (Site 3) to 12.25% (Site 2).

Conclusion

Conducting trials across a range of farm sites allows an opportunity to assess crop varieties under differing production conditions. Varietal differences were not consistent between sites. The interaction between variety and site and the dominance of the site effect over variety was a common theme noted in the analysis of grain and straw yield and protein concentration.

Whilst a trend was observed across sites of certain varieties outperforming others, the location of the farm in which the triticale varieties were grown was by far the most influential factor affecting yield of grain and straw. The newer varieties Bienvenue and Trimour tended to be the higher yielding varieties and these varieties also had the shortest straw. The most well established varieties, Logo and Legalo, were less consistent across sites but had longer straw.

The variability in crude protein content between sites was a pattern across all varieties and is probably consequential of differences in soil fertility, especially available soil nitrogen. Variety appeared to be irrelevant to crude protein. There were differences in stage of rotation and soil fertility building history at the various sites, and it is likely that these, as well as the inherent soil quality differences, were at least in part responsible for the large between site effects.

All indications from this trial showed spring triticale to be a viable organic cereal crop, in terms of both yield and crude protein content.

Acknowledgement

We would like to thank Simon Oates, Chris Phillips, Geoff Maddever, Paul Harris and James Lyall for contributing to the trial and providing the farm sites. We are also grateful to Tony Walkers and Oliver Seeds Ltd for supporting the trial through the provision of seeds and expertise. The Bienvenue seeds were provided by Sherborne Processing Ltd.

Further information on these trials can be obtained from Stephen Roderick at the OSC on 01209 722148

Science and the Agri-Environment

New information on cattle origins

A key feature of the Neolithic agricultural revolution started about 11,000 years ago when the two species of modern cattle were domesticated from wild aurochs (*Bos primigenius*) - taurine (*Bos taurus)* breeds in the Fertile Crescent of the Near East and zebu (*Bos indicus*) in the Indus Valley of Pakistan. All 480 of today's European breeds were descended from that one domestication event in the Fertile Crescent and subsequently spread across Europe as herding and farming lifestyles spread.

Or so it was thought. Now a study of genes (mitochondrial DNA) recovered from remains of 5 aurochs that died in Southern Italy 7,000 to 17,000 years ago suggests a more complicated picture with several domestication events in Europe and interbreeding with aurochs (Beja-Pereira et al. 2006). Also, their study of genes in modern cattle suggests that south European breeds were affected by introductions from northern Africa.

As well as showing that the pattern of cattle domestication was more complex than expected, the study shows that modern breeds of European cattle represent a more variable and valuable genetic resource than previously realized.

An abstract of Beja-Pereira et al's study can be read at:
http://www.pnas.org/cgi/content/abstract/103/21/8113?etoc

Things were happening 11000 years ago

Another genetic study points to an important aspect of the origins of agriculture – evidence that figs were being grown by people 11,000 years ago in the lower Jordan valley (Kislev et al. 2006). The study was based on carbonised figs and fig fragments, radiocarbon-dated to be about 11,400 years old. The reason for supposing that the figs had been cultivated is that they shared a mutation that made them unable to produce seeds – the trees would only have survived because people took cuttings for propagation. It seems that figs were being cultivated 1000 years before rice.

Kislev et al's study was published in the journal *Science*, vol 312, p1372.

The best biofuel: biodiesel or ethanol?

Biodiesel won out over ethanol (petrol replacement) in a study in the USA that used life-cycle accounting of factors such as net energy gain, effect on food supplies and environmental benefits (Hill *et al.* 2006). Ethanol was derived from corn grain and biodiesel from soybeans. Ethanol yields 25% more energy than the energy invested in its production, whereas biodiesel yields 93% more. Ethanol production and combustion reduces greenhouse gas emissions by 12%, biodiesel by 41% (relative to the fossil fuels they displace). Biodiesel also releases less air pollutants per net energy gain than ethanol.

These advantages of biodiesel over ethanol come from lower agricultural inputs and more efficient conversion of feedstocks to fuel. However, production of either biofuel would significantly reduce food production: even if all U.S. corn and soybean production was used for biofuels rather than food, only 12% of petrol and 6% of diesel demand would be met.

An abstract of Hill et al's study can be read at:
http://www.pnas.org/cgi/content/abstract/103/30/11206?etoc

Monitoring of internal parasites in organic sheep

The control of internal parasite infections in organic sheep flocks was identified as a problem by farmers in the 2002 survey of organic farms in Cornwall. In order to further investigate this problem, a longitudinal study on organic farms was started in 2005. The study aimed to examine faecal egg populations in a number of flocks across a series of production situations. The project was funded through the Cornwall College Research Fund. In this article, Jane Michell and Stephen Roderick summarise the results from four of the farms studied.

Introduction and method

Faecal worm egg counts (FECs) are reasonably well correlated with pathogenic worm burdens in lambs and are widely used as an aid to parasite control decision-making. In this study, the portable on-farm faecal worm egg counting system 'Fecpak' was used to monitor FECs in organic sheep flocks. The broad aim was to provide participating farmers with information on parasite burdens as an aid to understanding patterns of parasite infestation and avoiding unnecessary use of anthelmintics.

Four organic sheep flocks were monitored throughout 2005. All of the farmers involved had either indicated that they had a particular problem with parasite control on their farms or had expressed an interest in parasite monitoring. All farms also had beef cattle. Faecal samples were collected from sheep and FECs were estimated every four weeks using the 'Fecpak' approach and protocol. Management practices in each flock were periodically recorded.

Description of the flocks

Flock 1

A beef and lamb enterprise comprising of 100 spring lambing Lleyn ewes grazing mainly on improved grass leys. In 2004 and 2005 ewes were treated at spring turnout after lambing. In 2005 lambs were de-wormed at weaning. The parasite control strategy includes rotational grazing, selective breeding and nutrition. The objective was to reduce/avoid blanket worming and to use monitoring to assist with this as well as to compare worm burdens between ewes with single lambs and ewes bearing multiple lambs.

Flock 2

The flock comprised of 100 Lleyn and Charolais-cross mule February lambing ewes on mainly improved leys. Ewes were not generally de-wormed and only if there was a perceived need. The main control strategy was based on rotational grazing and use of conservation fields post-weaning. The farmer wanted to evaluate the general worm burden and explore ways that this could be decreased in replacement ewe lambs.

Flock 3

120 largely Dorset cross ewes divided into winter, spring and summer lambing and grazing on approximately 200 acres of improved grass leys and 60 acres of permanent pasture within a larger 600 acre farm. The research aims were to establish the relative worm burden on summer, autumn and spring lambing flocks and to evaluate the success of the clean-grazing parasite control strategy.

Flock 4

A March lambing flock of approximately 70 Romney Marsh ewes and, more recently, Texel x Lleyn ewes grazing approximately 150 acres of pasture plus 100 acres of cliff/rough grazing. Situated within an Environmentally Sensitive Area, fencing is not permitted on most of the predominantly rocky land.

Results

Flock 1

Egg counts in the ewes remained stable and under 500 eggs per gram (epg) during the monitoring period (Figure 1). However, the ewes were de-wormed at turnout in 2005, after lambing, as a response to a perceived high FEC. The estimated lamb FEC was generally high throughout (Figure 2) and remained high even after worming. This reached a peak during June, at 2,110 epg, and again in September, at 1,650 epg. All lambs were wormed during July and for 24 hours were put back onto fields known (from previous FECs) not to be clean before being moved to clean pasture.

Figure 1 Ewe faecal egg counts ewes (epg) in Flock 1 (2005)

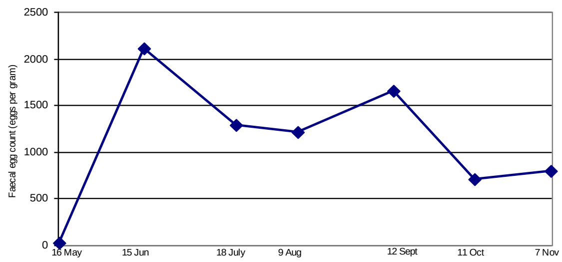
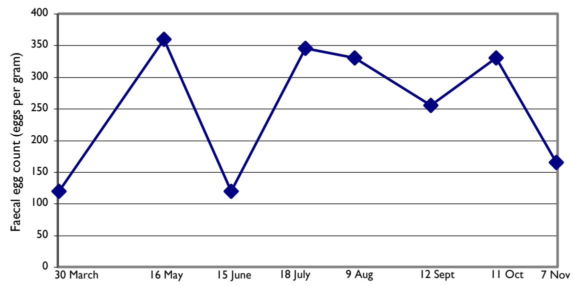


Figure 2 Lamb faecal egg counts (epg) in Flock1 (2005)



Flock 2

FECs in the ewe flock peaked at 700 epg in June and for most of the period ranged between 300 and 600 epg. The FECs for the lambs were initially (in May) very high at 2,715 epg, declining post-worming to 780 epg in July and rising again to 2,560 epg during September. Some lambs were de-wormed during May and all were treated in June. Weaning took place in July. Nematodirus infection was a feature at times.

The rise in lamb egg counts was not easily explained, as after de-worming the lambs were grazed on fields which were thought by the farmer to be clean of parasites. Monitoring gave an indication that the first field grazed, although re-seeded in 2003 and assumed to be parasite free, did in fact present a burden to the grazing lambs. Although lambs were then grazed on apparently "clean" fields the egg count increased to 2,560 epg by the next visit. Although the extended lifecycle of *Nematodirus* could have been a contributing factor causing the rise in FECs, and *Nematodirus* did feature strongly in May and June, subsequent egg counts did not show significant populations of this species.

Flock 3

Although for much of the time the winter, spring and summer flocks were monitored separately, on occasions they were grazed and sampled together, adding to the complexity of data interpretation. Throughout much of the summer, FECs were above 1,000epg in the ewe flock. The cause of the peak in FEC during August, followed by a decline during September, is not obvious. One of the explanations could be associated with the weaning of lambs during August.

A second peak of FECs in October resulted in a November treatment of a small number of ewes that had just lambed. The results of the first three lamb samplings (April to July) showed FECs at around 1,000 epg. In August this increased to 2,850 epg and the lambs were wormed in response. In November, smaller lambs and those in poor condition were again treated.

Flock 4

In the early stages, FECs for single carrying ewes and twin carrying ewes were collected separately. Although initially they had a similar egg count of approximately 1,000 epg, at the following two samplings FECs fluctuated, with ewes with twins initially showing an increased burden followed by decline and ewes with singles showing the opposite trend. During June ewes were monitored together and at this stage they had reached a high peak of FEC at 2,625 epg. A possible explanation is that ewes with singles had grazed fields known to be contaminated before being mixed and in doing so had picked up a considerable amount of L3 stage larvae in the process.

After weaning, the FEC dropped to below 1,000 epg. This has been attributed to a reduction in stress on the ewes post-weaning. At no time during monitoring were ewes treated with anthelmintics. A second peak in FEC occurred later in the season. This was again attributed to the use of contaminated pasture. Monitoring of lambs showed an initial decline to approximately 500 epg following de-worming. Nematodirus was a feature during May. A peak in FEC during August was attributed to lambs grazing on "dirty" pasture after weaning and then subsequent contamination of 'clean' forage aftermath.

Farmers' perception

All of the flock owners found the monitoring process useful for a number of reasons.

- Monitoring provided information for discussion with a veterinarian in relation to flock health planning and the results were used as justification for de-worming.
- It proved to be a useful reminder as to what should be done with regard to parasite control, showing when the burden on the farm was getting too high.
- The results also confirmed that some fields were becoming "*too wormy*" and should be re-seeded.
- A useful process, particularly with regard to confirming a decision to treat lambs when they were perceived to be infected.
- The monitoring confirmed the presence of contaminated pastures which is particularly hard to deal with when there is a restriction on the use of fencing.

In Flock 1 monitoring highlighted two important issues. First, having been de-wormed at turnout the ewe FEC stayed low throughout the season, in spite of the high egg numbers shed by infected lambs, indicating they had acquired a good degree of immunity. Second, lamb FEC did not decrease sufficiently after de-worming in July. There were two possible explanations: i) the possibility of anthelmintic resistance; and ii) the lambs picked up more larvae from the dirty pasture they had been returned to for 24 hours, before being moved to clean fields.

There were some negative comments regarding the process of regular on-farm faecal egg monitoring. Whilst considered to be beneficial and useful, one farmer felt that time and cost factors ruled out the possibility of using this system as a regular feature of the control strategy in a small flock.

Another participant, although appreciative of the benefits, had reservations and considered condition score and visual assessment of health to be more useful indicators (N.B caution should be applied when using condition score as an indicator as there are many other factors influencing this parameter, not least nutrition and physiological age).

Conclusions

Epidemiological data of this type are not easy to interpret, particularly when collected in a commercial farm situation, with all the potential confounding factors. Having mixed age groups also limits specific interpretation. Generally, the estimates of worm burdens reported, particularly in ewes later in the season, is higher than that observed in other studies (R. Keatinge, personal communication), although annual, regional, system and methodological differences can limit the value of comparisons. On all farms, the ratio of sheep:cattle was sufficient to enable a good dilution of worm infestation.

The unexplained rise in lamb egg counts in some flocks on supposedly clean grazing highlights the complexity of helminthosis epidemiology. Attempts to relate parasite burden to pasture management was difficult because monitoring did not always correspond to livestock movements and activities.

There were a number of **practical considerations:**

- The number of stages in the process of collecting, preparing, examining and recording presents scope for error. Monitoring requires practice before results can be considered as accurate. Consistency is important at every stage and training in the use of on-farm monitoring is a necessity. Further, a sampling protocol is required that ensures the variability in estimated burden are appropriately attributed to actual causes and not methodology.
- As well as the more common roundworm species, the presence of eggs of the *Strongyloides* sp were identified on all farms, although these were not counted. It should be recognised that some helminth species are more pathogenic

than others and mis-identification of certain species, particularly with regard to *Strongyloides* eggs, may result in an over or under-estimation of the parasite burden. Whilst over-estimates of FEC were a possibility, the quality control procedures were probably sufficient to provide reasonable estimates of burden.

- Monitoring over more than one season would be more beneficial in terms of reducing the variability associated with sampling procedures in relation to grazing management, lambing dates and the composition of sample groups. Identifying a representative (and if possible homogenous) group of sentinel animals, combined with sampling at key points in the production cycle, would more accurately chart the pattern of epidemiological development.
- It is important in each farm situation for farmers to develop a broad understanding of their own flock worm burden. On-farm monitoring provides a useful aid to achieving this. Regular monitoring is preferable to one-off sampling as this enables identification of trends. Gaining this overall picture is important in deciding if and when to treat. Further, the threshold at which a farmer might decide to de-worm varies from farm to farm. (The Soil Association recommends considering worming at more than 1000 epg whilst the "Fecpak" manual advises a threshold of 500 epg for conventionally managed flocks). On-farm monitoring can provide a rapid turnaround of data enabling effective assessment of risk and a good basis for treatment and control.
- Internal parasite infestation is complex and estimates of faecal egg counts are farm specific. On-farm monitoring is useful when used in conjunction with other information, such as the weather, previous field history, previous disease control measures, stress levels and condition of the animal.

We wish to thank Chris Oates, Dominic Fairman, Jo and John Rider, Chris Alderman, Bob Scambler, Carlton Lutey, Derek Julyan and Andrew Redwood for participating in the full study. We are also grateful for the assistance provided by Eurion Thomas , Gillian Butler, Ray Keatinge and Tim Bebbington.

Please contact Jane Michell or Stephen Roderick on 01209 722155 for more details of this study.

European organic livestock production: Standardising diversity?

As a consequence of a range of climatic, historic and economic conditions, there is significant diversity in livestock production across Europe and yet there are a common set of legislation. Enlargement of the European Union has added emphasis to the importance of this diversity. Statistics representing the recent development of organic farming illustrates the considerable variation across the continent in relation to land use and the main animal species farmed. The paper below examines some of the climatic and historical impacts of a diverse Europe and recommends a degree of flexibility in the adoption of organic standards.

Introduction

There are significant climatic, topographic, cultural, political and historical factors that have influenced agricultural production across Europe, resulting in diverse systems of production (Roderick *et al*., 2005). The diversity, both between and within countries, is important for the development of the organic sector which adopts a common broad philosophy and a single European Union (EU) legislative structure. The range of standards that have existed across the continent, and the long period required to reach agreement on the common EU regulation, serves to illustrate the relevance of this. Enlargement of the EU adds to the diversity and intensifies the need for discussion of this issue. This paper will describe some of the key features and factors influencing diversity and summarises recent developments in the organic livestock sector across Europe.

Climate

Climatic characteristics have been used to describe variation in typical grassland production systems across Europe. Agriculture in the far north is characterised by mountain and moorland with low temperatures, high rainfall, high winds, long winters and thin or peat soils best suited to sheep farming and forestry, and to a lesser extent beef. Arable and dairy production tends to be limited to coastal and sheltered areas. In the more central areas, with more maritime climates, intensive milk and meat production is most important. In the heavily forested Alpine areas livestock production is generally limited to small-scale production in fertile valleys with seasonal movement to higher altitudes. Sheep and goats are the most common livestock species in the Mediterranean zone, particularly in the harsher, non-irrigated areas not well suited for cattle. The influence of climate on the prevalence of a particular system is probably greater in the organic farming sector, with its emphasis on natural production, than the more environmentally controlled intensive animal production.

In most EU countries, organic farming has tended to concentrate in areas considered of marginal agricultural potential, where prevailing practices tend to be less intensive. The Alpine regions of Switzerland and Austria, the Dehesa of Spain, the Scottish highlands and northern Scandinavia provide examples of areas where the climate is harsh and organic livestock farming is common. Whilst organic systems in these regions frequently have positive impacts on biodiversity and landscape enhancement, the consequences in these often isolated areas has been a lack of accessibility to formal market structures and the resulting negative economic impacts. Also, there are potentially negative animal welfare issues, including risks of feed energy deficiency, long transport journeys, predation and reduced bio-security.

History

Historically, public policies and institutional conditions for organic farming have differed considerably among countries. For example, Denmark has had national support for conversion to organic farming since 1987, whilst in some Mediterranean countries this began in the late 1990s, largely as a response to EU legislation. The scale of development in organic farming in various European countries has been related partly to the national implementation of EU regulations as well differences in the response to organic farming subsidies (Michelsen *et al*., 2001). Consumer demand has also been a significant driver in determining development. In some countries, such as the UK, the response only followed a decline in general agricultural economy.

Land-use and livestock numbers

Organic and in-conversion land area in the enlarged EU (25 countries) reached an estimated 6.0 million hectares (3.8 per cent of UAA) on 155,400 holdings in 2004. The land area increased by 3 per cent compared with 2003 although on average the number of farms declined. There was considerable variation in growth rates between different countries. Land area increased in Portugal, Greece, Austria, Spain, Netherlands and Germany and in most of the new member states, whereas it declined in Denmark and the UK.

There was also considerable diversity in relation to land use (percentage of grassland) and the main animal species farmed. In some Mediterranean countries only 10% of the land area was used as grassland, whereas in some regions of the North and West this percentage increases to over 80%. Table 1 gives an estimate of the numbers of the main livestock species farmed in Europe and the main producing countries.

Table 1 Estimate of numbers of organic animals in the EU 25 in 2004 and the main production countries.

Animal category	2004	Main Countries	% of total livestock
Bovine	1.56 mil	AT, DE, IT, DK	1.8%
Sheep	1.8 mil	IT, DE, GB, FR	2.1%
Pigs	493,000	DE, DK, FR, GB	0.5%
Layers (EU15)	5.4 mil	FR, GB, DE, DK	1.5%

(Padel, 2005; EC, 2006)

Cattle were the main livestock species farmed organically in the northern, central and western European countries, reflecting trends in general agriculture. More than 40% of organically managed bovines were dairy cows in Denmark, France, Germany, Netherlands and in England. Sheep and goats were the most important species in the Mediterranean countries, with a strong emphasis on milk production, whereas in the UK and in Ireland the dominant sheep enterprise was meat production. Pig production tended to concentrate in Germany, Denmark, France, UK and Austria. The biggest producer of organic chickens (both layers and table chickens) in 2003 was France, with more than 6 million birds, followed by the UK (Padel, 2005).

Market development

The market for organic products has been estimated to be worth approx 12 to 12.5 billion € in total. The most important markets in value exist in Germany, Italy, France and the UK. Highest organic spending per person exists in Switzerland (over € 100 per capita and year) followed by Denmark and Sweden (Willer and Yussefi, 2006). Difficulties in establishing a balance between supply and demand are typical for the organic markets for milk, and beef, sheep and goat meat, i.e. products from ruminant animals. Grassland farms are relatively easily converted to organic production and so supplies of these products will always be relatively plentiful (compared with pig and poultry meats which are more reliant on availability of grain). In 2001, 32% of organically produced milk, 31% of beef and 46% of sheep and goat meat had to be sold to non-organic outlets (Hamm *et al*., 2004). The market situation for milk and meat has been further affected by increasing concentration of processing plants, so that organic producers in some regions have had no access to registered abattoirs or milk processing plants. Selling a proportion of product into non-organic outlets, resulting in lower farm gate prices, remains a typical situation for products of organic grazing livestock.

New and candidate EU countries

Recognition of the challenges inherent in diverse systems is perhaps stronger in countries with well established organic farming systems and where agriculture is generally more intensive than they are in countries where organic livestock farming is still relatively undeveloped. In the new and candidate EU countries there has been a relatively rapid expansion of organic farming in a situation with less than ideal physical resources (e.g. livestock housing), little investment capital and a dearth of specialist advisory support. Younie *et al*. (2006) also highlighted the underdeveloped home market for organic food, a poor organic marketing infrastructure (especially processing), lack of availability of organic replacement animals and feeds, concern over the increasing risk of GMO contamination of livestock feeds, an absence of organic conversion subsidy support and the high costs of inspection and certification.

Conclusion

Across Europe we see diversity in climate, topography, legislation, farm structure, markets, animal disease pressures and many other factors. These have resulted in the evolution of very different organic production systems, frequently producing the same product under the same basic standards. Although there are growing political and economic pressures to develop common legislative structures, these differences also call for a degree of flexibility in the adoption of organic standards.

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This paper was first presented at the European Joint Organic Congress held in Odense, Denmark (May 30- 31st, 2006). The authors were Stephen Roderick (Organic Studies Centre, Duchy College), Susanne Padel (Institute of Rural Sciences, University of Wales) and David Younie (SAC Consultancy Division, Aberdeen).

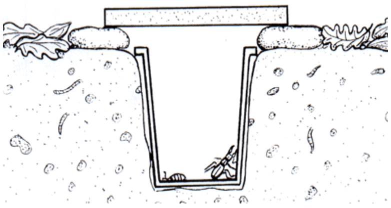
The distribution and abundance of ground beetles (Carabidae) on an organic farm.

The distribution and abundance of ground beetles at Coswinsawsin Organic Demonstration Farm was surveyed during August 2006 using pitfall traps. The survey covered 3 fields with different cultivation history. This is a preliminary report by Peter Mycock and Peter McGregor of the findings of the study which was funded by the Cornwall College Research Fund.

Pitfall trapping

The traps (Fig.1) were set at 5m intervals along transect lines running at right angles from the northern boundary hedge out into the field. Five transects were run in each of 3 fields, with 5m between transects. The pitfall traps did not contain a killing agent; they were checked daily and captures were marked and released.

Figure 1. A covered pitfall trap.



Study fields

Three fields were surveyed:
Scatterns – a 13-acre grass field being grazed by cattle, surveyed 2-4 August;
Alleygabens – a 10-acre crop of spring beans, surveyed 8-9 August;
Jobe's Close – a 3-acre field of harvested spring wheat, surveyed 15-18 August.

Beetle Abundance

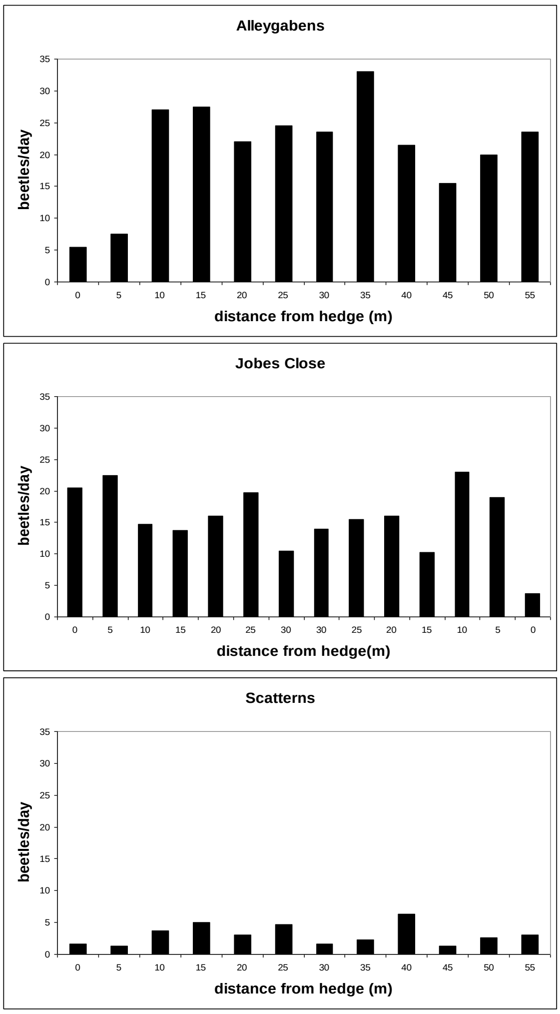
In total, 1,701 individuals of 14 species were captured (Table I). Traps in the compacted ground of the grazed pasture in Scatterns caught consistently fewer beetles than the other 2 fields, suggesting that the cultivated/broken ground of Alleygabens and Jobe's Close supported larger beetle populations and/or facilitated pitfall trapping. Two species made up >70% of the total: *Harpalus rufipes* (738 individuals captured) and *Pterostichus melanarius* (513). The survey was conducted after a long period of hot and dry weather, although the weather during the survey period was mixed. These conditions may explain the absence of some species that have been common in previous surveys (reported in OSC Technical Bulletin 6, Dec 2004) at Coswinsawsin (e.g. *Nebria brevicolis*).

Table I: Alphabetical Species List
Agonum dorsale
Amara aenea
Bembidion andreae, B. harpaloides, B. lampros
Dyschirius thoracicus
Harpalus rufipes
Loricera pilicornis
Pterostichus cupreus, P. melanarius, P. niger P. nigrita P. versicolor
Trechus quadristriatus

Beetle distribution

The transects covered different extents of the fields, with Jobes Close transects running across the full width of the field (i.e. from northern to southern boundary hedge), Scatterns covering 1/2 the field width and Alleygabens 1/3rd. Beetle numbers are generally expected to be highest close to hedges and to fall as distance from the hedge increases. However, our study did not find this pattern. If anything, numbers tended to increase towards the field centre (Figure 2).

Figure 2 Average number of beetles caught per day for all transects in the 3 study fields relative to the distance of traps from the hedge (northern field boundary, except Jobes Close which is both northern (left of graph) and southern boundaries).



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Managing the coexistence of GM, conventional and organic crops in England

In July 2006 Defra published a document entitled Consultation on proposals for managing the coexistence of GM, conventional and organic crops. *In October a meeting was held at Cornwall College, Newquay at which comments on the proposals could be aired, discussed and a response formally submitted to Defra by their deadline of 20th October. In this article Peter McGregor reports on the meeting and briefly summarizes other responses to Defra's proposals.*

A range of interest groups attended the meeting; from organic farmers and smallholders to ecological advisers and researchers. The farming editor of the Western Morning News represented the press and an advisor from Natural England attended as an observer.

The meeting began with an overview of the issues raised by Defra's consultation. This was to have been presented by Gundula Azeez, a Soil Association Policy Advisor, unfortunately last-minute illness prevented her from taking part. However, her presentation representing the SA's view was the basis for the overview delivered by the facilitator. The SA also provided clarity on some issues during the meeting.

A starting point for the subsequent discussion was a degree of disbelief that such a consultation was taking place – after all, several areas in the UK including Cornwall have declared themselves GM-free zones. The consultation document does little to dispel the view that this is GM by the backdoor; the Executive Summary contains the statement "No commercial GM cultivation is expected in the UK for several years, but if authorised GM crops are grown here in due course this may result in non-GM crops having a small GM presence (e.g. through cross-pollination or the dispersal of GM seed)." (Executive Summary, point 1, page 4). An apposite quote from a participant was included as part of the meeting's response to Defra on this issue "**We have said a resounding "No" to GM, why are we being consulted on mechanisms to allow it?**"

Further discussion of general GM issues led to these key points prefacing the response to Defra:

• GM is a relatively young technology attempting to exploit a complex evolving system (the natural environment). Neither the technology nor the system are adequately explored, let alone fully understood. In such circumstances it is vital to employ the precautionary principle, i.e. we should not go ahead with a new technology, or persist with an old one, unless we are convinced it is safe.

• The UK has the opportunity to remain GM-free. Once this position is relinquished it cannot be regained. It should not be abandoned lightly.

• The guiding principle in considering the impact of GM crops on conventional and organic agriculture must be that *the polluter pays*.

• GM may have potential to deliver significant advantages in the future. Were these to become apparent, and change the balance of costs and benefits, coexistence could be revisited.

Currently, the potential costs of GM heavily outweigh its documented benefits.

There was considerable discussion of the detailed proposals in the Defra document and a general feeling that the proposals favoured GM to the detriment of other systems, particularly organic systems. Nine aspects of Defra's proposals were identified as requiring specific changes:

1) Threshold for products deemed GM-free. Replacing the proposed set figure (the 0.9% criterion) with the phrase "current minimum detectable level" in order to "future proof" legislation in an area of rapid technological development and ensure best practice.

2) Separation distance. Other bodies have recommended considerably larger separation distances than suggested in the consultation. For example, separation distances recommended by the National Pollen Research Unit are 30 to 140 times greater than proposed in the consultation (5km v. 35m for oilseed rape, 3km v. 80m or 100m for maize). NPRU recommend 1km and 500m for sugar beet and potato, whereas the consultation makes no proposals for these two crops (source: Soil Association).

For separation distances to minimise contamination of other crops, they must

1) be large enough to reflect uncertainty in what is adequate separation (uncertainty arises through paucity of data and local differences in topography, microclimate and pollen vectors).

2) employ the precautionary principle.

In addition:

a) The onus must be on the GM farmer to create the separation distance.

b) The distance should be to the GM farmer's field boundary. It must not include features such as crop headlands on neighbouring farms.

3) Notification. There is potential for contamination of species related to the GM crop on smallholdings, allotments and gardens – and in consequence the destruction of the genetic integrity of heritage and other significant varieties grown there. It must be a statutory requirement for GM farmers to notify all owners of neighbouring land, not just other producers.

4) Desirable measures. Such measures are important enough to be statutory, with opportunity for periodic review.

5) Monitoring. Defra must define "effectiveness" and publish the criteria for the coexistence regime. They must also monitor for 3 years after the regime has achieved effectiveness.

6) Transport. Issues related to transport of GM crops and biosecurity generally are not adequately covered in the consultation document. There must be statutory requirements on hauliers to ensure adequate containment during all transport of GM crops and seed (including farm to farm) and also in the event of accident. The cost of implementation must be borne by the transporter.

7) Financial compensation. The GM farmer and seed supplier must be liable for the full cost of GM contamination. The full cost of compensation is not simply the value of the crop but must include:

1) damage to the commercial prospects (brand damage) of the contaminated producer, e.g. through loss of organic status and associated loss of trust/credibility.
2) costs associated with regaining former status, e.g. regaining organic certification through re-conversion.

8) GM-free zones. Note that such zones already exist – Cornwall (and Penwith district council within Cornwall) and Devon have declared themselves GM-free zones – such zones are the obvious first port of call for farmers interested in establishing voluntary GM-free zones. We recommend that current GM-free zones are recognized and have legal status.

9) Seed source. It is essential to prevent any contamination of seed. Clean seed is at the start of the production chain and the lack of sources of clean seed will prevent organic producers achieving minimum detectable levels of GM contamination. Institute a statutory requirement for supply of clean seed.

These detailed responses sent to Defra (copy posted at www.siaz.co.uk) as a result of the meeting are broadly in line with responses from national bodies and campaign groups. The GMFreeze webpage (www.gmfreeze.org) is a good starting point for those interested in seeing other responses. It also questions the legality of the proposals:

GM Freeze Director, Pete Riley said: "The Government appears to be willing to re-write EU law and the dictionary to make sure GM crop growing can progress unhindered. If GM crops become reality, the consultation proposals would cut the ground from under consumers and farmers – their right to choose GM free products or grow GM free food would disappear as GM contamination spreads."

Friends of the Earth's GM Campaigner, Clare Oxborrow said: "Government proposals for rules that allow GM crops to be grown alongside conventional and organic crops are a thinly veiled attempt to introduce GM crops through the back door. Allowing routine, unlabelled, GM contamination of conventional and organic crops is not only unacceptable to the public, it is legally flawed too. Ministers must tear up this GM pollution plan and protect our food, farming and environment from GM contamination".

Soil Association Policy Director, Peter Melchett said: "The Government's proposals to deny organic and other farmers the choice of staying free of GM contamination break their repeated promises to keep organic food uncontaminated by GMOs. It is now clear that on top of banning choice and breaking their word, they will also be breaking the law."

Michael Meacher MP, former Environment Minister said: "This consultation is the Government's latest attempt to back the GM industry over the wishes of the British public. Instead of paving the way for GM crops to be grown in England, David Miliband must take on board the thousands of responses rejecting the Government's GM contamination plans and put in place policies that protect GM free food and truly promote his vision of sustainable farming."
(http://www.gmfreeze.org/page.asp?id=306&iType=)

The Newquay meeting concluded that the GM debate is entering a new, less public, stage. It seems to be back on the political agenda and anyone concerned about GM needs to keep a close eye on developments. One such development is that in December the government gave BASF Plant Science permission to grow GM potatoes in Derbyshire and in Cambridgeshire.

References

Defra's GM consultation webpage
http://www.defra.gov.uk/environment/gm/crops/index.htm
The Soil Association's GM consultation page
http://www.soilassociation.org/Web/SA/saweb.nsf/ed0930aa86103d8380256aa70054918d/76591068b2811dd1802571c003d4efe?OpenDocument
GM Farmers must pay for contamination. Western Morning News 18th October 2006 (via www.siaz.co.uk)

The meeting was arranged as part of the activity of the ESF-funded *SME Skills in Applied Zoology* project (www.siaz.co.uk) in collaboration with the Organic Studies Centre.

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Organic Studies Centre and the Vocational Training Scheme

Duchy College's Rural Business School runs the Vocational Training Scheme in Cornwall and is very pleased to be able to support organic farmers and horticulturalists, through the OSC, with whatever training meetings/events they may require in 2007.

For those eligible, VTS is able to fund up to 55% of the costs in arranging a group training meeting or event. VTS employs, on a part-time basis, a series of Training Coordinators to work within specific sectors establishing and addressing the training needs of that particular speciality. We are delighted that Dan Symons, an organic farmer himself, has recently taken on that role for the organic sector.

We are keen to work with others to avoid duplication and ensure the best possible overall training provision. To this end, we are working in close co-operation with the Soil Association managed Objective 1-funded Organic South West project

If you wish to discuss any training needs or event ideas you have, please contact OSC on 01209 722155.

Coswinsawsin farm report: Summer & Autumn 2006

Paul Harris, farm manager at Duchy College, Rosewarne, provides his regular update on the commercial activities at the College's organic demonstration Farm, Coswinsawsin for the summer and autumn of 2006 on the farm. Additional information was supplied by Nick Pascoe.

The weather this year produced a mix bag, with drought conditions until mid August, a relatively wet late August, good growing conditions in September and October and more recently it has been very wet and windy.

Cereals and legumes

Summary of 2006 yields:

Winter wheat (variety Istabraq)	1.7 t/acre; 4.22 t/ha
Spring beans (variety Feugo)	1.6 t/acre; 3.99 t/ha
Triticale (variety Legalo)	2.8 t/acre; 6.91 t/ha

The winter wheat yield was down by 0.5 t/acre on last year. The yields were disappointing given the crop followed a pea and oat bi-crop. The straw yielded 1.5 t/acre and was sold for £35 per tonne off the field. The specific weight of the grain was 71.8 kg/hl.

The triticale yield is based on a moisture content of approximately 30% as the crop was sold for crimping to a local organic livestock producer. The straw yielded approximately 2t/acre. The triticale crop was amazing considering that after drilling it received no other operations until harvest during May. The window of opportunity to harrow was missed and yet the crop still out-competed the weeds.

The highlight of the 2006 harvest was the spring bean crop which was harvested on 2nd August at a moisture content of 16% and a yield of 1.6 t/acre dried. The beans so far have been the most successful fertility building/legume cash crop we have grown. Wheat will follow the beans. Following the disappointment of the variety Istabraq, Alchemy has been selected for the coming season. This was drilled in early November with the hope that this will minimise the damage from BYDV as aphid numbers should have been low at this time.

Potatoes

The variety Orla yielded a disappointing 7 t/acre. This was a consequence of the drought and a high weed burden. The potatoes were hoed four times, which resulted in excessive drying out of the potato banks. Very little blight pressure meant a single application of copper was required in mid June. The Orla was sold at £190/t ex-farm for packing. We are considering growing the salad variety Charlotte during the 2007 season, as this offers the potential to significantly improve the financial performance of the potato crop.

Brassicas

The organic cauliflower crop this year has been grown off-site for rotational reasons. At the time of writing, the winter cauliflower crop looked outstanding considering that it looked very poor in early August when it was suffering from cut worm, aphid and caterpillar damage as well as a deficiency of molybdenum. There has been no visible sign of ring spot in the crop although this has been observed in the non-organic cauliflower crop. This may be a consequence of the natural leaf wax in the organic crop not being damaged by the wetting agents used in the pesticides when growing the crop in a conventional situation. Harvesting started 16th October with the variety Regatta. To date, other varieties harvested include Optimist and Cendis.

A calabrese crop has been grown at Coswinsawsin, after incorporating spring beans in mid July. The beans appear to have provided a good source of readily available nitrogen together with a large volume of green matter to act as a soil conditioner. Harvesting of calabrese was started on 16th October and was completed during mid November. The crop received one application of copper to control the disease spear rot. This was a highly successful crop producing yields comparable to the College's conventional calabrese crop.

A spring green crop has also been grown following beans and this also seems to have benefited from fertility building. Harvesting was completed mid-December. Although a reasonable yield was achieved, the crop suffered from caterpillar damage and volunteer beans and, more significantly, a hail storm mid-harvest in early December.

Courgettes

This crop was grown as a trial using the variety Ambassador over an area of approximately 0.75 acres and yielded approximately 7.75 tonnes of courgettes. The crop suffered from the drought conditions and powdery mildew in early September. High winds in August also affected quality for a short period. Weeds were removed twice using a strimmer.

Fertility building

The Cotswold Seeds Pochon grass-clover ley was established following potatoes. This will be maintained for two years to provide an entry for a future brassica crop. Fertility building for potatoes after wheat has been a mixture of ryegrass, trefoil and buck wheat. The buck wheat is being trialled as it is supposed to have the ability to extract phosphate, which in turn we hope will provide phosphate for the potato crop next year.

Both these crops were established with minimal cultivations. The potato land was disced prior to drilling. There was no cultivation prior to drilling into the wheat stubble. Seeds were drilled in late August using a Verderstat cultivator drill followed by a roller. The results have been excellent.

Paul Harris
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