THE ORGANIC RESEARCH CENTRE ELM FARM

Bulletin

with technical updates from The Organic Advisory Service

No. 91 **December 2007**

Reg. Charity No: 281276
ISSN 1367-6970

In sickness and in health

Not quite plagues of Biblical proportions, but getting far too close for many farmers. Perhaps Summer 2008 will see locusts feasting across East Anglia…

We have had a year of disease after disease. Bird flu, foot and mouth, bluetongue, TB – all threaten the future viability of the UK livestock sector, farming livelihoods and organic production.

And unlike in the Bible, too many of these looming plagues are man-made. Bird flu in its most virulent form – H5N1 – is a product of over-intensive poultry farming in the Far East jammed alongside wildfowl. Bluetongue has arrived in the UK due to man-made global warming; foot and mouth this summer escaped from a laboratory.

So what, as a nation, are we doing to clean up the mess and the threat we have so efficiently created? Too often our responses are staggeringly primitive – devoid of science, technology and imagination.

Take, for example, the current debate about controlling TB. We are told that the simple choice is between slaughtering badgers and slaughtering cattle. What barbaric people we have become.

A far more civilised approach is to explore natural immunity to TB in cattle – a trait thought to be expressed in African cattle *Bos indicus* to a far greater degree than European cattle *Bos taurus*.

Consideration urgently needs to be given to how individual livestock which have developed natural immunity to TB can be retained to build-up resistance in the national herd. Since the 1930s in the UK the slaughtering of all TB reactors has prevented this.

Of 68 recent TB research projects listed by Defra, not a single one has explored the question of cattle natural immunity. In its 2005 TB strategic framework document the Government never mentioned the term.

There is another way. Positive health lies at the heart of organic philosophy. And that's why The Organic Research Centre is convening an Animal Health Summit, to devise a survival route through our storm of diseases – prevention, not cure.

Richard Sanders

Contents

The green shoots of organic plant breeding?

We have often grumbled over the years, says Professor Martin Wolfe, about the lack of support for plant breeding for the organic sector...perhaps someone's been listening at last.

European plant breeders came together in 1956 to form a collaborative, non-profit making, non-commercial organisation, the European Association for Research in Plant Breeding, which took the name Eucarpia. Over the next 22 years, Eucarpia defined and started ten sections, to cover all the main aspects of plant breeding. The organisation now has some 1300 members, with representatives from most of the EU countries and others from across the globe.

However, since 1978 there have been no new sections – until this year. Following an earlier initiative, and led by Prof. Edith Lammerts van Bueren[1], Eucarpia decided to form a new section on "Organic and Low-Input Agriculture". It will provide invaluable research links and perhaps funding opportunities for ORC led projects.

Close collaboration

This all took place at a special meeting in Wageningen in the Netherlands, the first of the Organic Breeding Group, entitled 'Plant Breeding for Organic and Low-input Agriculture: Dealing with Genotype-Environment Interactions'. This involved close collaboration with ECO-PB, COST SUSVAR and ISOFAR. The ORC was represented by Dr. Hannah Jones and by Martin Wolfe who gave the keynote lecture at the end of the meeting. The next major meeting of Eucarpia will be the four-yearly Congress, which will take place in September 2008 in Valencia, where, again, we will be well-represented.

A key outcome of the Wageningen meeting, and an indicator of real change, occurred during a discussion session when a well-known German breeder pointed out that his latest success in breeding wheat for conventional production arose out of a programme based on breeding for organic production – something that, until now, we were able to suggest only in theory.

In recent years, we have, of course, been very much involved in the EU COST Action, SUSVAR (SUStainable low-input cereal production: required VARietal characteristics and crop diversity (www.cost860.dk), which does have a Working Group on Genetics and Plant Breeding. This, and the Action as a whole, has been hugely successful with many valuable meetings and opportunities for our Research Team. However, the programme is limited to four years, in this case from 2004 to 2008 – and there is no possibility for extension.

Seamless continuation

What we are now hoping is that the new Eucarpia Section will provide a seamless continuation for the work of SUSVAR which has been so ably and energetically chaired by Dr Hanne Oestergaard[2]. Indeed, we owe a great deal to the imaginative hard work of Hanne and Edith (and many others), in providing this essential switch from the COST Action to the Eucarpia Section.

Just as one example of our activities in the COST Action, we now have a European team, that, in combination with the ORC wheat population project (see Top of the Pops this issue), is ready to spring into action as soon as there is the slightest whiff of EU funding in this area of research for sustainability.

(1) Prof. Edith Lammerts van Bueren works at the Louis Bolk Institute and is Professor of Organic Plant Breeding in the Agricultural University of Wageningen.

(2) Dr. Hanne Oestergaard is a Senior Research Specialist in the Biosystems Department of the Risø National Laboratory, Technical University of Denmark – DTU.

ORGANIC INFORM @ ELM FARM

Better British Organic Poultry

Talk amongst yourselves. The inaugural meeting of the new poultry producer group BBOP – Better British Organic Poultry – was a great success. Visits to Lawn Farm, Pewsey and Clare's Organics, Ashbury generated real debate and discussion on issues from feed to breeds to welfare. Here, BBOP visitors view some of the 4000 organic layers at Lawn Farm, producing eggs for Waitrose/Stonegate.

The next meeting of BBOP will be in February 2008. Details from Organic Inform 01488 657600 organicinfom@organicresearchcentre.com

A bright future for horses

"What will we do when the oil runs out", has become an all too common refrain.
But few people have addressed the question in such practical terms as organic grower Iain Tolhurst. Even on his eight hectare unit on the Hardwick Estate just outside Reading, Iain reckons he is "precariously vulnerable" to the looming fuel crisis. Horses may prove his only salvation.

So how does Iain think a horse-powered operation would look?
We would need to reduce significantly the cropping area as the horse would need cereal feed to maintain its condition. Around 15% of our land would cover one animal, but as we would often need two horses for key operations and deliveries we would probably need to set aside 25-30% of our land. Production would therefore drop dramatically.

We would also need to increase our labour input. With a 55 horse power tractor I can plough and prepare 4ha of land in around 25 hours. With horses this would take around 150 hours – that's six times longer. There is another problem: with diesel power I can complete work very fast, particularly important when considering the weather. A lost opportunity for land preparation can mean a delay of weeks, or even a missed crop, which would dramatically affect yields and income. Without doing a comprehensive study our output would probably drop by as much as 50% without fuel, while our labour costs would go up hugely.

Tractors have had a greater effect on yields per labour input than any other factor since the invention of fire and the wheel. Please note 'labour input': if you go to the developing world and see what farmers can produce on fertile farms using only hand labour then it is much higher than our Western system. Growing food by hand is wonderfully productive and is without doubt the ideal. But in Western culture people are not interested in spending almost all their time growing enough food to keep them. Our culture is centred on huge urban developments and food must therefore be grown on an ever larger scale.

The public have a romantic notion of 'back to the land', ambling along behind the plodding horse and plough, skylarks singing overhead and all that romantic stuff.

The reality, though, is gruelling hours in all weathers, physical work that wrecks the body; boredom and solitude that your average modern day keyboard operator could never comprehend. Not to mention the relative pittance of a wage. To replace our machinery with hand labour would be difficult and very expensive if we were to pay a living wage. Few people would accept this.

The conclusion is that the loss of fossil fuel would reduce our output and increase our costs. We would probably have to increase our prices by at least 350-400% to maintain a viable business using horse power. Without horses it would be many times greater.

In an average year I use around 1,100 litres of tractor diesel, 650 litres of petrol/diesel for deliveries and 110 litres of petrol for small machinery – a total of about 2,000 litres a year. So, for each of our 400 customers we use about five litres of fuel to supply around 70% of their vegetable requirements each year. Compared with non-organically produced vegetables this is very low. We make a little fuel go a very long way: our system is very fuel efficient and we could improve this further without too much difficulty.

But for other food businesses such as arable farms producing cereals and commodity crops, I suspect life without fuel would be very difficult – if not impossible. Under the relentless pressure of globalisation the average farm needs around 400ha to stay in business; more than 50 times bigger than our farm. They will generally employ just a farmer and one tractor driver. All other machinery operations are carried out by contractors. These arable farms are far more energy dependant as there is so little human labour involved. They would need dozens of horses and men to care for them, working them all day, every day.

A rule of thumb for arable farmers is that one needs to be able to till around 10% or more of your land in a day. So this could mean at least 100 horses to compete with present day work rates. This is unlikely to be realistic, so work rates would drop dramatically and yields suffer accordingly. And think of how much land you would need to feed that many horses…

Well done Iain

Iain Tolhurst, was one of the three finalists in BBC Radio 4's Farming Today award 'Farmer of the Year'. The judges were intrigued and impressed by Tolhurst Organic Produce's stockless system based around green manures, 'an organic farm without manure – that sounds really strange.' Although Farming Today's coverage included a quote from Iain referring to the scrupulous analysis of all energy inputs compared to food outputs, the programme did not do justice to the climate-friendly nature of his system.

The University of Surrey has calculated the carbon footprint of Tolhurst Organic Produce to be just 8 tonnes of carbon per year - the same amount as an average UK household - yet it produces and distributes organic vegetables to over 400 customers. This makes Tolhurst Organic Produce 90% more energy efficient than non-organic produce, grown and delivered to a supermarket.

Nutritional benefits of organic food shine through

The case is building for real, quantifiable data on the nutritional benefits of organic food. From the USA and across Europe experimental data is piling up to challenge doubters – such as the UK Food Standards Agency (FSA) and Defra – who argue that buying organic is merely a lifestyle choice.

Early results of a £12 million, four year EU study on the nutritional qualities of organic food suggest that some of them, such as fruit, vegetables and milk, are more nutritious than "conventionally" produced food and may contain higher concentrations of antioxidants, so useful in fighting cancer and in maintaining heart health. There were also higher levels of beneficial minerals such as iron and zinc.

Details of the study were announced by Professor Carlo Leifert of Newcastle University, who co-ordinates the EU funded work called the Quality Low Input Food (QLIF) project. It is the biggest so far to research the pros and cons of organic farming and food and involves 31 research centres, companies and universities in Europe and beyond.

The early results of the study show that organic fruit and vegetables have up to 40 per cent more antioxidants than non-organically grown produce. Even greater contrasts were found for milk, with organic milk containing up to 60 per cent more antioxidants and healthy fatty acids.

"This interim data confirms earlier work across the EU and US, which formed the basis of discussion for our conference – Does Organic Food have an extra quality? – held in 2004," says ORC director Lawrence Woodward. "But that conference and others failed to convince the FSA that there are health benefits to organic food."

These latest findings appear to underpin the founding philosophy and practices of the organic movement, which seeks to build positive health in the crops and livestock raised through organic farming – and thus of people eating that produce. And they reinforce the growing body of scientific evidence that indicates significant positive nutritional differences in organic food compared to non-organic food. But whether they are enough to sway the opinion of the FSA is another matter.

"Nutrient levels in food vary depending on many different factors," it says. *"These include freshness, storage conditions, crop variety, soil conditions, weather conditions and how animals are fed. All crops and animals therefore vary in nutrient level to some extent."*

The agency says it will study the QLIF interim findings, maintaining as it does a close watch on scientific papers that evaluate organic food as they are published.

Earlier this year three independent European research projects were published that revealed that organic tomatoes, peaches and processed apples all had higher nutritional quality than non-organic, supporting the results of research from the US on kiwi fruit reported in Spring 2007.

The US research by Dr Maria Amodio and Dr Adel Kader, from the University of California Davies discovered that organically grown kiwis had significantly higher levels of vitamin C and polyphenols. The researchers said: *"All the main mineral constituents were more concentrated in the organic kiwi fruit, which also had higher ascorbic acid (vitamin C) and total polyphenol content, resulting in higher antioxidant activity. It is possible that conventional growing practices utilise levels of pesticides that can result in a disruption to phenolic metabolites in the plant that have a protective role in plant defence mechanisms."*

The EU researchers found organic tomatoes 'contained more dry matter, total and reducing sugars, vitamin C, B-carotene and flavonoids in comparison to the conventional ones', while conventional tomatoes in this study were richer in lycopene and organic acids. Previous research had also found organic tomatoes have higher levels of vitamin C, vitamin A and lycopene. In the more recent research, the scientists concluded *'organic cherry and standard tomatoes can be recommended as part of a healthy diet including plant products which have shown to be of value in cancer prevention.'*

Other work found that organic peaches 'have a higher polyphenol content at harvest' and concluded that organic production has 'positive effects ... on nutritional quality and taste'. Organic apple puree was found to contain *'more bio-active substances - total phenols, flavonoids and vitamin C - in comparison to conventional apple preserves' and the researchers conclude 'organic apple preserves can be recommended as valuable fruit products, which can contribute to a healthy diet'.*

But it's not just fruit and vegetables that are being analysed for organic benefits. In 2006, the Journal of Dairy Science published the results of a three-year study showing a direct link between the whole organic farming system and higher levels of Omega 3 fatty acids in organic milk. The study by the Universities of Liverpool and Glasgow, was the first to consider a cross-section of UK farms over a 12-month production cycle. According to the research, a pint of organic milk contains on average 68.2% more total Omega 3 fatty acids than non-organic milk and has a ratio of Omega-6 to Omega-3 fatty acids believed to be beneficial to human health.

The FSA has always argued that differences in the components of food produced in different farming systems do not mean that food from one is healthier than the other. It also maintains that the presence of pesticide residues found in UK food does not pose a health risk thereby dismissing the biggest difference between organic and conventional foods.

Local, authentic, sustainable – a food model for Europe

The Spanish town of Zamora played host this autumn to the final conference of the EU's RAFAEL project. It has been a four year effort to increase support for sustainable and localised authentic food systems in some of the more economically challenged areas of Europe.

Public and private partners

The RAFAEL partnership involves public and private sector organisations from nine Atlantic Area regions, across four countries: Spain (Galicia, Zamora, Andalucia), Portugal (Alentejo, Tras-os-Montes e Alto Douro), France (Brittany), and the United Kingdom (Wales, Ulster, South West England). Unusually for EU projects, there is some real geographical logic in the structure of the project and historical linkages particularly in Celtic culture - a fact that helped to persuade the Welsh Assembly Government to provide match funding. The Atlantic Area (or Atlantic Arc as it is sometimes described) is essentially the western maritime fringe of the EU and is seen as being potentially disadvantaged by its "peripheral" position.

RAFAEL is an acronym that must have involved some creative thinking when it was devised. It stands for 'Renaissance of Atlantic Food Authenticity and Economic Links' and probably means different things to different people. The main aim of the project is *"to enhance the identity and economy of the Atlantic Area by the concerted promotion of authentic food systems".* The concept of 'authentic food' refers to people focussed, local, sustainable, distinctive and traceable food and products that preserve the identity of the Atlantic regions. For Welsh partners (Organic Centre Wales - the point of view is that it should provide a platform for the promotion of local procurement of organic produce along with a parallel programme of education in the issues of food authenticity.

Communicating good practice

At the core of the programme lies local food production and distribution. This has allowed the identification of good practice and innovation to be communicated between partners. These activities underpin the development of an information network, and the identification of new opportunities for the production and supply of authentic/local food.

It has also helped to develop opportunities for the wider distribution of Atlantic Area produce and food products.

In Northern Ireland RAFAEL has been instrumental in encouraging public bodies to purchase far more of their food ingredients locally. *"The project has had a real impact on public sector procurement policies, with the organic, fresh and local aspects providing real health benefits to patients and financial benefits to local farmers,"* says Florence McAllister of the NHS Central Services Agency based in Omagh. She's also keen to stress the cost savings in drugs and health care that can be achieved when a patient eats a sound, organic diet.

For the Alentejo region of Portugal – one of the poorest in the EU – RAFAEL has brought new opportunities in eco-tourism with a food trail for visitors mapped across the area. *"Our Route of Flavours has shown itself to be a model of good practice in direct selling both food and tourist facilities through the promotion of regional and local produce. Tourist numbers are increasing,"* says Pedro Roma of ADRAL – the Alentejo regional development agency.

Organic for schools

At the conference two regions focused on education initiatives. Organic Centre Wales has achieved success with its project to supply local organic food for school meals through a programme of school visits and sample meals. The host town of Zamora has been working with local children in providing organic school vegetable gardens and ecological menus in school kitchens. *"Our work in Zamora shows that when you place local, organic, authentic food in front of children they become interested in its origin and enthusiastic organic consumers,"* says Jesus Concepcion who led the Zamora work, but who is now a senior researcher at the Organic Research Centre – Elm Farm.

All delegates agreed that the biggest question facing them for RAFAEL was where now? Like all EU projects, it has taken time for partners to gel and for the programme of work to achieve results. RAFAEL II is now being assembled as a bid for Brussels under the Interreg funding stream. It certainly has merit if it allows this clutch of projects to develop further their local, sustainable and wholesome aims.

US ponders "organic" fish

Fish farmers and seafood retailers across the USA are awaiting the outcome of a National Organics Standards Board (NOSB) deliberation that is tackling the question of whether farmed fish should qualify for the U.S. government's official organic label. Some observers think the complexity of the issues means a decision could be delayed until 2009.

Aquaculture operators want a share of the estimated annual $15.5 billion organic foods market, which is growing rapidly.

Earlier this year the NOSB voted to temporarily exclude all farmed fish from the organic standard. It also asked for public comment on the use of fish feed and open-net pens.

A negative ruling on either the feed or pens would all but end the chances for the most popular farmed fish having a USDA organic seal. (Fish carrying organic seals from overseas certification bodies is already being sold in the United States).

Wheat LINK – Love thy neighbour

Zoë Haigh

How many close friends you have directly influences how much you can achieve - if you are a wheat plant that is. Harvest data from The Organic Research Centre's Wheat LINK project (Defra funded LK 0970) has shown that the number of neighbours you have (and where they live) has a significant effect on the yield you can produce.

The Wheat LINK project is now in its third year of trials, studying the interactive effects of five different agronomic variables on the performance of winter wheat in organic systems at different sites.

The factors included were: three drill arrangements (wide and narrow rows and the Claydon strip drill); two seed rates (250 and 150 kg/ha); three 'varieties' (Hereward, Aristos and a wheat Population (output from Defra funded AR 0914 'Wheat Breeding' project – see 'Top of the pops', this issue)); inter-row hoeing; and under-sowing with a white clover mix. Here we report only on the importance of seed spacing.

Balanced population

The most important factors for improving wheat yields were found to be optimising crop plant spacing. Important factors are on the one hand maximising the number of crop plants growing in a field whilst on the other hand minimising the competition they experience from other crop plants (and maximising their competition against weeds).

There is clearly a balance to strike, to grow as many plants as possible without limiting their access to the nutrients they require for productive growth.

The second year of trials has shown that narrow rows produce the best seed spacing amongst wheat plants, enabling them to compete most effectively against weeds, whilst minimising competition amongst themselves (Table 1). 'Number of neighbours' is the number of crop plants within a 10cm diameter circle centred on an individual plant; this single figure combines the effect of drill systems and seed rate. The fewer the number of neighbouring plants, the more resources that should be available.

		Mean no. of neighbours	
		Wakelyns	Sheepdrove
Drill	NR	3.47	3.56
	WR	4.61	7.58
	S	4.19	4.75
	l.s.d	0.51	0.32
Seed rate	High	4.37	6.25
	Low	3.8	4.35
	l.s.d	0.37	0.51

Table 1: Mean number of nearest neighbours within a 10cm diameter circle for the three drill arrangements (narrow, wide and strip drill) and two seed rates (250 and 150 kg/ha) and two sites (Wakelyns and Sheepdrove).

Table 1 shows the mean data for the drill arrangement and the seed rate. This improved seed spacing leads to an increase in grain yield (Figure 1), where narrow rows tend to produce highest yields at all sites, followed by the strip and the wide row arrangements. The high seed rate of 250kg/ha tended to result in higher yields across drill arrangements and 'varieties', but with no clear influence of under-sowing with clover.

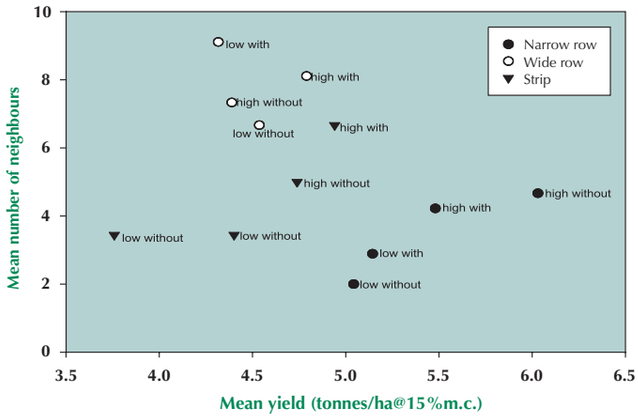


Figure 1: Mean number of nearest neighbours within a 10 cm diameter circle against mean yield for Hereward at Sheepdrove. The points are marked 'high' for seed rate 250kg/ha, 'low' for seed rate 150kg/ha, 'with' to indicate clover under sowing, and 'without' for no under sowing.

Data from our trial has confirmed that although lower seed rates lead to a greater grain yield per plant due to more resources being available to each individual, the positive effect of 'fitting more plants in' outweighs the benefits of raising individual plant yield, so that increasing seed rates to 250kg/ha provides overall yield benefits across sites.

Clearly seed spacing will also impact on grain quality; when available, this data will be reported in the *Bulletin*.

Novel agronomy

With organic wheat prices currently at excellent levels it may now be economically viable to amend the agronomic systems that farmers use, e.g. increasing seed rates further, or even considering investing in new equipment if a farmer is stuck with a less productive drill system. These essential questions of the economic viability of various agronomic systems will be addressed in this, the final year of Wheat LINK.

Outstanding oats for reliable rotations

Sarah Clarke

Oats have again proven their worth as a productive and flexible crop that should be an important element of any organic arable rotation. Despite the generally low-yielding season of 2007 husked oat trial yields were only down by 0.35 t/ha and the second cereal trial yields were, on average, only 3% lower than the first cereal yields. Tardis, the top yielding variety of last season, again performed well, with only Mascani, a newcomer to the trials, out-yielding it.

These are the third year of trials of the 'OATLINK' project, for which The Organic Research Centre - Elm Farm is the organic partner. The project, led by IGER, Aberystwyth, aims to incorporate important traits into the oat crop for milling and poultry feeding.

So that they were as close to farm practice as possible, the main trials in this season's experiments were sown as the second cereal in the rotation. Other, smaller, trials were also established as the first cereal in the rotation for comparison, but were only assessed on yield and quality parameters. At both rotational positions, two experiments were carried out - one looking at husked, and the other naked, oats.

The naked oat trials contained three varieties (Expression, Grafton, Racoon) and their three-way mixture. The husked oat trials tested four varieties (Gerald, Tardis, Brochan, Mascani), their four-way mixture and a bulk of IGER lines selected at F2 ('population') and grown at either Sheepdrove Organic Farm, Berkshire (SOF) or Wakelyns Agroforestry, Suffolk (WAF). The results that follow refer to the experiments carried out at Sheepdrove Organic Farm that were drilled in mid-October 2006 and harvested at the beginning of August 2007.

Husked Oats

Early in the season, Tardis had a significantly ($P = 0.015$) higher level of crop cover than the other varieties and mixture. However, this trend was not repeated later in the season when maximum canopy cover (Leaf Area Index) was assessed. Unlike in the previous season (2005/06), when Tardis had a significantly higher Leaf Area Index than the other varieties and went on to have the highest yield, in this season (2006/07) there were no significant differences in Leaf Area Index among the varieties, the mixture and populations.

Instead, the yields in 2006/07 related to disease levels. Unlike 2005/06 which was a low disease year, this season was notable in terms of the large amounts of disease present, especially rusts. There were significant ($P < 0.001$) differences in total disease levels on the flag leaf among the varieties, mixture and populations. Gerald had significantly higher levels of disease than the other varieties, with Mascani having slightly, but not significantly, lower levels than Brochan and Tardis. These results are reflected in the yields of the varieties with Gerald having the lowest and Mascani the highest yields of the second cereal experiments (Figure 1).

Interestingly, the mixture had 18 ess disease than the average of its component varieties. This is consistent with the results from 2005/06 where the mixture had 25 ss disease than its component varieties and continues to show the effectiveness of mixtures at controlling the spread of disease.

Unsurprisingly, yields were down compared to last season, but only by 0.35 t/ha in the husked trial. Overall there was only a 3 eduction in yield from the first to the second cereal experiments. In both experiments, Tardis and Mascani were the higher yielding varieties and Brochan and Gerald slightly lower. However, Tardis and Gerald were notably less productive as second cereals.

The mixture performed consistently in both rotational positions and interestingly the SOF population performed better in the second cereal position whereas the WAF population performed better in the first cereal position, which may indicate differential adaptation.

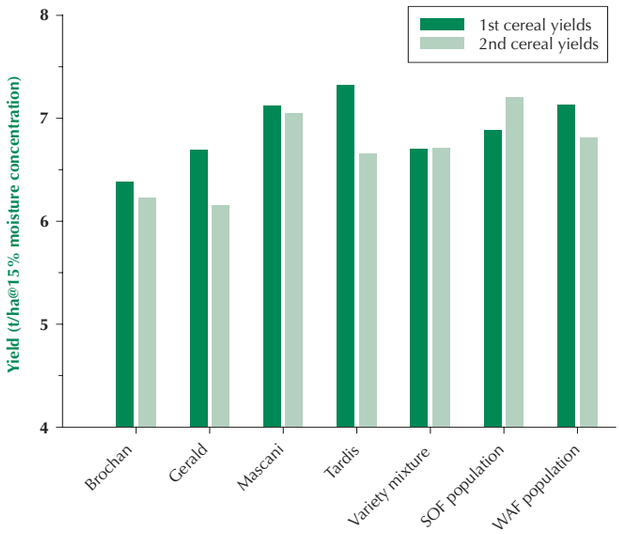


Figure 1. Yields (t ha-1 at 15% moisture concentration) of: husked oat varieties Brochan, Gerald, Mascani & Tardis; the variety mixture; & the 'populations' from Sheepdrove (SOF) & Wakelyns (WAF) grown as either the first (black bars; sed = 0.245) or second (white bars; sed = 0.292) cereal in the rotation.

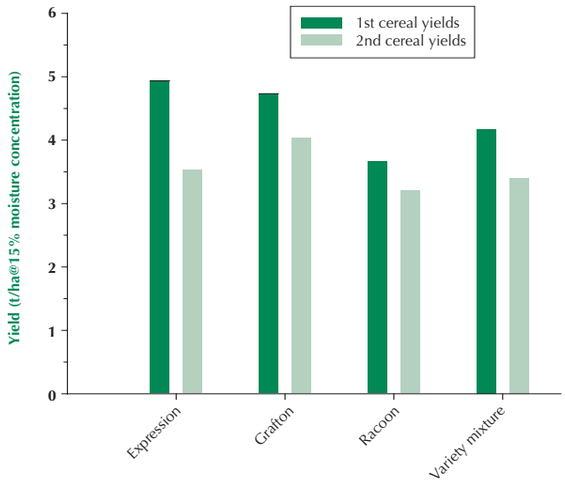
Naked oats

In contrast to the husked oats, there were no differences in disease among the varieties and mixture in the naked oat main (second cereal) experiment, although disease levels were still high. There were, however, significant ($P = 0.023$) differences in yield among the varieties and mixture (Figure 2). Again, when comparing the second and first cereal yields, varieties were relatively consistent in their performance with Expression and Grafton yielding more than Racoon.

However, the reduction between the average yields of the first and second cereal experiments was larger at 19% than in the husked experiments (3%). The difference between last

season's and this season's yields were also greater than in the husked trials, at 1.3 t/ha. The mixture performed as expected from the average of the component varieties.

Figure 2. Yields (t ha-1 at 15% moisture concentration) of: naked oat varieties Expression, Grafton & Racoon; and the variety mixture grown as either the first (black bars; sed = 0.235) or second (white bars; sed = 0.254) cereal in the rotation.



Experiments have again been established this October as the first and second cereal in the rotation so that effects can be examined further. Up-and-coming breeding lines have also been provided by IGER for us to test under organic conditions.

Further information can be found at www.organicresearchcentre.com or the OATLINK website, www.iger.bbsrc.ac.uk/OatLink/. This project is sponsored by Defra and SEERAD under the Sustainable Arable LINK programme.

Top of the Pops – another year of population performance

Helen Boyd

This year has seen the final year of field trials of our Wheat Breeding project, which has developed, grown and analysed winter wheat populations in the field. Based on Suneson's 1956 'evolutionary breeding' approach, 20 varieties of wheat renowned for either their yield or their quality potential were inter-crossed to create six composite cross populations. These six populations have been grown alongside the original twenty parents, and a mixture of the parents, at four sites (two organic, two non-organic) for four years.

The origins of the populations

Composite Cross Populations (CCPs) are the collective, segregating, progeny of multiple crosses of pure line cultivars. Such populations can be adaptable to different and changing environments over seasons.

Three CCPs were created by crossing:

1) 12 parent varieties selected for good milling potential (quality): Q CCP;

2) 9 parent varieties selected for high yield: Y CCP; and

3) both sets of parent varieties: YQ CCP.

The three CCPs are further divided into those with or without plants with heritable male sterility (ms), which facilitates cross-fertilization amongst plants.

The purpose of the project

Wheat varieties produced from pedigree line selection show significant yield deficits compared to their performance under non-organic farming systems. Not only are the yields reduced by around one-third, but they also vary from year-to-year and site to site. The limitations of the present breeding system are based on the selection of varieties under non-organic conditions. The more variable conditions on organic farms, with the consequent influence on crop performance, can be buffered by increasing the crop diversity. Organic agriculture uses a rotational approach to manage variation in soil conditions, weed, and pest and disease pressures. Taking this a step further, diversity within the crop can further compensate for variation within fields, amongst farms and between years.

Therefore, we started a programme of population breeding in winter wheat. The principle is to inter-cross in all combinations a number of varieties with different useful characteristics so as to generate a complex segregating population. The population is then exposed to natural selection at desired sites to allow adaptation. The objective is to generate a reservoir of genetic variation which can buffer the performance of the population against a wide range of environmental variation, more than would be possible using pedigree line varieties based on single genotypes. Here we report on progress with this approach after three years of field trials.

Populations give good yields

The results from three years of trials are encouraging. Populations have been shown to yield better than the mean of the parent cultivars, particularly under organic conditions (Table 1). The YQ (from crossing 20 parent lines) population gives the greatest gain in yield; this may be a result of the greater number of parents, and hence genetic diversity, in this population.

Populations give stable yields

Stability of yield is an important attribute, and in cases of high environmental variability, such as those found on low-input or organic farms, it can be difficult to achieve. Stability can be measured by calculating the standard deviation of the yield; a low standard deviation indicates a low variability, and therefore high stability. Populations performed well for yield stability (Figure 1), as well as giving high yields. This is particularly true of the YQ CCP and YQ CCPms populations, both of which appear in the lower right hand quadrant, showing they had above average yields and below average variation of yield.

Individual varieties may do very well in one year at one site - but the next year conditions may occur that lead them to yield poorly. The genetic diversity of the populations can buffer the environmental variation and lead to a predictable yield year on year.

	Non-Organic			Organic		
	Y	Q	YQ	Y	Q	YQ
Population	103	103	101	102	103	109
Population (ms)	101	99	100	107	105	104
Mixture	105	104	103	100	105	105

Table 1. Yields of the Y, Q and YQ populations, without or with male sterility (ms), and the mixtures, as a percentage relative to the appropriate parent means. Values of less than 3 per cent above or below 100 are unlikely to be significant.

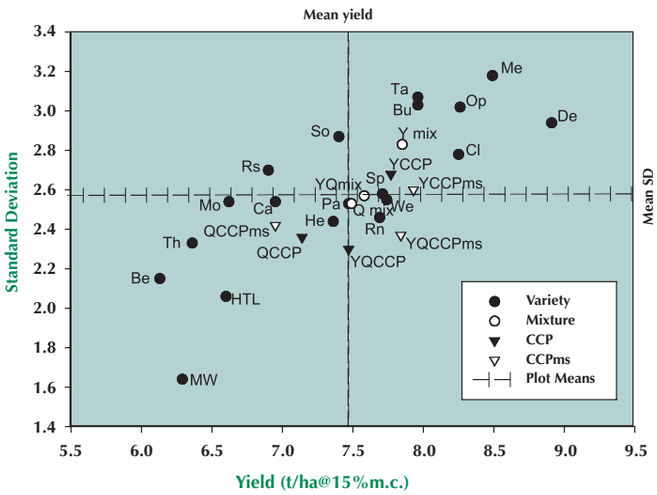


Figure 1. Yield stability of all parent varieties, mixtures and populations, taken from all four sites over three years. The lower right quadrant represents high yield-stability (high yield, and low standard deviation). (Be = Bezostaya, Bu = Buchan, Ca = Cadenza, Cl = Claire, De = Deben, He = Hereward, HTL = HTL (High Tiller Line), Me = Mercia, Mo = Monopol, MW = Maris Widgeon, Op = Option, Pa = Pastiche, Rn = Renan, Rs = Renesansa, So = Soissons, Sp = Spark, Ta = Tanker, Th = Thatcher, We = Wembley.)

Adapting populations?

Natural selection acting on the high genetic diversity in populations could result in local adaptation when populations are grown at one site continually, leading to a population specifically adapted to one particular environment.

To test if this site specific adaptation occurs we compared the populations grown under three different conditions: the same organic farm for all three years in the field ('organic mono-site'); more than one organic farm ('organic multi-site'); and alternate years on a non-organic and organic farm ('mixed multi-site').

The populations with the greatest yield stability were in fact the organic multi-site populations (Figure 2). These populations gave higher and more stable yields. This may be because increasing the range of environments to which a population is exposed might help to maintain or increase the genetic buffering capacity of that population. However, this might only occur if the population is moved to a site where the principal environmental stresses are of a similar nature, for example within the same farming system.

If a population is moved between organic and non-organic systems, then high levels of disruptive selection may reduce the potential response of the population to each system.

Therefore the organic multi-site, but not the mixed multi-site, has improved yield stability compared to the organic mono-site population. Organic mono-site populations may benefit from local adaptation to specific environmental conditions, but organic multi-site populations may benefit more from, potentially, greater genetic diversity.

Where next?

The John Innes Centre in Norwich is carrying out a genetic analysis of the populations, and will assess any changes in genetic composition since the populations were first created. This will help us to determine, for example, the extent to which particular parents contribute to population performance. This year sees the start of the new Defra funded Wheat Breeding LINK project.

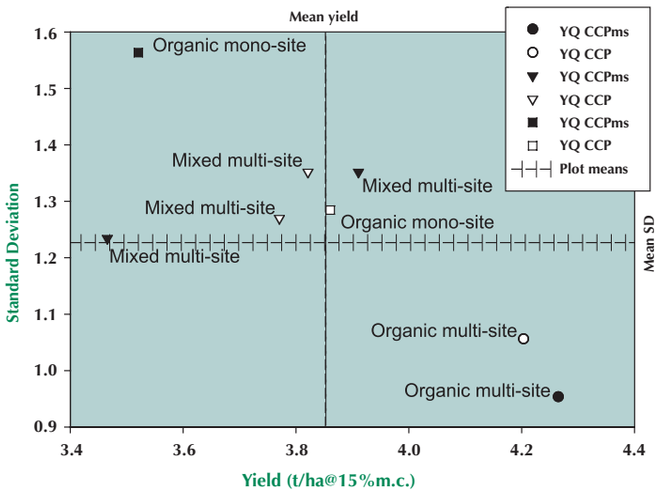


Figure 2. Yield stability of YQ Composite Cross Populations, either with (YQ CCPms) or without (YQ CCP) male sterility. The lower right quadrant represents high yield-stability (high yield, and low standard deviation).

This aims to develop and further evaluate the wheat populations; to trial the populations directly with farmers across the country and to assess their processing performance with millers, bakers, feed merchants, maltsters and distillers for their potential for general and local markets. It is essential to have the input from all the industry partners to determine the future potential of this wheat in arable production.

Finally, alongside population evaluation, we will address legislative and commercial issues which must be developed in order to regulate and market the populations in the future.

Rollercoaster ride for feed market

Catherine Phillips

Arable and livestock farmers have faced a tense few months as feed prices on both the conventional and organic markets have undergone severe fluctuations.

Grain markets have been particularly volatile this year affecting continuity of supply and increasing prices. This is in part due to lower quality and yields following weather damage in the UK and abroad as well as export restrictions in some countries. Fluctuations in the organic market have not been as severe as those in conventional futures markets, but it has still been a testing time for arable farmers facing lower yields and low specific weights. Livestock farmers have witnessed reductions in the availability of supply, resulting in rising prices.

Not withstanding weather conditions, the market is likely to see further adjustments in the coming months. With the New Year will come new rules on the proportion of non-organic feedstuffs allowed in organic livestock rations. From 1st January 2008, non-organic allowances will reduce from 15% to 10%. From 2010, the permitted proportion will further reduce to 5%.

Increasing the proportion of organic feed in rations is good news for the organic industry, and something that The Organic Research Centre has encouraged for some time. However, as the date of the standards changes approaches, farmers have some concerns. At the first meeting of Better British Organic Poultry (B-BOP), a group with the objective of improving standards in organic poultry production through intra-group support, some of the poultry farmers expressed concerns about being able to access organic feed. This is not surprising – organic poultry production in the UK has grown by more than 25% in the last year.

There seem to be two possible solutions to this problem: increasing the amount of organic feed or limiting the expansion of livestock - perhaps a combination of the two.

Increasing feed

We could continue to import feed, but transporting feed across the world is not really in the spirit of organic and leaves us vulnerable to export bans and to droughts. The alternative is increasing the amount of UK organic feed.

At recent meetings organised by the Yorkshire Organic Centre, farmers did express interest in growing more organic feed. But they had concerns; some have drilled crops for organic feed in the past, only to find that derogations have been given, effectively removing their market. One organic farmer commented - *"As a potential wheat producer, I don't want to produce until I have a cast iron promise that a derogation won't be issued."*

Decreasing livestock

The ideal is that farmers either produce their own organic feed crops, or partner up with a neighbouring farm to fulfil their feed requirements.

It's a tough choice to make – de-stocking to make way for home grown feed can be a big challenge. And some farms or areas of the country are simply not suitable for arable production as we currently know it.

There is increasing demand in the UK for organically produced goods, including meat. But if there is not enough organic feed available, perhaps changes in production and the market need to occur. Continuing to permit the current rate of livestock conversion with insufficient feed supplies seems both unwise and irresponsible. The ultimate impact on the market could even be that consumers (organic and conventional) need to consider reducing the amount of meat in their diets.

The current state of the market

Following the turbulence of the last few months "the organic market has paused for breath at the moment" according to Nigel Gossett of Norton Organic Grain. Prices are at around £250 for feed wheat and £280-290 for milling. Grain quality is "mediocre" in many respects, mainly as a result of this year's wet weather.

Year of Food & Farming

The Year of Food and Farming is an initiative from Government departments to get school groups out onto farms, and to re-establish a connection with how and where food is produced.

Not surprisingly, children are fascinated by the whole farming system, and it relates easily to their curriculum work across science, geography and environmental studies.

Several Trusts and local organisations have donated sponsorship to the Organic Research Centre for a total of 17 school visits to date. Three schools have taken advantage of this funding so far, and we have several bookings coming up for the Spring and Summer terms next year.

For details of school and young people visits contact – bob.w@organicresearchcentre.com or call 01488 658298.

H5N1 – It was the wicked wild birds that done it

Wild birds are to blame for the Suffolk outbreak of H5N1, says Defra. The acting chief vet Fred Landeg stated on national news bulletins that a close genetic match of the virus had been made with wild birds that died during the summer of 2007 in the Czech republic. No links to any commercial movements had been found, he said. Of course he chose his words carefully to blacken wild birds as they "could not be ruled out" as the source of this outbreak.

In its preliminary epidemiological report on the Diss outbreak Defra says - *"The current isolate has the closest genetic identity to an isolate from wild birds in the Czech Republic detected in mid-2007"* and it criticises the siting of this free-range turkey unit in close proximity to an ornamental lake frequented by wildfowl with the associated risks of disease transmission.

All these statements are a gross distortion of the facts. The Czech outbreak started on a commercial turkey farm on 21st June holding some 1800 birds. On 10th July, a single infected dead wild mute swan was found some distance away. Investigations concluded that disease had been introduced by commercial movements, and that *"A more likely explanation of the events observed is that the disease has spilled over from the turkey farms in the Czech Republic resulting in wild bird infections ".*

So says the official FAO report "Avian flu in Europe 2007" available at -
www.fao.org/docs/eims/upload/231765/EW_Europe_aug07_ai.pdf

Once again, for whatever warped reasoning of trade and industry, DEFRA is deliberately misleading the public into believing that wild birds are to blame, whilst disguising the fact that international trade in poultry and their products is the root cause.

A new demand from Defra to separate free range and organic poultry from wild birds is on the way, reports The Times, with the British Poultry Council delighted to deflect attention away from intensive production.

And by the way, despite intensive surveillance and sampling of wild birds in the Diss area, Defra failed to find a single trace of H5N1 circulating in them.

"Wait and see" on GM crops

The UK Government has a new policy on GM crop coexistence – it's called "wait and see". After a whole year of analysis of its coexistence consultation exercise – in which 11,600 responses were received by Defra - junior minister Phil Woolas could only manage this "holding" statement - *"We are grateful to everyone who responded and have considered the various comments made very carefully. It is clear that before our coexistence plans can be finalised we should await various developments that could have an important bearing on how we move forward."*

Apparently it has suddenly dawned on Defra that key pieces of its GM jigsaw are missing. These include -

– Outstanding research results
– The need to commission new research
– The wait for an agreement on thresholds for GM presence in seeds

In his statement the Minister specifically acknowledges the importance of seed thresholds in policy-making on coexistence -

"These will dictate what level of GM material might be in the seeds sown by non-GM farmers. This in turn bears directly on what coexistence measures need to achieve, in terms of minimising the potential for further GM transfer into non-GM crops. We should await clarification of what seed thresholds are to be adopted."

Pete Riley of GM Freeze (of which the Organic Research Centre is a member) says - *"We made the point in our submission to the consultation that Defra's evidence base for their proposals was weak and that key policies like seed threshold were needed before decisions could be made about "coexistence". The Minister now apparently agrees with us."*

"The legal opinion that GM Freeze submitted over a year ago raised serious questions about the legality of what Defra was proposing on seven counts. Instead of answering these points, the Minister has apparently decided to shelve the issue for the time being. The Government's policy on GM crops is a farce and has been since 1997."

Visitors from Denmark

A group of some 50 Danish students from Gråsten Landbrugsskole (Graasten School of Agriculture) visited Elm Farm on 22nd November. Unfortunately, following a spell of dry weather, there had been a downpour for most of the previous 24 hours. The well known law of misfortune had struck again and access to the land was out of the question. Some of the young people had practical experience of organic farming, but their college studies had not yet covered the subject. Bob Winfield spoke on the principles of organic systems; then Hannah Jones and Sarah Clarke summarised our research programme. This stimulated a long series of questions.

An outing for Eco Agriculture in Brussels

The European Network for Eco-Agriculture (Eneac) presented itself to EU policy and decision makers in Brussels in October. The event was attended by over 70 delegates, who represented the range of players in the arena of sustainable food, farming and rural development from MEPs to civil servants, NGOs and food and farming organisations. The event was sponsored by the Bavarian EU Embassy which provided an ideal location and warm hospitality.

The meeting was themed around a discussion on the ongoing health check of the Common Agricultural Policy (CAP) and about what Eneac can do to inform this review. It went under the title of *"Recognising the Potential of Best-Practice in Organic Food, Farming and Sustainable Rural Development – a Contribution to the CAP Health Check"*.

The meeting was opened by Heidrun Piwernetz, the Head of the Representation of the Free State of Bavaria to the EU, providing an introduction to the health check. Prof. Dr. Franz-Theo Gottwald, from the Schweisfurth Foundation - representing Eneac - then presented how the work of Eneac, and its constituent partners, closely addresses the current and future needs of a sustainable EU rural development and food & farming.

This was followed by a questions and answer session to a panel from Eneac (Bruce Pearce, Matthias Siebold, Marc Mößmer, Daniela Braun and Martein Lankaster). The formal part of the evening was completed by a closing statement from Anton Dippold - Head of Unit, Bavarian Agricultural Policy in the Bavarian State Ministry of Agriculture and Forestry which was followed by a meal of typical Bavarian organic food and drink.

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