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ELM FARM

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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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Slaying the GM dragon

A big, new push is under way from bioscience companies to promote their GM crops on the back of global worries about food shortage and high prices. To arms, to arms, a new approach is needed from the organic sector to fight this move.

As promise piles on promise for what these "second-generation" GM crops will deliver, the truth is that these companies – Monsanto, Syngenta and so on – have so far failed to deliver crops capable of thriving in drought, salt or nutrient deprived conditions. That breakthrough eludes them. And doubts about future delivery are fuelled by the over-hyped promise of their first generation Roundup-Ready and pest resistant crops, which has not been met.

The recent IAASTD report (International Assessment of Agricultural Science and Technology for Development) concluded that for food and crop production "business as usual is no longer an option". It called for a shift to 'agroecological' food production. In fact large sections of the IAASTD favoured organic production, much to the anger of the United States and the GM lobby.

Commenting in London recently, Professor Bob Watson, formerly IAASTD chairman and now chief scientific adviser to Defra, stated quite clearly that – "*The absence of GM crops is not the driver of hunger today*". That accolade more sensibly goes to global poverty – where the poorest are now priced out of the food economy and where method of production, GM or otherwise, is an irrelevance.

The argument against GM crops has moved on from the frightening spectre of "Frankenfoods" and health scares. Quite simply, the GM route reinforces an outdated model of industrial, energy reliant agriculture, wholly unsuitable for adapting to and dealing with the conditions that climate change and expensive, scarce oil bring for global food security.

Most importantly we have to ask if undue research and commercial focus on GM foods and crops is diverting our attention from the development of truly reliable alternatives of sustainable (organic) agriculture which are capable of feeding a hungry world today and tomorrow.

Along with the campaign group GM Freeze (ORC is a member), we are active in corresponding with national media and in producing briefing documents. You too can play your part. Write to national papers, even your MP, and question, query and quash the nonsensical claims of the GM lobby.

Richard Sanders

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GM crops – an answer to which question?

Prof. Dr. Hartmut Vogtmann and Rafael Rios

Across Europe the GM crop debate has taken off once again. Nothing, of course, to do with political pressure from the out-going president of the United States; in no way related to a co-ordinated PR push from the all-powerful (US) life science companies; totally disconnected to the sabre-rattling of American lobbyists within the World Trade Organisation on Europe's use of GM regulation as a non-tariff barrier. This is, of course, all about a technological solution to feeding a hungry world.

By 2050 the global population is expected to reach 9 billion (UN figs). Just what are so many people going to eat? The GM crop/food lobby claims to have the ready solution for this – manipulate the genes of a crop, increase it's productivity and the problem is solved, the world is fed, case closed. GM technology also promises other benefits, such as preventing blindness in the developing world by introducing beta carotene-rich rice, so called golden rice; growing in areas where no crops can grow; reducing the need for pesticides; and overall acquiring desirable traits faster than traditional breeding methods.

Millions of people die and 500,000 children go blind from vitamin A deficiency each year. Golden rice was proposed as the answer to this problem. However, research done in South East Asia reveals that golden rice will have little effect on reducing vitamin A deficiency, providing at most 20 per cent of an adult's vitamin A requirements (Biothai et al., 2001). Since 300 grams of uncooked golden rice contain only about 100µg of beta-carotene, an 11-year-old would have to eat 7 kilograms of cooked golden rice a day to satisfy his minimum daily requirement of vitamin A. On the other hand, the consumption of only 42 grams of carrots, 50 grams of cassava leaves, 73g of dark green vegetable leaves, 78g of sweet potato leaves or 133g of taro leaves would easily fulfil this daily requirement.

Even if scientists boosted beta-carotene levels, it probably wouldn't do a malnourished child much good, since the body can only convert beta-carotene into vitamin A when fat and protein are present in the diet. Fat and protein in the diet are, of course, precisely what a malnourished child lacks (Pollan, 2001). "*Effective nutrition education is much better than adding yet another source of vitamin A which most likely will not be equitably distributed. Other priorities should be improving livelihood; providing better health care system; addressing malnutrition, communicable diseases and other illnesses that make children more vulnerable to vitamin A deficiency.*" (Biothai et al., 2001).

Another argument suggested that GM crops would be able to grow in areas where no other crops could grow, thereby solving the problems of climate change, drought and loss of soil quality. Golden rice was also part of this campaign where it was stated that it would be particularly useful in marginal areas such as drought-prone regions where vegetables usually cannot be grown. But the Development Resource and Service Center (DRCSC) in Calcutta has demonstrated that such regions can be made to produce a rich and varied diet and should not simply be written off in this way.

Through the efforts of local farmers and the interventions of DRCSC, these arid lands have been transformed into productive and diverse farmland. In home gardens, vegetables are grown year-round. In the fields, rice or corn and pulses are grown during the rainy season; legumes and oilseeds are the main focus in winter. Careful planning, and the promotion of sustainable agricultural practices such as soil and water conservation techniques, mixed cropping and appropriate crop varieties were critical to achieving success. These interventions helped to increase soil water retention and organic matter content and helped prevent the remaining topsoil from eroding to the lowlands. (Biothai, 2001).

In South America, recent research suggests that many small farmers cope with climate change and minimise crop failure through increased use of drought tolerant local varieties, water harvesting, mixed cropping, opportunistic weeding, agro-forestry and a series of other traditional techniques. Surveys conducted in hillsides after Hurricane Mitch in Central America showed that farmers using sustainable practices such as "mucuna" cover crops, intercropping and agro-forestry suffered less "damage" than their conventional neighbours. The study spanning 360 communities and 24 departments in Nicaragua, Honduras and Guatemala showed that diversified plots had 20 per cent to 40 per cent more topsoil, greater soil moisture, less erosion and experienced lower economic losses than their conventional neighbours (Altieri, 2008).

Simple promise, complex failure

With a great fanfare from the life science companies, the first tranche of GM commercial releases – herbicide tolerant (HT) GM crops and pest resistant GM crops, promised to reduce the need for pesticides. The argument is simple – one strong herbicide to kill all plants except the herbicide tolerant crops. Pest resistant GM crops are actually engineered to produce Bt toxin, a powerful insecticide, within their own cells, rendering them deadly for the unfortunate insects that consume them. However, recent research done in the USA, where GM crops are widely adopted, revealed that GM corn, soybeans and cotton have led to a 55 million kg increase in pesticide use since 1996.

While Bt crops have reduced insecticide use by over 7 million kg over this period, HT crops have increased herbicide use by 62 million kg. Bt crops have reduced insecticide use on corn and cotton about 5 per cent, while HT technology has increased herbicide use about 5 per cent across the three major crops. But since so much more herbicide is used on corn, soybeans, and cotton, compared to the volume of insecticide applied to corn and cotton, overall pesticide use has risen about 4.1 per cent on acres planted to GM varieties (Benbrook, 2004). Extensive herbicide application on HT crops has hastened the evolution of herbicide resistance weeds, forcing farmers to apply more herbicides and older herbicides that are severely toxic (Acker et al., 2004, Pengue, 2004, Freudling, 2004).

It may be true that the process of genetic modification is faster than traditional breeding methods. But to date, GM technology

only delivers to the market two traits, herbicide tolerance and pest resistance. The most promoted promise of GM technology, higher productivity, is still to be delivered. Any increased production achieved by GM crops so far are therefore linked to pest and weed management, not to a direct rise in the crop productivity itself (Clark, 2008). Scientists still have to rely on traditional breeding methods to generate higher productivity crops.

A failure of productivity

So what about productivity? In a 10-year review of the Canadian experience with HT crops, public variety trials show not an increase but a 4 per cent yield decrease in GM soybeans and an absence of yield benefit from GM corn. In a 2-year trial over 5 western Canadian locations, HT out-yielded conventional canola (oilseed rape) weed control practices in just 6 of 30 plots, all occurring at sites and years of particularly problematic weeds.

A 1998 producer survey commissioned by the Canola Council of Canada, itself the proprietor of a GM canola cultivar, reported a 10 per cent yield advantage for GM canola. The higher yields of GM canola were attributed to better weed control, and to the use of higher yield potential cultivars. In other words, the GM yield advantage was attributed to the lesser effectiveness of competing weed control options and to the higher yield potential of the conventionally bred cultivars into which the GM trait was fitted, relative to that of available non-GM cultivars (Clark, 2008).

And then there is the very big question of risk – the unknown short, medium and long term environmental and health risks of GM crops. Tests done on GM crops revealed that GM potatoes damaged rats' intestines, rats fed GM tomatoes got bleeding stomachs and several died, rats fed Bt corn had multiple health problems, mice fed Roundup Ready soya had unexplained changes in testicular cells, and other adverse health risks (Smith, 2007). There is also a potential tendency that gene transfer happens inside human stomachs, in fact researchers found modified genes in human gut bacteria following consumption of GM foods. This characteristic possesses a great risk if the transferred genes actually made infectious bacteria or viruses stronger and harder to be treated (Domingo, 2007).

A tendency to escape

From research done in the USA and Canada, Clark (2004) concluded that modified genes could not be contained. GM cross-pollination has contaminated conventional crops and wild plant species. This generates a host of novel problems, including herbicide tolerant weeds, casualty of non-target organisms, and the loss of natural biodiversity. The emergence of herbicide tolerant weeds has forced farmers to use more herbicides, even toxic older herbicides. This obviously runs counter to the first goal of producing a HT crop, which is reduced herbicide usage.

Bt toxins expressed in GM crops do not seem to be as specific as expected. Organisms other than the target pest species may be affected. This may cause a negative impact on the whole ecosystem of the farm and even beyond (Mertens, 2008). Wide cultivation of GM crops has contaminated many natural species with GM traits. In Mexico, the natural origin for maize, GM contamination was found within five regions, some produced mutants (Robin, 2008). Imagine what might happen if similar GM contamination produced mutants that would be dangerous to health, especially if pharmaceutical (e.g. vaccine carrier) crops are grown.

In practice, GM crops were often sold together with herbicide. For instance, the soyabean technology package in Argentina combines GM soybean and glyphosate. This package and the practice of no tillage system in Argentina encourage farmers to use more herbicide. Strong campaigning for commercialisation of transgenic soyabeans in Argentina has led the country's agriculture towards monoculture, which has caused a serious decline in soil fertility and increased soil erosion, consequently raising the chemical fertiliser consumption by more than 800 per cent. These monoculture practices have also hit the farmland and wild biodiversity of Argentina (Pengue, 2004).

GM technology has failed to fulfil almost every promise it made on its introduction. It continues to serve its commercial owners rather than the world's farmers or the world's hungry. It won't solve the problems of starvation in developing countries, but is set to increase, in a neo-imperialist way, the dependency of farmers on multi-national companies that supply GM seeds and chemical pesticides (Pengue, 2004).

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Principle and practice: stopping the erosion IFOAM World Congress 2008

Martin Wolfe, Zoë Haigh, Hannah Jones

The Big Tent environment was not ideal for the inspirational plenum speakers at the 16th IFOAM Congress (incorporating the 2nd ISOFAR Conference) at Modena, Italy, in June. The imagery had to be pumped up to compensate – Vandana Shiva, for example, exhorted us to improve the quality of cow shits and farts as a major research objective. Carlo Petrini likened the competitive activities of the 'organic industry' against the major food corporations to a child playing games with a sports professional. The best solution is to run off and start another kind of game – at the local scale, with a systems approach.

These themes cropped up repeatedly – first, the need for more research and innovation to push the ecological quality of organic farming forward, together with the need to ensure a clear distinction between the delivery of organic agriculture against the often improving standards of non-organic, pushed by the rapidly increasing costs of synthetic inputs.

Generally there was confirmation of the better energy efficiency and sustainability of organic compared to non-organic systems. For example, Hanne Oestergaard and colleagues have been using 'emergy' to compare the efficiency of different farming systems. This is the total solar energy used, directly and indirectly, for production, measured in sej (solar emergy joule). For winter wheat, they found that organic production was significantly more sustainable than non-organic.

The resource use efficiency of production per unit biomass was higher under non-organic systems, but this depended on an environmental loading ratio (the ratio of all non-renewable emergy flows both from inside and outside the system to the renewable emergy flows), that was far lower under organic management.

Organic production of many vegetables, wheat, beef, sheep, pigmeat and milk were all more energy efficient than non-organic, though the reverse was true for poultry and egg production. But there are other reasons why this sort of intensive production is unacceptable.

A session on biogas depended entirely on contributions from Germany, where total biogas production from agriculture is now sufficient to provide the energy needs of a whole city. This highlights UK backwardness in this area. For example, the attractive 'feed in' electricity tariff has contributed to a 50% increase in the number of biogas plants in Germany since 2005. Overall, 5% of all biogas plants are on organic farms producing some 15-20 MW, enough for about 10,000 homes. The University of Kassel found that utilising crop residuals (e.g. forage) gave a better energy return than inclusion of specific energy crops (e.g. maize). Questions still remain: does removal of carbon from the C-cycle have a negative effect (but use of slurry can lead to a 50% loss)? Does digested material returned to the land act in the same way as non-digested material? Can further digestion using micro-organisms be of use? Could somebody produce a smaller-scale efficient digester?

Contributions and discussions on fertility in organic systems centred, first, on the value of inoculating wheat seed with Azospirillum bacteria before planting. The objective was not to test the inoculation but rather to look at the ability of varieties bred at different times to take up nitrogen via these free-living organisms. Encouragingly, a number of varieties did respond, including some modern material. Could this be happening in our populations?

On the other hand, a paper from Australia underlined the current problems with phosphorus – rapidly declining world supplies and the trend in organic farming to continue mining soil reserves. The case was made for allowing some form of soluble phosphorus fertiliser so that organic farming will be able to maintain the IFOAM farming standards into the future. This also generated a discussion, again, on the use of human wastes in organic agriculture, particularly now that some of the companies involved are able to produce materials that have a high safety value.

An interesting variant on inter-cropping was demonstrated by Hiu-Lian Xu and colleagues in the production of field tomatoes in Japan. Under high rainfall, serious erosion can take place, with leaching of nutrients and a high incidence of water borne and rain splash pathogens (including Phytophthora sp.). Experimental trials growing tomatoes between established grass strips not only reduced the level of disease significantly, but also increased yield and tomato quality while limiting erosion. The higher incidence of mycorrhizae in the grass and tomato roots contributed to the benefits of this production system. Mulching of the grass cuttings onto the tomatoes provides additional benefits for soil protection and nutrition.

Throughout the Conference we noted that agroforestry slotted neatly into many discussions, as a way to improve systems. For example, recent work indicating that minimum tillage systems may only re-distribute carbon through the soil profile rather than helping to increase it was discussed, along with the fact that carbon sequestration in organic systems has not yet been proven better than in non-organic systems; but the benefits of including trees in systems to store carbon are indisputable. During talks on the continuing problem of nitrogen leaching, it was shown that site can be more important in reducing leaching than conversion to organic management. But one system that always reduces leaching while improving water use efficiency is, again, agroforestry.

And a final sound-bite from Vandana Shiva: *"…Organic agriculture deals with living carbon, industrial agriculture deals with dead carbon…"*

A picture of health

The Organic Research Centre – Elm Farm animal health colloquium

Oxford, June 2nd and 3rd 2008

One of the greatest challenges facing organic agriculture in the UK and further afield is livestock health. Serious disease pressures keep building, with Bluetongue, avian influenza, foot and mouth disease, along with bovine tuberculosis and Johne's disease in cattle, heading a long list of animal health threats.

At The Organic Research Centre – Elm Farm (ORC) we believe that novel approaches and real leadership are needed to ensure that truly organic livestock farming does have a healthy future. Even within the confines of the organic movement itself, there is confusion and misunderstanding about the deteriorating and fragile status of livestock health and what can be done about it.

It was against this background that the ORC organised an organic animal health colloquium in Oxford on June 2nd and 3rd. Leading vets, organic farmers, researchers and advisers gathered to debate where agreement (and disagreement) lies, how modern animal health technologies might be applied to organic production, and how best to mine the existing body of animal health knowledge that exists, but which appears to be poorly deployed.

Bluetongue

Due to its on-going, topical nature, discussion turned first to Bluetongue. We heard that across the EU, morbidity rates from Bluetongue (BTV-8) were running at about 30 per cent in the first year of infection (2006). In the second year of infection in mainland Europe (2007) far higher morbidity rates occurred and mortality amongst infected livestock was up to 30 per cent in sheep. The virus is becoming more virulent as it co-evolves within livestock hosts.

We were reminded that Bluetongue is dependent on midge vectors.

On vaccination, vet delegates urged 100 per cent take up by farmers to achieve Bluetongue control (not the 80 per cent current target).Concerns were expressed about the practicality and desirability of vaccination when cattle are being served. The importance of vaccinating cattle was highlighted as they are preferentially bitten by midges.

The aim of the vaccination programme is to control and eliminate infection over a period of three or four years. This very much relies on successful control in the near Continent and on the level of infection in UK wild animals such as deer.

From an organic perspective, the question of natural immunity was raised – animals need time to adapt and adjust to disease, Bluetongue has been a very rapid arrival and spread – how to achieve indigenous resistance? This has been observed in Africa, where Bluetongue is a constant threat, but where native breeds of livestock appear resistant.

Exotic breeds, such as Merino sheep, have been severely hit by Bluetongue when introduced into Africa. Naïve hosts increase the potential for a disease to spread and alter the profile of disease from the sub-clinical situation in native hosts to more serious, clinical disease in naïve hosts.

There is no sign of any Bluetongue resistance in UK livestock – "this is not a disease (BTV-8) that stands still" and it would be most unusual for an animal to exhibit resistance to a disease it had not encountered before.

An organic – non-interventionist – approach appears unlikely and would risk serious welfare problems and the accusation from "conventional" agriculture of organic producers being a repository of disease.

Avian influenza

Unlike Bluetongue, highly pathogenic avian influenza – such as H5N1 – is a serious zoonotic threat. As a result, the general debate on H5N1 and vaccination revolves around whether such an approach increases or decreases the risk to humans?

We discussed the ethics and the practicalities and economics of prophylactic vaccination, aware of the point that in the past the UK Government has indicated its willingness to shut indoors all free range/organic poultry as an H5N1 control response. Prophylactic (preventative) vaccination presents an alternative to shutting up and has been deployed in Holland.

Delegates debated vaccination costs (up to £2 a bird in Holland), the materials available for vaccination and the effects on trade.

Once again the relationship between organic livestock and conventional farming was raised – the vaccination of outdoor birds may be crucial in protecting others (and vice versa). The rate of mutation of avian influenza viruses was raised – this has accelerated in recent years.

There was agreement that appropriate biosecurity guidelines for organic poultry operations were needed along with a proper apportionment of biosecurity risk and control between farmers and government.

A key point was the emerging technology of recombinant vaccines which is destined soon to provide the best protection route for H5N1 in poultry along with protection for Newcastle disease. Some were opposed outright to the deployment of recombinant (GM) vaccines whilst others pointed out that in vaccines the genetic modification is not free in the environment as in GM crops. In fact the organic regulation does specifically allow GM vaccine use in UK organic agriculture.

Foot and mouth disease

Whereas avian influenza control is something of a voyage into the unknown, the approach to FMD should be far more clear-cut. It is not a zoonotic threat, but FMD has the capacity to generate severe economic threats. We should remember that FMD control is regulated by both EU and OIE rules as a serious, transboundary disease and that since 2006 in the UK vaccination options are required to be considered by Government on a par with culling ("stamping out").

Casting our minds back to 2001, some farmers had then claimed natural immunity in their stock to FMD but such claims were not tested. Recent progress has been made in the UK, with research workers now agreeing that if an animal is proven to be carrying FMD infection, this does not translate to inevitable transmission.

The Pirbright outbreak of 2007 was discussed as a perfect test bed for the deployment of FMD emergency vaccination (to live) on a regional basis (Surrey and the immediate periphery), and frustration was voiced that Defra did not opt for the vaccination route. At some point field vaccination for FMD must be used to learn about its practical deployment and to generate comfort (rather than panic) in its use as a control tool. Vaccination exit strategies, though, are still unclear.

Trade issues were raised time and time again as a serious block to FMD vaccination.

The desire of supermarkets and others in the supply chain for parallel labelling was condemned and true parity between vaccinated and unvaccinated meat and products was called for. In particular, delegates called for the time period for exclusion from international trade to be equalised between different control approaches. (Currently this is 3 months exclusion if stamping out is deployed, 6 months if vaccination is used.)

TB and Johne's disease (Paratuberculosis)

Mycobacterium bovis and other mycobacterial diseases are an area where organic agriculture has claimed differential success in the past. The reality at the moment in the UK is that cattle from all production systems are affected. Does this now mean a re-think is called for in the organic response to TB?

More likely it means that a serious re-think is required by Government which in recent years has focused its effort and investment on badgers and cattle culling. Perhaps the focus on TB vaccine development for both badgers and cattle is also a disproportionate drain on resources with no imminent sign of viable product for use in the field.

Instead individual organic farmers – such as Dick Roper in Gloucestershire – have begun to address mineral imbalances in both their cattle and badger diets. Dick Roper feeds selenium rich minerals to both and has enjoyed TB free status in his cattle while all neighbours record reactors in their herds.

The late Mark Purdey was quoted as theorising that increasing acidity in farm soils due to far less use of liming, leading to low pH is a causative factor. This in turn allows a super uptake of iron which allows iron-loving micro-organisms such as mycobacteria to multiply and thrive.

The role of good stockmanship was stressed, along with proper housing and the need to separate cattle from badgers.

Have badgers and TB spread as a result of greater use of maize silage?

Defra's policy of TB testing and culling of positive reactors could be running counter to organic notions of building natural immunity. In the process of culling we are removing all animals exposed to TB, whether they have developed (or are developing) natural immunity or not. In addition, the diagnosis of bovine tuberculosis is not an accurate science.

There is a growing body of opinion that vast sums of money are being spent on not controlling TB, whilst other diseases are neglected or ignored.

Frustration was evident that the badger debate buries the great complexity of the TB issue and in its polarised nature, true science is lost.

We discussed the theory that Johne's disease in cattle is related to Crohn's disease (and possibly irritable bowel syndrome) in humans. If confirmed this would have a serious effect on the dairy industry (organic and conventional) as milk would need to be UHT as pasteurisation doesn't kill the bacteria.

Sheep scab

Sheep scab is theoretically simple to deal with. It is caused by the mite *Psoroptes ovis* and infection is passed from sheep to sheep by live mite transfer. In the past, the UK has been virtually sheep scab free, but now the disease is widespread.

For organic sheep farmers it is a particular problem as many of the treatments once available (such as cypermethrin) have been withdrawn and the remaining interventions either require very long withholding periods (up to 140 days) or involve the use of organophosphate insecticides which are unacceptable in organic systems.

Biosecurity is the control method of choice, to achieve isolation from neighbouring stock.

We discussed the problems of common grazings and the fact that when outbreaks do occur, conventional sheep farmers have a tendency to blame organic neighbours as the source. Regional/national health planning is required to tackle sheep scab – Scotland is debating the need for compulsory treatment.

Reality check

At the end of the first day of discussion Professor Sheila Crispin, the immediate Past-President of the Royal College of Veterinary Surgeons delivered a "reality check".

- In pursuing healthier organic livestock she urged attention to the farm animal gene pool – genotype is important.
- In terms of novel diseases we need to question whether animals are naïve or non-naïve to the threat. There is much to learn about the role of the immune system.
- What is the role of stress? The work of John Webster and others at Bristol, as an example, has shown the links between stress and diseases like mastitis in dairy cattle. Generally the assumption can be made that a good organic system does lower stress.

- Attention should be paid to the role of intercurrent disease – where one disease makes the animal more susceptible to another. In this respect the organic livestock sector is more careful with its application of drugs.

- Stockmanship and good husbandry are central factors in animal health. Also bear in mind the herd/flock nature of livestock which brings advantages/disadvantages depending on the nature of the health threat.

- The complex role of nutrition in both macro and micro nutrients – not easy to do meaningful field trials.

- Biosecurity – a word which entered our vocabulary in 2001. Often the weakest link in the biosecurity risk chain is the human factor.

- We should consider the changing nature of land management – for example silage verses hay, strip grazing and wildlife corridors.

- Interconnections between pathogens and vectors are often complex and not well understood.

- And on trade issues – these are not going to be resolved until true parity between vaccination and culling.

A review of animal health and welfare practice and the principles of organic livestock production – (Defra project OF0364)

Project leader Ray Keatinge presented the interim findings of this project to colloquium delegates. Principally it is focused on organic dairy and poultry production looking at strengths and weaknesses, offering a review of the technical issues and future research and development needs. One area highlighted was in knowledge transfer of existing work and results which are not being taken up on-farm. Another key output of the project has been in agreeing that organic nutrition and its impact on health and welfare is a priority area for research and improvement.

As this project is a review exercise, rather than novel research, we commented that commercial progress is ahead of the picture it contains to be presented to Defra. Work on lessening feather pecking in laying birds and the selection of birds for organic poultry systems were mentioned as examples.

The variability in performance between farms broadly classed as organic, including those in the period of conversion was discussed. Significant variations were agreed to do with how and why particular farmers enter the organic sector (economics/philosophy?) and their willingness to adopt organic production rather than adapt their previous conventional model.

Discussion then moved on to concerns over inconsistencies with organic certification and inspection. Issues thrown up included a need for better inspector training, lack of specialist advice to farmers during conversion and the need for outcome-based assessments of organic animal welfare and health and standardised health monitoring.

Positive Health

What is positive health? A combination of breeding, feeding, management – "an attempt to optimise health of the animal to resist disease". An adaptation of breeds to environment. More than an absence of disease – livestock with vitality.

We argued about organic breeding strategies and whether selection by longevity rather than by production performance was more important.

This raised the question of positive health and the level of production – reducing stress is important, but in the process might this lead to lower productivity? Others felt there was no general conflict between health and productivity – if an animal isn't healthy it won't thrive and it won't produce.

An organic element should be that feed should originate from the home farm.

Stockmanship was deemed a determinant of positive health.

Vaccination

To put it politely, the organic movement is ambivalent on the issue of vaccination.

But it is a challenging policy area that needs debate and resolution. Too often, on farms, vaccination is viewed as "the easy way out".

We discussed the range of vaccination interventions available from routine, "management" vaccination (as widely used in the poultry sector) to the use of vaccines to control serious diseases such as FMD and avian influenza.

There was agreement that if vaccination is used to mask bad management then it is not acceptable. Proper risk assessment needs to be carried out before vaccine use – tools such as DeSTVAC (developed some years ago by SAC and Reading University) should be used more widely.

Is there a risk of an overload of vaccine use?

We explored the possible scope for homoeopathic treatments to replace vaccination and were reminded that the principle of organic livestock farming is to look at the farm structure holistically as part of the wider environment rather than as management through inputs.

In homoeopathy one is treating the animal, not the disease. Is this the same as using preventive/prophylactic vaccination?

There were calls for modern research trials to test the effectiveness of homoeopathy.

On recombinant (GM) vaccines the view was expressed that their use is far easier to justify than GM crops as their use is contained and not free in the environment.

There was also debate about the differentiation between live and inactivated vaccine, methods of application and vaccine formulation.

The Organic Compendium – www.organicvet.co.uk

Stephen Roderick of Duchy College briefed the colloquium on the newly updated Organic Animal Health Compendium. This is a web-based resource with some 800 pages of information on health and welfare with over 2500 references and many web links. It contains three key sections –

- Veterinary management – for vets, advisers, students as background to organic health
- Health and welfare – systems level approaches
- Disease management – full details, by species, of 160 diseases and their treatment.

This revised compendium is currently awaiting Defra approval.

Delegates agreed it is an impressive resource which needs on-going funding and support to keep it updated.

The compendium could be a hub for future work on health benchmarking. It certainly should be an indispensable tool for livestock farmers and advisers during conversion planning. It needs promoting widely to vets.

Defra and officialdom

In the UK we have real confusion in the overlap between animal health and politics. There is a lack of engagement from Government unless a zoonotic or serious trade threat is involved. Defra aims for a diminishing animal health role in future.

Elsewhere, what is the animal health role of certifying bodies – how do they share responsibility with individual farmers?

Some delegates feared that despite the cost and responsibility sharing agenda of the Government, there is little prospect of real power shifting away from Defra and its agencies.

With Salmonella as an example, the sharing agenda runs more along lines of industry pays whilst Government keeps firm control of policy, strategy and regulation.

Bluetongue is another example of "assymetrical power" where even in a voluntary scheme Defra defines if and when you can vaccinate, the materials to use and by extension, the cost.

Despite reservations from some, delegates were urged to co-operate with cost and responsibility sharing – "it is going to happen".

We heard calls for proper, independent expert advice on Government panels and committees on such issues as virology and vaccination. Defra should move away from reliance on in-house experts, who by definition are not independent and access the best advice on subjects such as virology and vaccination.

Concern was expressed that EU organic regulation is "dumbing down" standards and that within the UK commercial competition between certifying bodies was allowing producers to find a line of least resistance.

Others thought that generally, the organic movement has an opportunity to show we can present a united animal health face, and that we need to be careful not to concentrate on the negative.

Is there then a need for a new umbrella industry body – a forum – to interface with policy makers and the broad organic sector (not just certifying bodies)? Alternatively should we work harder to make existing industry structures function more effectively?

Conclusions

As agreed by delegates, these are the main conclusions of the ORC Organic Animal Health Colloquium –

- Vaccination – it is an important strategy within organic animal health but some aspects need further detailed investigation and debate such as GM (recombinant) production of vaccines. A focused workshop is needed to investigate further and to achieve a greater organic understanding of vaccination. Vaccination is a fact of life. The DeSTVAC tool should be considered when making vaccination decisions. Vaccination should not be used to prop up bad management.
- Application of vaccination – we strongly advocate the use of Bluetongue vaccination. There is a need to continue to press for the use of FMD vaccine – to live – in the event of an outbreak. Trade issues should be examined so that vaccinated animals are given equal treatment to non-vaccinated animals.
- On the issue of the Government, shared costs and responsibility – shared costs are inevitable. The organic sector has to engage with this issue and develop its position.
- Appropriate biosecurity – we need to identify best practice and what is actually important and appropriate for organic farms. Biosecurity as a tool for disease prevention should be considered at all scales.
- Minerals/soils – develop testable hypotheses to answer questions about the role of minerals/soils in animal (and plant) health.
- TB – we should remove badgers as the sole focus of research and debate. There are real issues about testing methods amongst cattle. The current control policy is unsustainable. We need urgently to review alternatives.
- We are supportive of the conclusions and recommendations of the animal health and welfare review carried out for Defra (OF0364).
- Farm health planning and use of welfare assessments need to be explored further. We advocate their application. Outcomes should be measured.
- Positive health – organic systems are well placed to show how farms can reduce stress in animals and lead to optimal production. The Stonegate/Waitrose Columbian Blacktail programme is a good example where the whole supply chain has worked together. The organic sector needs a push to understand and promote best practice – improve health planning, training, inspections etc.
- Homoeopathy – this needs objective research to tackle the view that homoeopathy doesn't (can't) work. The difference between homoeopathy and homoeoprophylaxis needs to be clarified.
- Dealing with Defra – we have to avoid the negative as much as possible, but should show what the organic sector can do for the agricultural industry as a whole.
- There should be a greater use of existing information eg DeSTVAC as a tool for vaccination decisions. The Organic Animal Health Compendium (recently updated) should be promoted.
- The organic sector should take the initiative with certain animal health issues to pioneer solutions for the broader livestock sector.

Richard Sanders

Fertility building – is N transfer efficiency the key?

Cotswold brash is a free draining soil, where rapid leaching of nutrients makes the selection of the right legume/legume mixture for fertility building a high priority. Over the last three years Adrian Dolby of Barrington Park Estate has been observing a range of legumes for his fertility building, followed by assessment of yield and quality from the first and second cereals.

Adrian drilled five hectares each of white clover and chicory, sweet clover, red clover and yellow trefoil. These leys of 24 months were followed by four strips, drilled perpendicular to the leys, with spring barley, spring oats, spring wheat, and a control of the original white clover. Finally this year he has seeded the entire field with oats.

The first set of soil analyses were presented by Adrian last year (2007) at the Sheepdrove Open Day. Subsequent to this he has the yield data from the first cereals (Figure 1), and also an estimate for the SNS (soil nitrogen supply) this spring (Figure 2).

In figure 1, yields following red clover tended to be higher for all three cereals. These yields varied however, though wheat performed consistently less well than the other cereals. Replication would be needed to determine whether these differences are statistically significant.

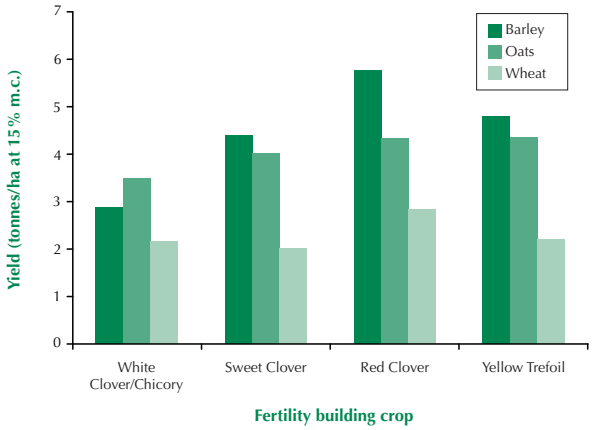

Figure 1: Grain yield of spring barley, spring oats and spring wheat on Parson's Piece, Barrington Park Estate in 2006-07 against fertility building crop. The data came from a single measure of yield over a five hectare plot.

Analysis of the soil fertility (Figure 2) indicates a lower reduction in the SNS in the areas following the white clover/chicory ley compared to the red clover, yellow trefoil or sweet clover. This suggests that the inclusion of chicory may assist in improving the N release into the second cereal in the rotation, which may relate to the higher carbon to nitrogen (C:N) ratio of chicory. A high C:N ratio results in slower breakdown of crop residues, such that the chicory residues may be interacting with those of the clover, partially locking up nitrogen, and subsequently releasing N over a longer period.

The real value of this will be with the second cereal oat harvest – if the oats in the chicory/clover plots are of higher yield and/or quality compared to the others, is it more economically viable to use chicory/clover rather than red clover over the two years at Barrington Park? There is also a safety issue in that regular use of white clover in the rotation is less likely to lead to a build-up of damaging nematode infection than is the case with red clover, which needs a minimum four to five year break between crops.

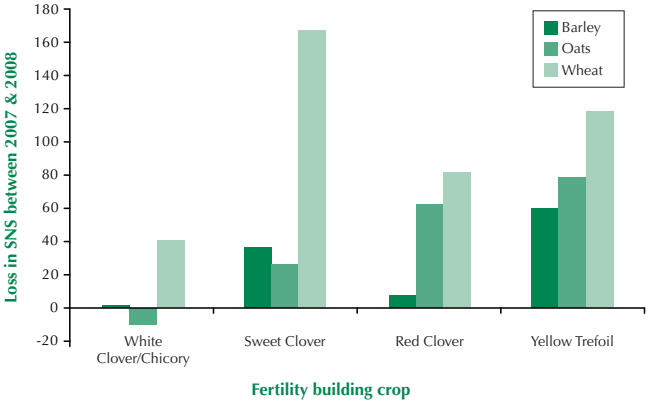

Figure 2: The difference in soil nitrogen supply (SNS)* between April 2007 and April 2008 for plots on Parson's Piece, Barrington Park Estate against fertility building crop (grown in 2005-06) for the first spring cereals (2006-07). The data come from a single measurement of SNS per variable. *Soil nitrogen supply is an estimate of the total nitrogen that is available to the crop in the growing season.

From Fig 1 and 2 taken together, there is also an indication of lower nutrient use efficiency in wheat relative to barley and oats, because of the generally lower yield and greater loss of soil nitrogen.

Barrington Park's trials indicate the necessity to consider the transfer efficiency of nitrogen from the fertility building ley to the subsequent crops, rather than a simple consideration of the total nitrogen fixed. Adrian will be hosting one of the five species legume trials that are planned in the new legume Sustainable Arable LINK project (see Bulletin 93) sponsored by Defra and industrial partners.

Understanding Bluetongue vaccination

Two key livestock scientists - Dr Chris Oura (Institute for Animal Health) and Dr James Wood (University of Cambridge) have embarked on a new study to investigate the effectiveness and application of Bluetongue vaccination in Britain.

Following the arrival of Bluetongue (BTV-8) in the East of England last September, farmers began vaccinating their livestock with newly developed, protective vaccine in May.

"We are most keen to get the involvement of farmers in Cambridgeshire, Norfolk and Suffolk in this study, they being at the epicentre of last year's historic outbreak." says Chris Oura. "To help farmers this year and next year, we need to assess how well vaccination is working and what reasons underlie decisions to vaccinate".

The ORC urges all organic livestock farmers in the region to take part, as vaccination as part of organic livestock systems is often little understood and to some remains controversial.

Dr Wood is Director of the Cambridge Infectious Diseases Consortium, a veterinarian who has specialised in the epidemiology and control of infectious diseases of livestock, horses and wildlife. All information sent to him "will be treated in the strictest confidence and will be unattributable. Email: btv8@vet.cam.ac.uk or phone 01223 764962.

Soil tillage, not pillage

Hannah Jones and Peter How

To plough, or not plough, that is the question…

In Yatesbury village hall, near Marlborough, with not even standing room left, an audience listened intently as an inspirational farmer from Germany described how he and his father had successfully pioneered organic non-inversion tillage. Friedrich and Manfred Wenz have developed, with a number of other partners, the Eco-Dyn cultivator, a machine capable of both high precision and flexibility.

The Wenzs' stopped using their plough in 1981 on their farm in the Rhine valley. The change was spurred on because they recognised that their soil quality was getting worse; a reduction in annual yields and the depth of the top soil were unsustainable. Recent rapid increases in oil prices have also enabled them to make significant savings on fuel. Friedrich described how many years pass before damaging agronomic practices become obvious, which is of course in strict contrast to animal husbandry where problems become evident in a matter of days.

Friedrich described how they carry out non-inversion tillage. Repeated cultivations, of up to four times from harvest to drilling can destroy weed infestation. This long and intensely managed stale seed bed is cultivated to a depth of exactly 4 cm; the majority of roots are cut off, which leads to rapid dehydration and death of the rest of the plant. The repeated wounding of the dock tap root at the same depth during this dry season is sufficient to control and eliminate dock infestation.

Using the same method leys can be destroyed, but it requires two passes, the first to cut the roots in one direction, and the second to cut and destroy the sward perpendicular to the first. Modest incorporation of surface material with soil in the first few centimetres is seen as important for promoting the composting process. Again the destruction of the roots (at the 4 cm depth) causes dehydration and destroys the ley.

Friedrich demonstrated how they have used these non-inversion methods successfully on their farm over 27 years. Scepticism could prevail but for a chronological sequence he presented of one field over four years. On this newly acquired land, with a high weed burden, the use of under-sown crop mixtures, cover crops and the cultivations described above eliminated thistles and docks in three years.

The Wenzs' do not consider themselves a stockless farm because the enormous numbers of worms on the land require feeding. Straw is not carted away, but left to be dragged down into the soil by the worms, with the consequent effect of improving soil structure, and resilience to both drought and flood.

How can these methods be adapted to the UK? Obvious issues relate to the weather, since we cannot rely on a long dry period in the summer, and soil quality and depth. Richard Gantlett of Yatesbury Organic, who hosted the day, gave an excellent tour of his farm in Wiltshire. His farm, following a relatively recent transfer to the reduced tillage methods, clearly showed how much there could be to gain.

Mark Measures of IOTA, who commissioned the review* of reduced tillage by Andrew Trump, Director of Organic Arable, is planning a trip to Germany to see the system working in practice. This visit is provisionally planned for 21st August 2008 and will include the Wenzs' farm, a look at the machinery and seeing it in operation, weather allowing. It will be an opportunity to gain further information from which the technology can be adapted and developed for non inversion tillage in organic systems in the UK. Further details will be available from IOTA preferably by email **iota@organicadvice.org.uk** , alternatively 01547 528546.

Rising fuel costs provide a changing context for farm economics. Five years ago red diesel costs were a small part of the machinery cost equation (as described below), now it has become the greatest part. Low fuel food supply systems will become an increasingly important objective as this picture becomes more extreme.

labour + ownership + fuel = total cost

Tractor Costs, Spring 2007, £/hr four wheel drive 154 –180h.p. based on 500 hours of use per year	
Ownership	12
Labour	8
Fuel and Oil	10
Total	30

Red Diesel Cost of Ploughing to 8" £/ha	
2002	2.7
2007	5
2008 (June)	10

If you are interested in attending a future event on reduced tillage, please contact Andrew Trump on **andrew@organicarable.co.uk** (08456 521706)

Acknowledgements: Thanks must go to Andrew Trump of Organic Arable and IOTA for organising an excellent and thought-provoking meeting.

* This review was undertaken under the Defra funded PACARes project which provides dissemination of organic research. Further details of the project and the Non Inversion Tillage Review are available on the IOTA website: **www.organicadvice.org.uk/res_reviews_public.htm**

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The mysterious case of cannibal owls

Martin Wolfe

This is an unfortunate twist to an otherwise exciting story about the extraordinary barn owl – what happens when food supplies, mostly voles, really run down. But the story of why the food supplies run down is perhaps more fundamental.

Visitors to Wakelyns Agroforestry have often had their attention drawn to the tendency for the local barn owls to fly along the tree rows hunting for their main food source, field voles. This led us to install a barn owl box, in collaboration with Steve Piotrowski, Paul Jackson and other members of the remarkable Suffolk Barn Owl Community Project (**www.scbop.org.uk**). The first occupants of the box, last autumn, were a pair of stock doves, one of those farmland birds whose numbers have declined alarmingly since the late 1950's when I remember many being taken for the pot.

However, from January this year, we started to see a pair of barn owls hanging around the box with increasing frequency until it was obvious that they must have taken up the freehold. At the beginning of June, the SCBOP team came to take a look and, great excitement, they found a broody mum with three chicks and an unhatched egg. Mum was carefully weighed and tagged.

Three weeks later, the team returned to check on the progress of the chicks. Disaster. Both parents were in the box, but no chicks. The assumption made was that the chicks had been eaten by the parents because of a declining food supply. Apparently, if the supply of voles declines, smaller chicks will first be eaten by the larger chicks, and if the supply continues to decline, then the adults eat the remaining chick.

But what had happened to the food supply? Had our agroforestry management been at fault? It turns out that field voles, like a number of other small rodents, have cyclical population frequencies over periods of about three to five years with a range of a few dozen to several hundreds per hectare. But what causes the cycling – is it the density of barn owls (plus kestrels, tawny owls etc., that also nest at Wakelyns) in a typical predator-prey cycle? Apparently not. After a number of investigations into the cause, the latest and most likely explanation by Massey et al. (2008), is that the system is driven by the relationship between the voles and the grasses that they eat, mainly the tussocky grasses in the well-covered habitat of the tree understorey.

Many 'wild' grasses have a defence system against grazing – if grazing increases to an unacceptable level the grasses lay down more silica and other secondary metabolites in the leaf cells, which reduce their digestibility and attractiveness (the grasses used for farm forage were selected presumably because they exhibit these characteristics to a much lesser extent) which probably relates to declining quality of forage in over-grazed uplands, which have a range of less-cultivated grasses.

Massey et al. (2008) found that the reduction in digestibility leads to reduced weight gain in the voles, particularly as they prepare for winter, which, in turn, reduces their fertility and population size. With the decline in population size of the voles, the grasses (cocksfoot and others) are able to survive with less energy expenditure on the grazing defence mechanisms and so become increasingly more succulent – which means that the vole populations start to increase again. And so, then, do the barn owls.

A further twist in this precarious balancing act, is the need to maintain the barn owls and others as predators of the voles, particularly the wood vole, otherwise a rapid increase in the vole population can lead to significant damage to young trees. Currently, however, there is a large amount of natural generation and regeneration of a range of tree species, too many for the voles to damage seriously.

And the lessons from all of this? A further demonstration of the importance of biodiversity, the extraordinary interactions among the elements of biodiversity – and the dangers of tinkering with them. Oh, and again (and again), the potential value of agroforestry systems for produce, energy, biodiversity, pensions and many other short and long-term benefits, together with the value of a mixed diet – don't keep all your voles in one basket.

F. P. Massey, M. J. Smith, X. Lambin and S. E. Hartley (2008) Biol. Lett.
doi:10.1098/rsbl.2008.0106

Entente cordiale for organic breeding

Zoe Haigh

The Organic Research Centre's approach to crops for organic production, the use of diverse populations to buffer environmental stresses, is unique in the UK. However, segregating populations have been used in Europe as a tool to study genetic evolution for some time. The Dynamic Management programme at INRA, France, for example, created wheat populations based on 16 bread wheat lines in 1984 which have been the focus of several studies into genetic adaptation and diversification. I was able to discuss these populations with key researchers at INRA in June, as part of a Short Term Scientific Mission funded by SUSVAR (Sustainable low-input cereal production: required varietal characteristics and crop diversity).

One INRA study investigated climatic adaptation of the population at seven sites across France, under high and low inputs, for ten generations. The heading date was evaluated for each population. This provides a good indication of evolution, as plants have to adapt rapidly to adjust their life cycle to the optimum environmental conditions. Temporal evolution during the ten generations was not significant, but populations in generation ten had differentiated according to a north – south divide: populations grown in the south had an earlier heading date than those in the north. This is probably because plants in the north are at risk of frost if they flower too early, whereas plants in the south have to flower early to avoid drought later in the season.

Unlike the ORC populations which were designed for farmers to use on-farm, the French populations were created for research purposes. However, these populations have been distributed through a network of farmers in France, some of whom have been practising their own selection on-farm in order to improve the crop for their own purposes. This may involve removing excessively high genotypes, and adding seed from other farmers' populations to improve particular characters such as taste or baking quality.

The ORC Producer Conference

January 6 - 7 2009

As we move into 2009 the organic sector faces challenges like never before. There is a new Organic Regulation that will change the way producers manage the use of previously restricted inputs. There is a fresh assault by the pro-GM lobby along with sympathetic politicians in the name of feeding the world and stabilising prices. Some see the mainstream organic market as becoming increasingly conventionalised. The oil price is affecting most of us, including the organic sector. There are on-going debates on animal health issues – vaccination vexes many. And then there's that huge imbalance between the production of organic feed in the UK and the demands of organic livestock.

Our third annual producer conference will address these and other issues. The market is tough at the moment and standards and practices need improvement. By working together we can become a wiser and stronger community which can provide demonstrable benefits not only to the organic industry but also to the wider farming sector.

We are developing an exciting programme, with input from farmers and farmer groups. Speakers include producers, representatives from producer groups and researchers.

Topics will include:

- Feed – availability, nutrition, alternative feeds and on-farm production
- Personal experiences of organic farming and the market
- Technical sessions
- Vaccination and animal health
- Essential soil management
- Grazing management

In these changing times we have decided that it is also time to change the venue to give better access for other parts of the country. Harper Adams University in Shropshire will be welcoming us this year.

Fuller programme details will be available shortly and booking will open over the summer. There will be an Early Bird discount for prompt enquiries. In the meanwhile, state your interest by calling 01488 657600 or e-mailing **organicinform@organicresearchcentre.com**

Lively arable open days

The crops had grown, the crowds gathered, and at just the right moment, the sun shone. The Arable Events Open Days at Sheepdrove and Wakelyns drew people from as far afield as Wales and Scotland, and with local farmers as guest speakers, both meetings were focussed on putting research into action. One issue that emerged was the problem of achieving a critical mass of organic producers; with organic farmers often isolated in a sea of non-organic production, it can be difficult to make transport and processing viable. A lively discussion on the feed issue was held at Sheepdrove: can on-farm feeding be part of the solution? Should we produce more cereals and fewer livestock?

A visit to the Better Organic Bread trial at Sheepdrove gave a whistle-stop tour of spring wheats and their bread-making potential. And despite the high value of wheat, oats were being recommended as a first cereal for their ability to smother weeds and yield well.

Over at Wakelyns, the tour of the agroforestry systems highlighted the potential carbon sequestration of the farm, as well as being a source of fuel, fruit, and a safer-than-most pension. With agroforestry as a backdrop, each of the major cereal research trials was visited and explained. There was considerable interest in the wheat populations, and debate over how best to exert selection to ensure continued performance.

The spring wheat population trial (see Bulletin No. 92: Winter wheat populations – a springboard?) looks set to deliver its promise of doing away with the need for winter cold to stimulate flowering in some of the plants, and so transform a winter wheat to a spring wheat. As for the wheat agronomy project, Wheat LINK, the secret to the results of the Claydon drill may be underground – in the form of altered root distribution. And the same message was evident from the oat trials – why not use winter oats as a first cereal?

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