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## THE ORGANIC RESEARCH CENTRE

is an international research, advisory and educational organisation based in the UK.

The business of The Organic Research Centre is to develop and support sustainable land-use, agriculture and food systems, primarily within local economies, which build on organic principles to ensure the health and wellbeing of soil, plant, animal, man and the environment.

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## Up the junction. Squeeze time for organic movement?

We can fan dance all we like around retail surveys revealing acceptable bits of TNS and Mintel, hiding others with flashy footwork and the flimsy drapes of claims about consumers. The reality is that many organic businesses are facing unprecedented pressure.

Downturns happen; recessions come and then recede. This one may go too, but meanwhile it will crunch many businesses and initiatives to their core; some may not survive; those that do will be in a different economic environment where the end of cheap energy and climate change means "business as usual" is not an option.

The hollow, fatuous phrase "market failure" now has a more unacceptable, harmful meaning. Markets are failing on a massive scale and tragically the casualties might include those enterprises that could have a leading role in developing business, trade and markets appropriate to our world of finite and diminishing resources.

Fritz Schumacher called these "preliminary examples"; activities that could lead the evolution of an economy fit for these conditions. The problem is that the current and prevailing economic conditions are hostile to them.

Even in good times they are vulnerable – for example local producer box schemes preyed on by corporate national ones – but they are particularly so when so many adverse forces come together as now.

It is now that we have to act as a movement.

Can we find ways of working together so that those farms and businesses that have the movement's principles at their heart can survive? Can those with financial muscle or knowledge use their skill and resources to help those who are more vulnerable? Can the ethical banks really support them? Can the organic millionaires help with loans, shares or funding instruments? Can the certification bodies act to protect the genuine organic pioneers? Can the large farmer work with the small farmer, sharing or loaning equipment, land, stock, feed?

Can we find a different way of doing things? Because if we can, now is the time to innovate. We would really like to hear from you.

**Lawrence Woodward**

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## World's birds calling for help

**The birds of the world are in serious trouble, and common species are now in decline all over the globe. And Europe and the UK are not immune. So says the Cambridge-based conservation partnership BirdLife International in a new report - State of The World's Birds.**

It identifies many key global threats, including the over intensification of industrial-scale agriculture and fishing, the spread of invasive species, logging, and the replacement of natural forest with monocultural plantations for biofuels and food. It goes on to suggest that in the long term, human-induced climate change may be the most serious bird population stress.

When brought together, as in its new report, the regional pictures of bird declines combine to present a startling picture of a whole class of living things on a steep downward slope.

A remarkable 45 per cent of common European birds are declining, with the familiar European turtle dove, for example, having lost 62 per cent of its population in the last 25 years.

*"Many of these birds have been a familiar part of our everyday lives, and people who would not necessarily have noticed other environmental indicators have seen their numbers*

*slipping away, and are wondering why,"* says Dr Mike Rands, BirdLife's chief executive.

All the world's governments have committed themselves to slowing or halting the loss of biodiversity by 2010, but reluctance to commit funding – even within the EU – means that this target is almost certain to be missed.

An analysis of 124 of Europe's common birds over a 26-year period reveals that 56 species (45 per cent) have declined across 20 European countries, with farmland birds badly hit. The familiar common cuckoo *Cuculus canorus* has declined by 17 per cent. The European turtle dove *Streptopelia turtur*, grey partridge *Perdix perdix* and corn bunting *Miliaria calandra* have dropped 62, 79 and 61 per cent respectively.

Birds migrating between Europe, the Middle East and Africa have suffered 40 per cent population declines over three decades. The Eurasian wryneck *Jynx torquilla*, northern wheatear *Oenanthe oenanthe*, and common nightingale *Luscinia megarhynchos* are vanishing.

The State of the World's Birds report can be found at – [www.birdlife.org/sowb](http://www.birdlife.org/sowb)

## Italian thumbs up for organic chicken

For many years, the debate has raged on whether organic birds are better than conventional chicken. Just this summer, University of Bristol researchers found that conventionally reared chicken tasted better than organic birds and last year, there were claims that organic chickens contained higher levels of Campylobacter.

In a fresh study in Italy, organic chicken has come out on top with new data suggesting that eating organic breast meat instead of conventionally reared birds may be good for you.

Led by Gianvito Martino at the University of Teramo, the group analysed 24 birds, half conventionally reared and half organic.

They found that breasts from organic chickens contained nearly 30% more polyunsaturated fatty acids than conventional birds. Consequently, saturated fatty acids and mono-saturated fatty acids were more abundant in conventional chicken.

As the researchers pointed out, the intake of saturated fats by people is related to increased levels of LDL cholesterol in the blood. And it is LDL cholesterol which has been linked to heart disease. Therefore, organic chicken may have a role in reducing heart disease.

The debate goes on.

## German bee disaster

A mass bee death in the German region of the Upper Rhine has been blamed on the seed dressing Clothianin which is widely used in maize.

This year maize crops in the region were drilled in very dry conditions and the Clothianin (marketed as Poncho Pro) was blown about on fine soil particles in strong winds and contaminated blossoms of all plants growing nearby. As the bees collected pollen, they contaminated the hive which then died from the pesticide activity. Some 11,000 colonies were wiped out in this way, amounting to 300 million bees.

Poncho Pro manufacturer Bayer Crop Science has accepted responsibility for this catastrophe and has compensated the

beekeepers. A watching brief has now been kept through the summer on whether the seed dressing might also directly be transferred to the flowers and pollen of the maize crops themselves. Surprisingly, no studies have been previously carried out in this area, but Bayer says it will now do the work.

ORC President Professor Hardy Vogtmann says that once again this sorry tale shows how pesticides are widely used in the environment without proper testing.

There are now calls for this family of pesticides - neonicotinoids - to be banned in the UK.



## Organic boost from expensive oil

**The production of organic combinable crops, such as wheat and barley, is set to generate greater margins compared to non-organic as the price of oil heads to US \$200 a barrel - predicted by a recent Chatham House report to happen in 5 to 10 years – reveals a new study carried out for the Soil Association.**

The study by Andersons, the farm business consultants, is titled 'The impact of rising oil prices on organic and non-organic farm profitability'. It shows that with oil at US \$200 a barrel, the profit margins of non-organic combinable crop systems range from £296 to £348 per hectare, per year whilst the organic margins range from £371 to £411. This is mainly due to the high cost of oil-based artificial fertilisers that are extensively used in non-organic systems which could soon rise to £550 a tonne.

At such prices, the fabled efficiency of fossil-fuel and fertiliser dependent industrial farming begins to crash. Organic rotations that use clover to use nitrogen naturally from the atmosphere can fix 200kg of nitrogen per hectare over a year.

Peter Melchett, Soil Association policy director, says – *"This study suggests that as oil inevitably becomes scarcer and costs more, economic forces will increasingly favour organic farming. Organic systems are not perfect, but they do use less energy, generally emit fewer greenhouse gases, can sequester carbon in the soil, provide more jobs and support more wildlife. This report suggests they could also offer a more secure long-term financial future for the UK's farmers."*

*Due to rising input costs NFU president Peter Kendall recently warned that "conventional farmers will have to think harder about rotations as ways of reducing fertiliser and pesticide input."*

The report takes into account cropping patterns which are based on the rotations of actual farmer clients of Andersons, and the costs and returns are based on current figures.

## Bog standard SA certification lives on

In a surprise move, the Soil Association (SA) has announced that, after all, it is to continue operating its organic certification company – Ascisco – (UK15) which certifies organic businesses to the baseline EU regulation (minimum organic standards).

Previously the SA had announced that it would end operations of Ascisco Limited this year due to concerns that it was too closely associated with the certification scheme UK15, and that it needed to make a clear distinction between its own enhanced standards (UK5) and those operating to baseline standards.

The SA certification board now says it has decided to continue operating Ascisco to deliver organic certification to those businesses *"not yet able to meet the Soil Association organic standards"*.

Just what incentive such a move might deliver to "baseline" businesses to trade up to full SA certification standards is hard to see. This smacks of commercial hand-wringing rather than the high principles that the Soil Association ought to be striving for.

## Hard sell on GM crops from UK Government

Watch out. UK Ministers have given their strongest backing yet to GM crops being planted across the country. The latest intervention comes from science minister, Ian Pearson, who predicts that the public would accept GM crops if they could be convinced that the technology would benefit consumers.

*"I don't think the GM debate in 2000 was handled very well," says Mr Pearson. "I think that the public wants to see benefits for GM technology for the consumer, not just for the life science company or the farmer. If GM can demonstrably provide benefits for people living in sub-Saharan Africa, then I think the public will want to support those as products and want to see them commercialised."*

He acknowledges that the Government needs to communicate its science message better to the public. *"We need to find new and better ways of consulting and of working with people and making sure that we take them along with us."*

Ian Pearson's comments are part of a blatant, concerted effort

by ministers to reopen the GM issue. On BBC Radio 4 Farming Today last month, the environment minister, Phil Woolas, said the Government considered opponents of GM had a year to prove it was not safe. *"If you are opposed to GM it is now up to you to provide the evidence that there is harm. Ten years ago it was the other way around."*

The new mood in Government has been warmly welcomed by GM lobbyists. Dr Julian Little, head of the Agriculture and Biotechnology Council, the umbrella group for the food biotechnology industry says – *"Biotechnology can make a significant contribution to rising food and fuel prices and environmental challenges."*

The Organic Research Centre – Elm Farm along with the pressure group GM Freeze and other green groups says that ministers are simply using the apparent global food crisis as an excuse to align themselves with the biotechnology industry. It seems the government has forgotten what came out of its own public debate on the issue in 2000. (See GM conference back page).





# Ancient cereals to deliver healthy organic foods

Geza Kovács, Agricultural Research Institute of the Hungarian Academy of Sciences

**Exciting new work in Hungary looking at the ancient cereals, einkorn and emmer - which were a staple food of the human population for more than 10,000 years – is set to deliver new varieties producing excellent raw materials for high value functional organic food products, including bread, pasta, green salad, juice, and the like.**

Modern consumers expect organic food to have a higher nutritional value, to be healthier, or simply to be safer or less risky. The effects of organic and 'low input' production methods on food quality and safety and indirectly on livestock and human health are essential in this consumer offer. The next step is to offer new crops such as einkorn and emmer for the production of "functional organic food".

The nutritional status of the most important staple foods, such as cereals is ultimately dependent on their metabolic composition. Nevertheless, while traits associated with yield and resistance have been in research for a number of years, quality traits have been less well studied. During the last ten years much more attention has been given to the phytonutrients which show a significant effect on the reduction of the incidence of ageing-related and chronic human diseases. Among the numerous antioxidant compounds present in foods, lipid soluble antioxidants play an important role in disease prevention. Interestingly, natural antioxidant activity of these compounds might complement their positive functional characteristics in maintaining freshness and shelf life of food products, thus providing a natural alternative to synthetic antioxidants for the organic food industry.

We now know that wheat, which of course is a key staple food for developed economies, is not only an energy and protein source, but is also a useful source of such antioxidant compounds. In bread wheat, however, the concentration of carotenoids and tocopherols is low. They are far more abundant in emmer and einkorn. Emmer and einkorn are also an excellent source of several other functional compounds. To be able to reintroduce these species to modern organic farming practice, an organic breeding project was initiated in Hungary some years ago.

## Materials and methods

During the last few years 250 einkorn and 130 emmer genebank accessions were screened for their agronomic performance and quality traits. Out of these accessions the best 20 were selected for further crosses, and several breeding lines were established from both species. The best lines were characterised for their agronomic value under organic condition, and then were further selected according to the needs of the end users, such as bakers and consumers.

According to the on-farm results, the new einkorn varieties MvGB 4 and Mv 140 have an acceptable yield compared to the bread wheat control, with a significantly higher protein content. The wet gluten content, a very important trait for bread making quality, is also higher in the new einkorn varieties than

in bread wheat alongside a higher bread volume, making them an excellent raw material for bread making. The two other varieties are showing a very interesting profile, as meanwhile the protein content is very high, they do not contain wet gluten at a detectable quantity. They could be a useful cereal food source for people having gluten allergy. All of the new varieties have very soft seeds.

According to the on-farm field results, varieties MvGB 4, Mv 794 and Mv 140 are tall varieties (plant height is 130cm), recently preferred by organic farmers, with a good lodging tolerance and allelopathic activity. Meanwhile Mv 347 is a modern semi dwarf type (plant height is 98-110cm), making it useful for conventional high input farming.

The significantly high levels of fat-soluble antioxidant content, coupled with a high tocopherol/tocotriol ratio (T3T) provide evidence that these einkorn varieties are nutritionally outstanding cereals, giving an excellent source of functional food production, similarly to produce natural antioxidants for the food industry.

The data also suggests that the use of einkorn has several advantages over bread wheat as a source of several novel functional bakery and cookery products, as well as as breakfast cereals. In a cooked form they can be used like rice substitutes in several diets.

## Agronomic and quality performance of the new emmer

The organically bred new emmer variety also has a relatively good yield (3.5t/ha) under organic farming conditions, excellent weed competitive ability and an extremely high biomass production, as it is very tall (plant height is 145cm). The seeds are very hard, practically harder than durum wheat. The protein content is somewhat smaller than that of the einkorn, but still higher than in bread wheat (15.4% average). The carotenoid content is also higher than in the case of bread wheat, giving a yellow mill, necessary for pasta production, but the tocopherol content is similar to durum or bread wheat.

This emmer variety has recently been used for the development of new cereal products, for example to production of the famous smoked ancient cereal food, called "Frikeh" which is made from green seeds harvested before complete maturation, and then smoked on an open fire. It has an excellent taste, and could be one example of the reintroduction of ancient foodstuffs into modern society.

This autumn at the Organic Research Centre – Elm Farm we shall be planting nine of these Hungarian einkorn lines to see how they are suited to UK weather and growing conditions. Already, commercial UK organic millers are showing a keen interest.

(This project is funded by the Hungarian National Office of Science and Technology.)

## **In the current economic squeeze, across the organic world poultry farmers are amongst those being squeezed hardest.**

Feed costs represent about 75 per cent of the cost of producing a live meat bird and slightly less for the cost of an egg. If cost of production must be reduced then the obvious place to start is the feed costs.

To say that organic diets are expensive relative to normal commercial diets is to state the obvious. Organic ingredients are often in short supply, particularly sources of protein. Obviously, some ingredients which reduce the cost of conventional, commercial diets are not approved for organic diets. An example of this is synthetic single amino acids which can be used to reduce the amount of protein required from other ingredients.

As organic diets are so expensive, every effort should be made to improve the feed conversion ratio. The first stage is to record current performance. This can be assessed by dividing the amount of food eaten by a flock by the weight of the flock - at killing if meat birds or the eggs produced if a laying flock. The breeding company may provide performance goals which should be the initial yardstick.

If the data indicates that the amount of feed used is higher than expected, it may have one of several causes.

### **Feed wastage**

This is a common cause of the problem. If any feed can be seen in the litter, it will represent only a small proportion of the wastage. It is like an iceberg - most is unseen as it breaks down into dust. The wastage may result from one of the following factors.

### **Unsuitable feeders**

This is a particular problem with turkeys being fed from chicken feeders. Older turkeys may only be able to feed by eating from the feeder at an angle resulting in feed being flicked out. Older chickens can sometimes behave similarly if the feeder space is too narrow. Fitting of collars around feeders which retain the feed can sometimes be a practical option.

### **Over-filled feeders**

While it is important that feed is easily available for the birds to get optimum performance, this should not be achieved by setting the feed to be near or at the top of the feeding trough as this will make it easier for the feed to be flicked out onto the floor when eating.

The only time when the feeders should be filled to over flowing is in the first days of life. It is very important that the day-old chick or poult finds the food quickly. A small quantity of food wasted at this time is a small price to pay to ensure a good start to life.

To help the day-old bird find the food quickly, it is good practice to either have food sprinkled on the floor on paper or to put food in egg flats or chick box lids

### **Feeder height**

It is important to regularly adjust the height of the feeders as the birds grow. If the feeders are hung too low, it is easier for the birds to flick food out of the feeders which is then wasted. The feeders will also collect more shavings in them.

Conversely it is important for the bird to be able to feed readily so the feeders should not be hung too high.

The accepted wisdom is that the correct height of the rim of the feeder should be at the bird's shoulder height.

### **Feeder cleanliness**

The birds should be discouraged from perching on the feeders otherwise faeces will collect in the feed which must then be cleaned out and discarded. It also is a health risk.

### **Feeding unwelcome visitors**

Rats and mice can consume surprising amounts of feed. Their numbers are difficult to estimate. Vermin control should be efficient and access to the house made difficult. Feeders should not be positioned outside the house for the obvious reason that they will be used by wild birds besides rats. These will then pose an additional problem of risking the introduction of diseases such as salmonella and mycoplasmas.

### **High bird losses**

On average mortality in organic flocks is low. However if losses are higher than the norm, the feed eaten by those birds lost must be carried by the remainder of the flock. This is particularly significant if the birds are nearing killing age. It is important to find the cause of losses and to try to rectify the problem.

### **Formulations**

The bird's appetite is dictated by its energy requirement. If the feed is low in metabolizable energy (ME), the bird will eat more of it than if the ME was higher. The ME content of the diet will directly influence its cost. The lowest cost per tonne may therefore not result in the lowest feed cost per bird killed.

It is important that ways to reduce the feed cost per bird produced are investigated. The Organic Research Centre (see page 6 and 7) is researching this field, being particularly interested in ingredients that can be grown on the farm or locally and that can be fed in conjunction with a balancer, pelleted diet.



# On-farm feeding and how to tackle rising prices, oil shortage and emission reduction

Peter How

**Organic principles have natural systems and cycles at their heart. The example of excessive importation of feed, particularly for monogastrics, represents a weakness of these systems. SA standards will require that by 2011 50% of feed should be sourced either on-farm or at a linked holding (Soil Association Standards 10.13.15, 2007) though it is not yet clear how 'linked holdings' will be defined.**

The price and availability of oil is one of the direct and indirect contributors to feed price increases, and despite a recent reprieve in crude oil prices it is clear that the general trend of scarcity will become much more significant in the future.

The emissions implications of burning oil is, rightly, also increasingly being considered important as decisions are made on farm (and in other businesses). The reduction in transport fuel achieved by feeding on farm can be considered as a credit to the farm and as a contributor to a high value product.

As commodity prices have risen sharply in recent times, and previously reliable protein sources have in some cases become even impossible to find, the capacity to feed from the farm represents preparedness for a new context of volatile commodity availability and prices.

So for reasons of principle, price, uncertainty, and 'future proofing' the development of on-farm feeding strategies is a desirable achievement.

Sheepdrove Organic Farm has been committed to finding diets for their livestock from home produced sources and has worked with the Organic Research Centre to develop an understanding of what might be possible within this system.

## Simple on-farm feeding for mixed farms: wheat

In an early effort to establish what could be achieved on many mixed holdings we have looked at a simple substitution diet with 30% whole wheat.

Wheat is an important ingredient in compound pellets but a number of health benefits have been shown to be derived from feeding the grain whole, including improvement of gut flora for establishing and maintaining a healthier bird, and improvement in the efficiency of utilisation of the balancer diet (or standard compound feed).<sup>1</sup>

In choice feeding scenarios poultry are known to positively select for increasing quantities of whole grain as they grow older and the level of wheat eaten is strongly influenced by the protein level in the balancer. In one study where the balancer diet had 270g/kg crude protein, birds were selecting 55% whole grain at 35-42 days old.<sup>2</sup>

## The trial

This trial involved substituting 30% of the regular poultry compound ration with whole grain wheat at Sheepdrove Organic Farm in a finisher ration for birds from 6 weeks old to slaughter at 12 weeks. The key objective was to establish whether birds finished to target weights in the given time period.

Birds were weighed throughout the six week trial period so growth curves could be observed and carcase measurements were also taken.

Three trial houses were divided into two in order to simulate six sheds, each of which had a group of 20 birds. The feed treatments were -

- compound only feed
- 70% compound feed and 30% whole wheat (by weight).

Groups of 20 birds of five weeks old were selected from the commercial flock and placed in each shed. The birds were fed with their regular compound feed in the first week to allow acclimatisation in the new sheds. Each shed had a bell drinker and 2 round feeders: one for grit. Wood shavings were used for bedding and checked regularly along with feed and water. At six weeks old the feed for three "sheds" was replaced for the 30% whole grain feed and all birds were ringed, and weighed separately. Birds were weighed each week and on the day before slaughter.

Birds were slaughtered at 81 days old. Identity could not be maintained throughout processing but carcasses were weighed and indicative measurements taken for breast and thigh sizes with a tape measure. Welfare assessments were also carried out in the slaughter house.

Statistical analysis was carried out with Genstat.

## Results

It was interesting to observe the initial negative selection of wheat in favour of the compound pellet, and then a week or two later the positive selection of wheat over the compound feed.

No statistical significance was attributed to the effects of diet on the birds in this trial except for the suggestion that there may have been greater leg/breast size ratio in the 30% whole wheat fed birds' carcasses. This needs further investigation.

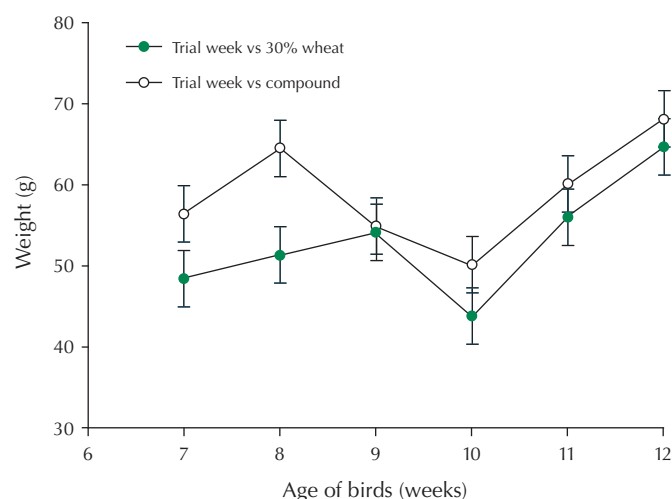
Birds fed on the compound ration gained weight faster than those on the 30% whole wheat diet in the first two weeks of the trial (see Figure 1), with this difference narrowing in the final four weeks. Birds grew very well on both diets with daily weight gains of over 55g/day, s.e. 1.13. Any effect that the whole grain diet had in limiting growth rates may be considered an advantage since more birds fed on compound feed finished over weight. (See Figures 1 and 4.)



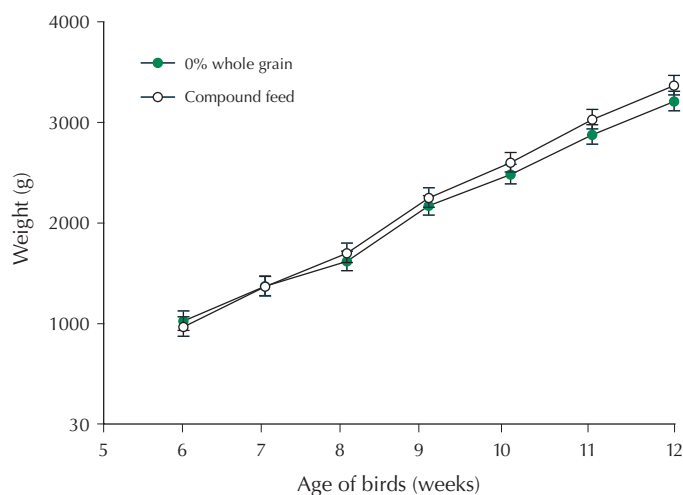
Birds fed on compound only rations finished 195g heavier than birds fed on the 30% whole wheat diet, though the s.e.d. was 120, meaning this was not statistically significant. (See Figure 2.)

Field observations suggested that birds may have been selecting for compound feed in the first few days but showed no consistent preference for either whole grains or compound pellets after this period.

**Figure 1:** Daily rate gain curves for birds finishing on two diets.



**Figure 2:** Growth curve for birds finishing on two diets.



### Diet effects on carcase

It was not possible to observe all carcasses because 14 birds were removed during processing.

A slightly higher proportion of birds fed on the 30% whole grain ration came into the preferred target weights of between 1.8 and 2.4kg with more birds fed on compound feed only growing to more than 3kg. (See Figure 4.)

There was some evidence that birds finished on the 30% whole grain diet had a greater leg: breast ratio. The methodology for measuring leg and breast weights is untested so this needs further investigation and validation.

**Figure 3:** Table showing proportion of birds falling into carcase weight targets.

Distribution of Carcase weights within target zone					
	No Birds	< 1.8kg	1.8 - 2.4kg	> 3kg	Excluded
30% Whole Grain	50	7	36	1	6
Compound	50	7	33	2	8
Total	100	28	69	3	14
30% Whole Grain	50	14%	72%	2%	12%
Compound	50	14%	66%	4%	16%
Total	100	28%	69%	3%	28%

**Figure 4:** Table of carcase aspects of birds fed on 30% whole grain and compound only diets.

Carcase weights and measurements					
	Carcase Weight	CW/LW <sup>†</sup>	Leg	Breast	L/B
Whole Grain	2184	0.68	12.77	17.5	0.73
Compound	2172	0.64	12.81	18.65	0.68
s.e.d	72	0.0268	0.058	0.588	0.015
Significance	††	††	ns	ns	**

<sup>†</sup> small under-estimate: 5 birds have been selected out before carcase weighing

<sup>††</sup> large birds have been selected out before reaching carcase assessments

ns = no significance \* = significant at 10% \*\* = significant at 5%

CW = Carcase weight; LW = Live weight L / B = Leg : Breast measurement ratio

### Conclusion and recommendations

This on-farm trial demonstrates that feeding whole wheat is feasible and that producers should consider their capacity to deliver mixed feed to the flock and the opportunity of the approach in their given systems.

The 30% whole grain ration produced a higher proportion of carcasses of preferred target weights. This is an important advantage for marketing and revenues for the system. With birds throughout the trial, and in the commercial flock generally, growing at high rates during the spring / summer season, the concept of slowing growth (and so final weight) is desirable. This would not be the case during the winter period and the performance of the birds on the new diet during winter months needs to be carefully observed.

No social disturbance seemed to be created by the introduction of the novel feed or negative performance effects.

The jump from zero whole grain to 30% at six weeks is dramatic and seemed to result in a temporary decline in growth rate, whilst this had no negative impact on finish weights in this trial, it is recommended that chipped or whole grain is available for choice feeding in brooders from three weeks, with whole wheat increased more steadily to 30% for 6 weeks. This will allow earlier development of the birds' digestive systems.

1. Gabriel, I., Mallet, S., Leconte, M. Fort, G. & Naciri, M. (2006) Effects of whole wheat feeding on the development of coccidial infection in broiler chickens until market-age. *Animal Feed Science and Technology* 129(3/4): 279-303.

2. Sahin, A., Yildirim, H. Kaya, S., Canogullari, S. & Bavlan, M. (2001) Selection of whole wheat by broiler chickens in semi-commercial experimental conditions. *Journal of Animal Production* 40(1): 8-20





# Brave new world for old cereal varieties

Hannah Jones

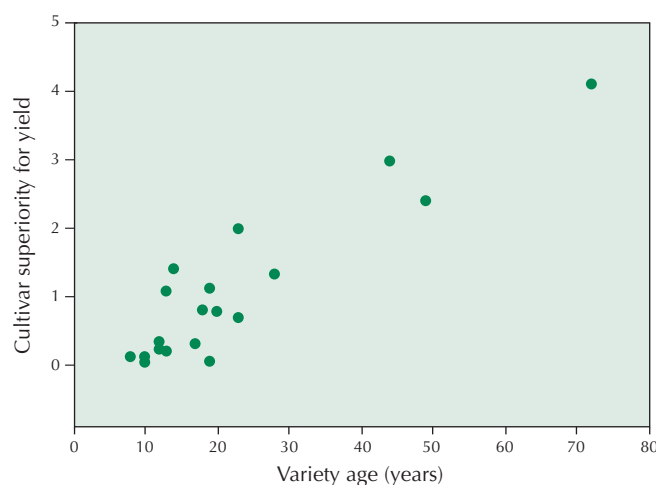
Old wheat varieties are still relatively popular with organic farmers and often said to be more reliable in obtaining milling quality, and with the added advantage of height which is useful for weed competitiveness. Non-organic farmers are rarely seen with a field of Maris Widgeon – such a crop would not only lodge and provide poor yields, but it would have a protein level equivalent to a more modern variety such as Soissons.

The varieties that are available on the recommended lists are bred by pedigree line selection. The hybrids between two or a number of varieties are sequentially selected and crossed with themselves by the breeder. A fraction of the plant types that arise from the original cross are finally multiplied and sold as individual pure line varieties.

Pedigree line selection has successfully produced varieties in the UK, which, when grown under high input conditions, have increasing stability of high yield. Figure 1 shows a positive increase in stability for some popular winter wheat varieties from the last 80 years or so.

## Patterns of performance

These data are taken from three years of field trials run by ORC for nineteen varieties. Figure 1 presents data from just the non organic sites (Morley and Metfield Hall) but equivalent trials were also run at Wakelyns Agroforestry and Sheepdrove Organic Farm.



**Figure 1:** Plot of variety yield superiority (indicates stability of performance: a low value highlights a high superiority) against variety age for non organic trial sites, Morley and Metfield Hall for 19 varieties. A low value for superiority indicates a higher level of performance (stability of performance, and total yield) Correlation coefficient = 0.9161 (P = 1%)

These variety trials were part of the trial series on the ORC composite cross populations and mixtures.

In the absence of mineral fertiliser, herbicides, pesticides and growth regulators, these varieties frequently under-perform in organic systems – organic yields were on average 56% of non-organic yields for the 19 varieties tested over three years.

Variety	Quality/Yield/Both	Winter/Spring	Country of origin	Registration date	Endosperm Soft/Hard	Grain use
Bezostaya	Both	Winter	Russia	1959		
Buchan	Yield	Winter	UK	1995	Soft	Feed
Cadenza	Quality	Spring	UK	1995	Hard	Bread
Claire	Yield	Winter	UK	1996	Soft	Biscuit
Deben	Yield	Winter	UK	1998	Soft	Feed
Hereward	Quality	Winter	UK	1990	Hard	Bread
High Tillering Line	Yield	Winter	UK	n/a	n/a	n/a
Maris Widgeon	Quality	Winter	UK	1964	Hard	Bread
Mercia	Quality	Winter	UK	1989	Hard	Bread
Monopol	Quality	Winter	Canada	1980		
Norman	Yield	Winter	UK		Soft	Bisc/Feed
Option	Yield	Winter	UK	2000	Hard	Bread
Pastiche	Quality	Winter	UK	1988	Hard	Bread
Renan	Quality	Winter	France	1989		
Renesansa	Quality	Winter		1994		
Soissons	Quality	Winter	France	1996	Hard	Bread
Spark	Quality	Winter	UK	1991	Hard	Bread
Tanker	Yield	Winter	UK	1998	Hard	Feed
Thatcher	Quality	Spring	USA	1936		
Wembley	Yield	Spring	UK	1985	Hard	Bread

**Table 1:** Trials varieties with grain characteristics, use, country of origin, and registration date.

The parent age was taken to be the registration data, with exception to High Tillering Line (HTL) which was released as breeding material in 1985.





A closer look at these varieties in the two different farming systems reveals a pattern across yield performance, protein quality, and the total protein yield.

The trial included both old and new varieties (Table 1), and are the parents lines which were used to develop the composite cross populations. These particular varieties were selected because they were widely popular for long periods, or were parents of successful varieties, in Northern Europe down the Atlantic seaboard (with the exception of the Russian variety Bezostaya).

### Comparing performance

The varieties in Table 1 are grouped either as quality or yield depending upon their end use (because of contamination, data from Norman were not used). The performance of these variety groups can then be compared under organic or non organic conditions. Table 2 provides the figures describing whether there is a positive (improved) or a negative (decreasing) variety performance with age. The key points to note are that at organic sites

- there is a significant improvement in yield performance, and protein yield for the soft wheats in more modern varieties;
- there is a significant decrease in protein content in more modern soft varieties;
- there has been no increase in the performance for milling varieties in terms of yield, protein content, or protein yield.

At the non organic sites in contrast:

- For both soft and hard wheats there has been a significant increase in yield in the more modern varieties

Character		Yield	Quality
Organic	Yield	0.8247**	0.4378
	% protein	-0.7497*	-0.4621
	Protein yield	0.7163**	0.1633
Non-organic	yield	0.8965**	0.927**
	% protein	-0.7116*	-0.5294
	Protein yield	0.9118**	0.9287**
n		8	12
df		6	10
R <sup>2</sup> (5%)		0.707	0.576
R <sup>2</sup> (1%)		0.834	0.708

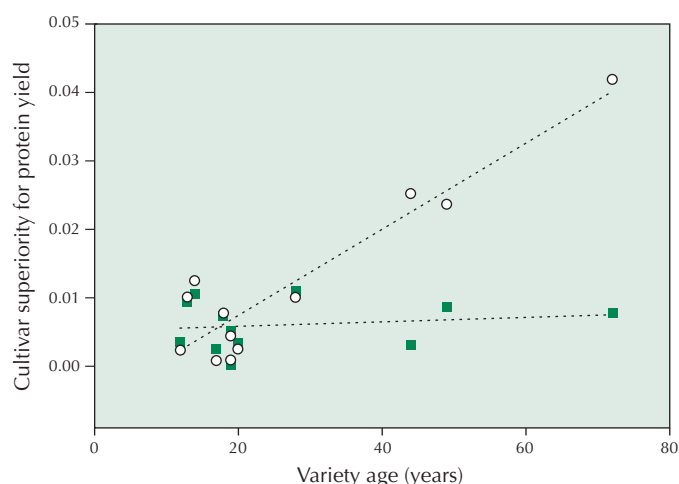
**Table 2:** Correlation coefficient for variety age against cultivar superiority for yield (tonnes/ha), protein content (% at 15% moisture content) and protein yield (tonnes/ha) at the two organic sites (Sheepdrove and Wakelyns) and at the two non-organic sites (Metfield and Morley). 'n' indicates the number of varieties, and 'df' the degrees of freedom for the correlation. The significance values are indicated at 5% and at 1% significance. Correlations that are significant at the 1% level are marked with '\*\*' and at the 5% with '\*'.

- There has been no increase in the protein content (and a significant decrease for soft wheat) in the more modern varieties but the overall protein yield has significantly increased for both soft and hard wheats.

The protein yield is a particularly valuable character to assess here because any increase in protein content in the more modern varieties is masked by the larger increase in yield. In other words, the protein the crop produces is 'diluted' across more grains.

Therefore, the present breeding system produces varieties far more suitable for non-organic conditions. This is because of selection of varieties in high input environments; modern lines have optimal performance when the environmental variability is reduced through chemical inputs.

However, the possibility of non-organic growers reducing the level of inputs is quickly becoming a reality due to a combination of increasing oil price for fertilisers and pesticides and EU legislation against pesticides. These combined with the increasing threat of more extreme and unpredictable weather highlights the need to increase the resilience of farming systems.



**Figure 2:** Plot of variety protein yield superiority (indicates stability of performance: a low value highlights a high superiority) against variety age for non organic trial sites, Morley and Metfield Hall (open circles), and organic trial sites (Sheepdrove Organic farm and Wakelyns Agroforestry) (closed squares) for 12 'quality' varieties. A low value for superiority indicates a higher level of performance (stability of performance, and total protein yield) Correlation coefficient for non organic sites = 0.9287 (P = 1 %), correlation coefficient for organic sites = 0.1633 (not significant)

### Resilience comes from diversity

Organic farmers already have greater diversity from their rotations and management practices but, as highlighted in our research on composite cross populations, increasing the buffering capacity from within the crop, through greater genetic diversity, has the potential to stabilise fluctuations in yield between years. The analyses here further highlight the limitations of single varieties; in an increasingly variable environment can single varieties alone have the capacity to deliver?

(This work was funded by Defra in the project AR 0914.)



# Waiting game for organic seed

Roger Hitchings

**The European Consortium for Organic Plant Breeding (ECO-PB) has been holding workshops aimed at promoting the increased use of organic seed since 2003. The latest in the series was held recently at the head offices of Bejo Zaden in Warmenhuizen, Holland with the aim of increasing co-operation among countries in NW Europe. Several contributors to the workshop spoke of the difficulty (or even impossibility) of achieving agreements across the 27 Member States and various climate zones of the EU.**

ECO-PB is interested in seeds for all sectors but this workshop focused primarily on vegetable seeds with a nod in the direction of cereal and potato seed. Currently the EU Regulations (old and new) require organic seed to be used at all times but they also provide for untreated conventional seed to be used under derogation in a variety of circumstances.

If all Member States agree a crop species can be placed in an annex, that will prohibit the further use of non-organic seed except for research and trials. A key objective of this workshop was the identification of up to 5 species that might be considered for entry to the annex in the next 2-5 years. As a prelude to a full proposal for annexation the meeting was asked to consider if local inter-country agreements would be possible.

## System variety

It became clear in the initial reports from individual countries that the systems operated in each member state were quite different. Most reports included a number of so-called general derogations where blanket permission has been given for non-organic seed of a given crop species to be used without requiring further permission. The number of crop species subject to general derogation can be quite significant. The UK does not operate a system of general derogation and so all derogations must be applied for individually. Some countries are able to record the number of times general derogation seeds are used and others cannot.

The other key difference between the UK and many of its close neighbours is the move to creating a national 'annex' in which species may be placed with consequent restrictions on the use of non-organic seed. These are variously called Category 1, Level 1, Red List, etc. and are essentially voluntary in the sense that the member state cannot legally enforce such provisions. The key to the success of such moves is the voluntary engagement of all key stakeholders in the process of deciding which crops should be 'annexed'.

Every Member State that has made progress in this direction has also provided for the establishment of expert groups that include representatives from all stakeholder groups and who meet regularly to review seed availability. The UK has four Industry Seed Working Groups but after a promising start, the funding has been reduced to the point where only one group can have a face to face meeting in a given year.

It's clear that national systems would need some degree of harmonisation before the realities of inter-country agreements could be explored with any chance of success.

There was a definite willingness in principle but in the UK's case there would have to be a significant increase in funding for the seed working groups before any progress could be made. A number of members of the Standing Committee on Organic Farming (SCOF) were present at the workshop and they agreed to raise a number of issues at SCOF aimed at reducing the rigid nature of the present requirements.

## A question of lettuce

A number of candidate species were discussed as possibilities for action in the near future and these included both vegetable and cereal species. The difficulties were once again exposed in the discussion on lettuce – is it one species or do we consider Batavia, Romaine (Cos), leaf lettuce, crisphead lettuce, etc. as separate candidates? Potatoes have been seen as a strong candidate by the UK (ACOS is discussing the possibility of a proposal for submission to the Annex) but an industry representative was pessimistic, given the recent wet summer weather.

The workshop concluded with a sense that some degree of progress is now possible especially as there seems to be a renewed willingness of some seed companies to engage with the sector.

## UK seed derogations

By way of illustration, the latest figures from the UK Annual Derogation Report for 2007 show a reversal of the trend of decreasing numbers of derogations. The total increased from 8417 in 2006 to 10322 in 2007 – numbers are not that informative as the quantity of seed per derogation can vary from 25 seeds to 10 tonnes. The pessimism about potato seed is illustrated in the 3-fold increase from 415 tonnes in 2006 to 1169 tonnes in 2007.

Arable seed is often thought of as another potential area for the exclusive use of organic seed but again the derogation figures tell a different story. The number of derogations decreased from 2006 to 2007 but the quantity derogated increased from 1374 tonnes to 1523 tonnes over the same period.

Vegetable seed derogations showed the sharpest increase rising from 2642 in 2006 to 3825 in 2007. Increases in numbers of derogations over this period included garlic, kale, onion sets, tomatoes, leeks, squash, cabbage, lettuce, Asia greens and broccoli. The vegetable derogations are to be analysed in more detail to see if there are key varieties that can be communicated to seed companies for inclusion in their future plans. In celery the variety Victoria accounted for 95+% of the quantity of seed derogated.



## Towards zero greenhouse gas farming

**The Organic Research Centre – Elm Farm has joined forces with other environment, food and agriculture bodies to pursue a route to zero greenhouse gas emission (GHG) farming and food in the UK.**

A set of principles and targets has already been established. The elements of low, zero or even positive GHG farming would include -

- More fruit, vegetables and other plants in season, and less meat and other livestock products
- More agro-forestry
- More carbon embedded in the soil
- More local production for local consumption
- More organic farming - no artificial fertilisers, and dramatically fewer agrochemicals and veterinary drugs

The pursuit of zero GHG farming will also mean a food chain system -

- sustainable in the fullest sense, incorporating environmental, social and economic issues – not just GHGs (being particularly keen to reclaim the language of “efficiency” from some economists)
- taking account of global as well as UK issues, particularly for poor people in poor countries
- tackling consumption issues as well as production

- based on reducing emissions and not predicated on GHG offsetting
- that is ambitious – aiming for 80% reductions in GHG emissions

This approach will, inevitably, lead to some “win-lose” situations, as well as a large number of “win-wins”.

Despite the information that already exists, and agreement on these general principles, the group has agreed that we do not yet have a blueprint that can set out exactly what would need to be done in the UK to meet the widely agreed target of 80% reductions in GHGs by 2050. To that end the next step is to approach an expert body such as the Tyndall Centre for Climate Change Research to examine the possibility of funding a project to put figures on UK farming and food GHG impacts along with mitigation data.

Already across the world four countries have pledged to become zero carbon in their economies (including food and farming). They are Costa Rica, Iceland, New Zealand and Norway, all working as part of a UN Environment Programme initiative.

Partners in this initiative along with SUSTAIN and ORC include - Centre for Food Policy, City University; Food Climate Research Network; Friends of the Earth; Soil Association; Welsh Assembly Government; Compassion in World Farming; International Institute for Environment and Development; Commonwork; Greenpeace; East Anglia Food Link.

## Compost at heart of EU greenhouse gas effort

The European Economic and Social Committee (EESC) at the request of the French presidency last year has just delivered its opinion on the link between climate change and agriculture at European level. It sets out clearly where the committee sees the contribution of agriculture in solving climate change problems.

It says EU agriculture can contribute in many different ways to reducing greenhouse gas emissions from current levels. Top of the list is not converting forest, moorland, wetlands and grassland into arable land, and reducing nitrous oxide and methane emissions through sustainable land management and if possible long-term land cover (catch crop cultivation), multiple crop rotation (e.g. to minimise pest problems), and appropriate fertiliser use.

Energy inputs in agriculture have historically not been regarded as problematic, especially as energy was available very cheaply. The EESC sees an urgent need to focus more in the future on particularly energy-efficient forms of farm management and to promote these. Organic farming and so-called low-input production (e.g. extensive pasturing) can make a key contribution.

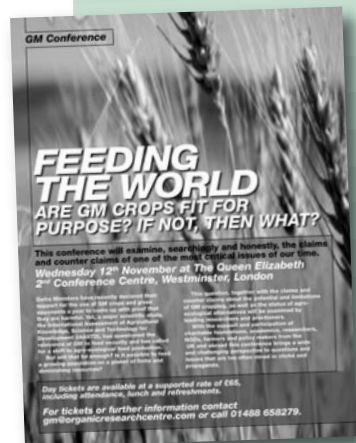
Experiments in the field of so-called mixed cultivation have produced promising results. For instance, different types of crop are cultivated in the same field with pulses and oil crops, which means less use of fertilisers and pesticides, as well as increased biodiversity and promotion of compost.

Compost use is crucially important for climate change. In future, there should be more of a focus on achieving the most stable and highest compost content on agricultural land in particular, which will necessitate changes in crop rotation. The EESC calls on the European Commission to evaluate studies available jointly with research institutes in the Member States and if necessary to commission further studies, in order to seek and support optimum compost procedures.

This also means considering the importance of solid animal manure use. The opinion also says that it must also be clarified whether whole-plant utilisation, as planned for second-generation biofuels, might not undermine the objectives of humus creation.



# Feeding the World Conference. Are GM Crops fit for Purpose? If not, then what?



## Queen Elizabeth II Conference Centre. 12 November 2008.

This conference will examine, searchingly and honestly, claims and counter claims of one of the most critical issues of our time. Full programme to follow soon. Day tickets available at a supported rate of £65 including lunch, refreshments and conference pack.

To book your place please contact The Organic Research Centre. Telephone: 01488 658279 or email: [gm@organicresearchcentre.com](mailto:gm@organicresearchcentre.com)

### Why this conference is important

Defra Ministers recently declared support for the use of GM crops and have given opponents a year to come up with proof that they are harmful.

Yet, a major scientific study, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), has questioned the relevance of GM to food security and has called for a shift to agro-ecological food production.

But will that be enough? Is it possible to feed a growing population on a planet of finite and diminishing resources? This question, together with the claims and counter claims about the potential and limitations of GM cropping, as well as the status of agro-ecological alternatives will be examined by leading researchers and practitioners.

With the support and participation of charitable foundations, academics, researchers, NGOs, farmers and policy makers from the UK and abroad this conference brings a wide and challenging perspective to questions and issues that are too often mired in cliché and propaganda.

Visit [www.feedingtheworldconference.org](http://www.feedingtheworldconference.org) for details and conference news.

## Elm Farm grand opening at Hamstead Marshall

Local and not so local friends, neighbours and dignitaries (over 60 in total) converged on Elm Farm last month to celebrate the opening of our newly re-furbished offices. The event also marked the start of a Phase 2 development at the site which will see a conference centre and other facilities being crafted from the farm's 16th century barn.

Overall the twin developments will cost nearly £1 million, funded by the sale of some Elm Farm cottages, a grant from SEEDA - the South East England Development Agency and through on-going fund-raising from supporters and friends.

In keeping with the organic ethic, all the development has been done on ecological grounds with solar panels and ground-source heating, recycling of rainwater, building materials and furniture.

*"A big thank you to all our guests from near and far, who helped christen these state-of-the-art facilities," said ORC director Lawrence Woodward. "After nearly 30 years working from the house and lab at Elm Farm, we are now ready and able in our new buildings to move forward to play a key role in the future of organic farming and sustainable development."*



Bernard Harris from the Swan Inn, Inkpen with ORC researcher Helen Pearce, discussing the cereals display at the Elm Farm grand opening.

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