The Maine Organic Farmers and Gardeners Association
presents

✯✯✯ Spring Growth 2005 ✯✯✯

Local and Organic in a Global Food Economy: What is our role?

✯ as farmers ✯ as consumers ✯ as citizens ✯

a day-long engagement with the future of our food system featuring big thinkers from around the world and right here in Maine

Is our future any food from anywhere at anytime? Or is there a possibility that we could, together, build an alternative that is so deeply rooted in our farms and our communities that it becomes the preferred choice? How do these competing visions fit with our current understanding of energy use, of climate change, of rural development, of food quality and health, of organic certification? This year's Spring Growth conference takes on these important questions, with the help of some luminaries of the sustainable agriculture and local food movements.

✯ ✯ ✯ *Featured Speakers* ✯ ✯ ✯

✯ **Fred Kirschenmann**, long-time organic farmer from North Dakota, is currently chair of the Leopold Center for Sustainable Agriculture at Iowa State University. He'll talk on the long-term implications of energy, climate, and our continually consolidating agriculture, and the alternative vision that he has been so instrumental in advancing for 20 years.

✯ **Molly Anderson** is now U.S. Regional Director at Oxfam America and formerly Director of the Agriculture, Food, and Environment Program at Tufts University. She is a nationally-respected leader in the growing Community Food Security movement, and will talk about the intersection of sustainable agriculture, nutrition, and access to good food for people of all income levels.

✯ **Lawrence Woodward is the director of the Elm Farm Research Centre, in Berkshire, UK, a world leader in organic agriculture research and education. His topic is the relationship of soil quality to food quality, and the importance for the organic movement to make this connection in the public's mind.** (Lawrence Woodward has worked closely through the years with Hardy Vogtmann, whom some may remember from MOFGA's Farmer to Farmer conference several years ago).

✯ **Jan Schrock** is Senior Advisor at Heifer International, whose core mission is helping people around the world to build local food production capacity. She'll be joined by Amy Burchstead of Buckwheat Blossom farm in Wiscasset, and program leader for Heifer in northern New England.

✯ Finally, a panel of **Maine Farmers** and others involved in the food system, including Jo Barrett of King Hill Farm and Jim Amaral of Borealis Breads, will respond to the presentations, and offer their perspectives on what's needed as we lead Maine towards a local, organic food system, and set an example for the rest of the country.

March 2005
MOFGA's Common Ground Education Center Unity, Maine
mofga[a]mofga.org

LOCAL AND ORGANIC IN A GLOBAL FOOD ECONOMY
SOIL, FOOD QUALITY AND HEALTH

I was delighted to receive an invitation to attend and speak at the March 2005 Maine Organic Farmers and Gardeners Association's conference. Firstly because of all the good things I have heard over the years about your conferences and secondly because your organisation seems to be steadfastly grassroots and genuinely organic, a rare and valuable thing in a sector that is increasingly losing touch with or selling its soul. Also today's topic is one of the most critical facing whatever is left of the organic movement. It is intrinsic to fulfilling any aspirations we have to spread the organic concept of health and it is vital to the wellbeing of our society and that of future generations for us to find and practice an alternative to the destructive and iniquitous spread of globalisation.

This conference posed the question – **"Local and Organic in a Global Food Economy: What is our role? -** As farmers, as consumers, as citizens? – What is our role? - Questioning what is generally seen as the inevitability of globalisation is something you do not do in smart circles – in the UK at least. You are regarded as a "flat-earther" if you dare to mutter anything about possible alternatives. Any hint of the word "protect" – even if linked to food quality, health, dispossessed people, communities, equitable development – any hint, is beyond the pale in polite society.

My perspective of the global food economy is that we have to, in the first place and urgently, develop an alternative to it. A locally based food economy is right for nutritional reasons, for development reasons, and for socio-economic reasons. But more than that, we have no choice if we wish to preserve anything that resembles a democratic and civilised society.

At the risk of being subtle: we live in world of finite and rapidly diminishing resources. Quite apart from being inequitable and a moral abomination, the global growth economy upon which we struggle to base our society is untenable. It is in fundamental conflict with the biological base of our planet and must be replaced as our civilisation's central organising principle.

Can such a dramatic statement be justified? I believe so**. The threats posed by the depletion of hydrocarbon energy and climate change receive most attention but the depletion of water reserves and loss of fertile soil are arguably as pressing** – more so in some parts of the world. To focus on the first two though:

Global warming is happening. The last decade was the warmest on record. Extreme Weather events are occurring on an unprecedented scale. The polar icecaps are thinning at an unprecedented rate Coral reefs are dying.

Man-made pollution is the most significant factor in global warming. CO^2 emissions in the atmosphere are at the highest levels ever recorded. There is now a consensus about the problem across worldwide scientific opinion - other than in the Bush administration.
"All countries must accept that the case has been made. Continuing to deny the impact of human activities on the environment may ultimately have catastrophic consequences for everyone on the planet" Lord May, President of The Royal Society and former UK government Chief Scientist.

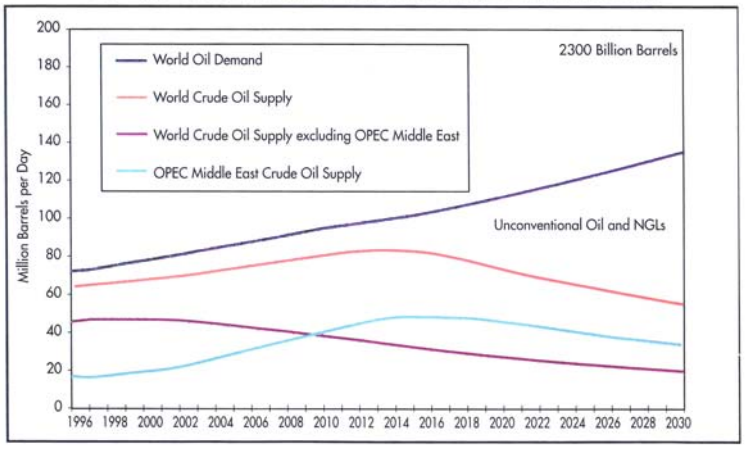
The IPCC says we need an immediate 40% reduction in climate relevant emissions to stabilise global warming – see www.grida.no/climate/ipcc_tar/wg1/005.htm for chapter and verse - to stop the global growth economy dead in its tracks.

Not to worry though, the rundown of our energy supplies might help us!

Elm Farm Research Centre

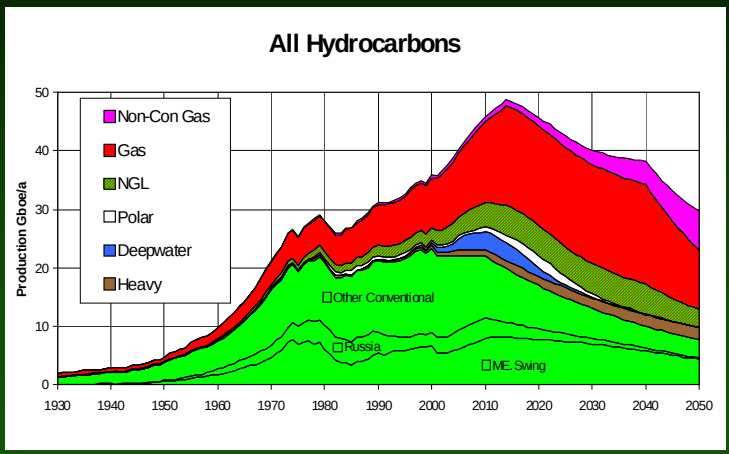
The code that almost no one cracked

Figure 7.7: **Oil Supply Profiles 1996-2030**
Ultimate Conventional Oil Reserves of 2300 Billion Barrels



Four oil shocks

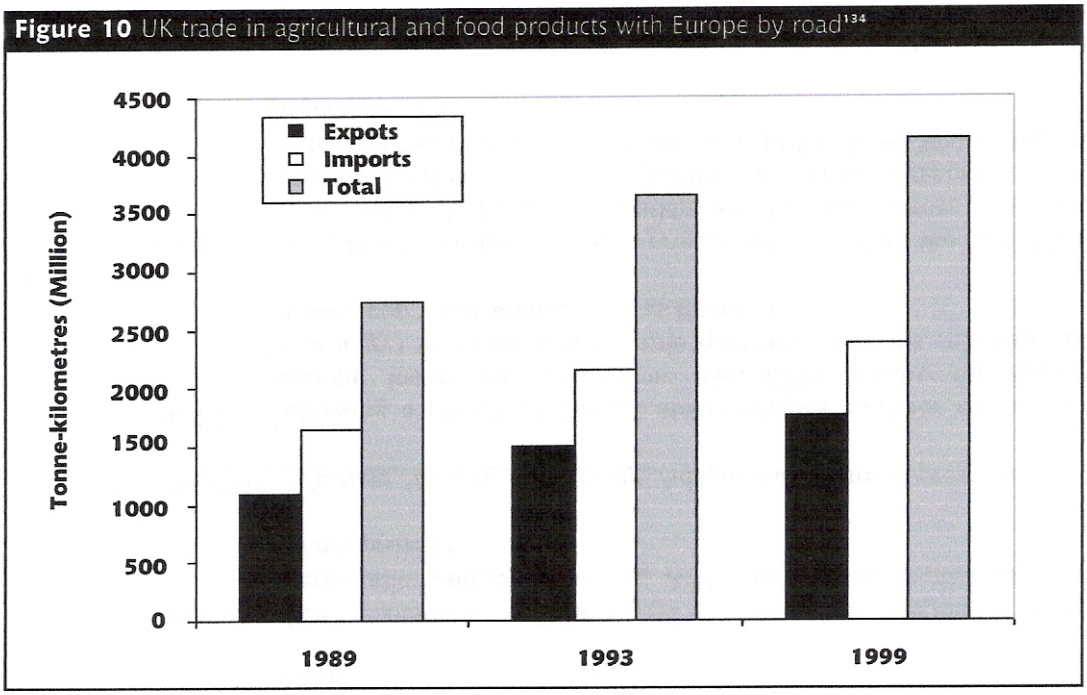
1. About 2005: conventional oil peaks.
2. About 2010: all oil peaks.
3. About 2015: all hydrocarbons peak.
4. About 2040: gas peaks



It is clear that “business as usual” is not an option; the unfettered depletion of our natural resources cannot continue. A major, I would argue fundamental, change in how we live our lives is absolutely necessary, including of course how we feed ourselves.

The **global food system** is an integral part of the global economic system and is increasing in volume and importance; for example, international food trade increased by 184% between 1968 and 1998. The annual UK imports of food and animal feed amounts to over 83 billion tonne-kilometres, using 1.6 billion litres of fuel, resulting in 4.1 million tonnes of CO2 emissions. Between 1989 and 1999 there was a 90% increase in the road freight movement of agricultural and food products on UK roads. This represents 28% of all goods transported and amounts to an estimated environmental cost of £2.35 billion per year. The farming and food system produce some 22% of all UK CO2 emissions.

Figure 10 UK trade in agricultural and food products with Europe by road[134]



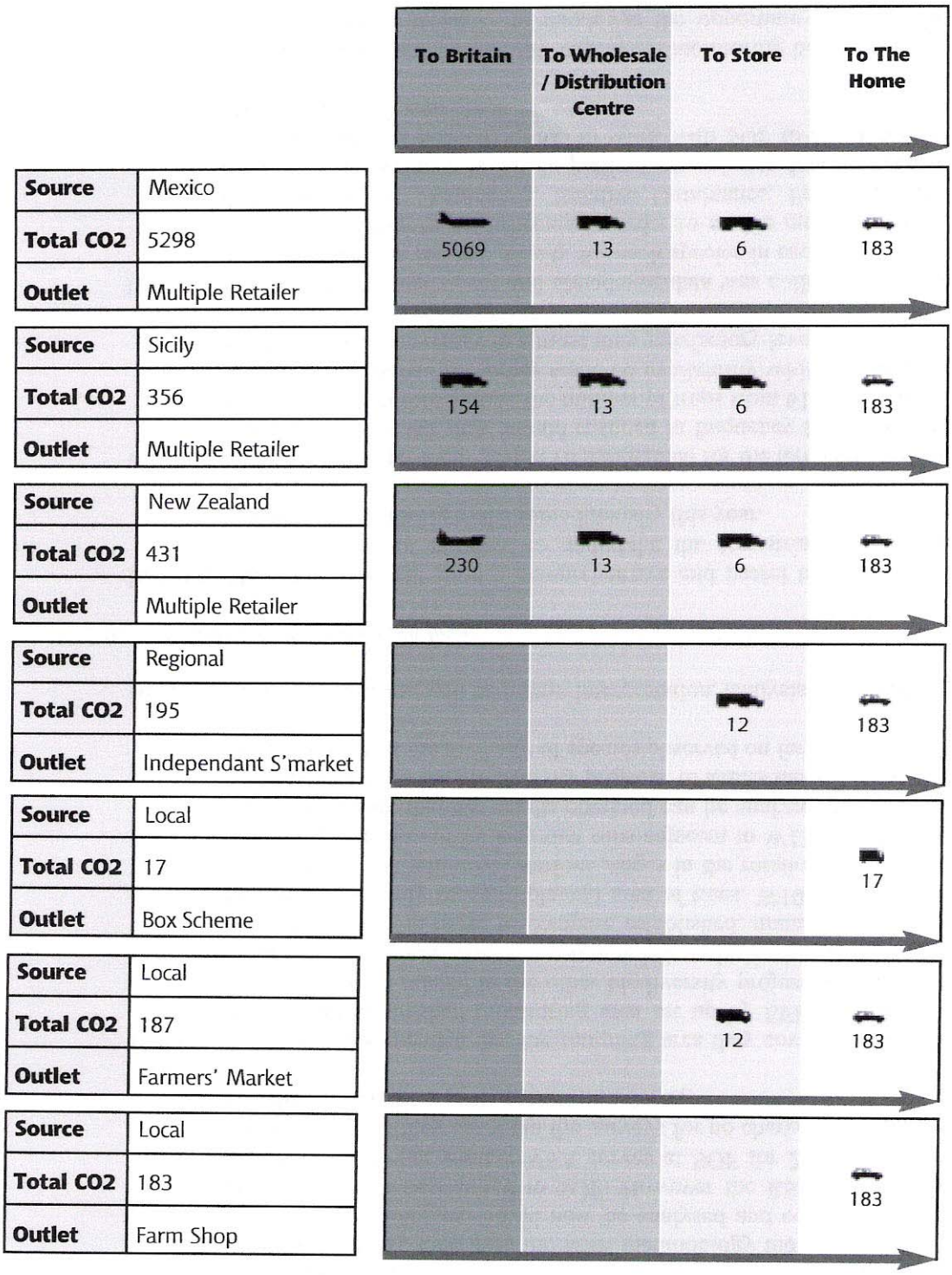
So we have a food system that enables us to have food that is in season all the year round and in theory at least gives access to an exotic choice. But as you can see with this traditional English Sunday lunch we are also transporting staples around the globe; not because English farmers are making so much money they can't be bothered to produce such normal fare but because it's cheaper for the packers and retailers.

Table 2 The carbon dioxide emissions when supplying the ingredients for a 'traditional' Sunday meal[62]

Product	Origin	Distance (Miles)	Mode of Transport	Quantity (kilograms)	Carbon Dioxide Emissions (g)
Beef Joint	Australia	13339	ship	1.6	343
Potatoes	Italy	1521	truck	5	771
Carrots	South Africa	5979	plane	2	10969
Broccoli	Guatemala	5457	plane	0.9	4505
Runner Beans	Thailand	5924	plane	1	5434
Total (a)		32220			22022
Blueberries	New Zealand	11706	plane	1	10738
Strawberries	California	5452	plane	1	5001
Total (b)		17158			15739
Grand Total (a+b)		49378			37761

I would like to say that this was the conventional picture and things are different with the organic sector. But I can't.

Figure 18 The carbon dioxide emissions of organic food sourcing, distribution and marketing systems (grammes of CO2 per kilogram product)[368]



This table lists imported organically certified products; together with miles, fuel used and carbon emitted, that are found week in and week out on the shelves of UK supermarkets. It is hardly different from the conventional picture.

Table 1 The carbon dioxide emissions, energy and fuel consumption when importing various organic products by plane[39]

Product	Origin	Distance (kilometres)	CO2 Emissions (grammes)	Energy Consumption (MJ)	Fuel Consumption (litres)
			Per kilogram of food		
Strawberries, Cherries, Peppers, Herbs	Ankara, Turkey	2835	1616.0	24.24	0.64
Strawberries, Green Beans, Salad Onions, Garden Peas, Sugar Snaps,	Cairo, Egypt	3520	2006.4	30.10	0.80
Fine Beans, Mangetout, Sugar Snaps, Courgettes, Salad Onions,	Nairobi, Kenya	6804	3878.3	58.17	1.54
Chanterelle Mushrooms, various vegetables,	Lusaka, Zambia	7905	4505.9	67.59	1.79
Herbs	Harare, Zimbabwe	8257	4706.5	70.60	1.87
Strawberries, Baby Spinach, Raspberries, Watercress, Rocket, Lettuce, Limes, Peeled Baby Carrots, Cherry Tomatoes, Herbs, Garlic, Cranberries, Cherries, Broccoli, Green Beans	Los Angeles, California	8774	5001.2	75.02	1.98
Broccoli	Guatemala City, Guatemala	8782	5005.7	75.09	1.99
Avocados, Cherry Tomatoes, Mangoes, Limes,	Mexico City, Mexico	8941	5096.4	76.44	2.02
Ginger,	Rio de Janeiro, Brazil	9307	5305.0	79.57	2.11
Mangetout, Fine Beans, Runner Beans, Herbs, Asparagus,	Bangkok, Thailand	9534	5434.4	81.52	2.16
Avocados, Baby Carrots, Asparagus, Radish, Peppers, Grapes,	Cape Town, South Africa	9622	5484.5	82.27	2.18
Garlic,	Buenos Aires, Argentina	11082	6316.7	94.75	2.51
Raspberries, Kiwi Fruit, Asparagus, Grapes, Plums, Blackberries,	Valparaiso, Chile	11663	6647.9	99.72	2.64
Beef Cuts, Ginger	Melbourne, Australia	16913	9640.4	144.60	3.83
Blueberries	Wellington, New Zealand	18839	10738.2	161.07	4.26

We do have a government organic action plan, which I am involved with, and we are making progress with increasing the sales of UK produced organic food – and of course there are an increasing number of organic farmers who sell solely within their locality through box schemes and farmers markets – but the vast majority of organic food in the UK is sold through supermarkets and the mainstream food system; where food miles are an irrelevance, seasonality is marketing ploy and the cost/price ratio is all that matters.

But of course that ratio does not include all **the real costs**; **the external, environmental costs** are not included and are neither paid at the checkout nor deducted from the supermarket's profits: they are eventually paid though, by the environment and by the taxpayer.

One argument offered in support of organic farming is that the organic farmer covers these external costs within the method of farming. Depending on the quality of the farming system – and there is plenty of poor quality organic farming around – this is true to the farm gate. But after that varies enormously with the distribution and retail system that follows; as we shall see from a very recent UK study.

I am grateful to Tim Lang and Jules Pretty for providing the material pre-publication so that I can include it today. But first a health warning! Calculating these costs involves assumptions and controversial judgement calls, nonetheless, the results can be interesting and useful.

Table 1
The negative externalities of UK agriculture (year 2000)

Source of adverse effects	Actual costs from current agriculture (£ M yr^{-1})	Scenario: costs as if whole of UK was organic (£ M yr^{-1})
Pesticides in water	143.2	0
Nitrate, phosphate, soil and *Cryptosporidium* in water	112.1	53.7
Eutrophication of surface water	79.1	19.8
Monitoring of water systems and advice	13.1	13.1
Methane, nitrous oxide, ammonia emissions to atmosphere	421.1	172.7
Direct and indirect carbon dioxide emissions to atmosphere	102.7	32.0
Off-site soils erosion and organic matter losses from soils	59.0	24.0
Losses of biodiversity and landscape values	150.3	19.3
Adverse effects to human health from pesticides	1.2	0
Adverse effects to human health from micro-organisms and BSE	432.6	50.4
Totals	£1514.4	£384.9

Sources. Adapted from Pretty et al. (2000), Hartridge and Pearce (2001) and EA (2002).

Table 2
External costs to the farm gate for 12 food commodities grown and raised in the UK

Produce	External costs from conventional agriculture		Scenario: as if whole of UK was organic		Proportional change in external costs from conventional to organic (%)
	Total external cost (£ M yr^{-1})	Unit external costs (p kg^{-1})	Total external cost (£ M yr^{-1})	Unit external cost (p kg^{-1})	
Cereals	377.5	1.72	71.1	0.32	−18.6
Potato	28.2	0.42	3.5	0.05	−11.9
Oil seed rape	49.9	3.54	9.7	0.69	−19.5
Sugar beet	20.6	0.22	3.7	0.04	−18.2
Fruit	4.6	1.44	0.8	0.25	−17.4
Vegetables	17.6	0.61	3.0	0.10	−16.4
Beef/veal	441.9	64.79	82.5	12.09	−18.7
Pork	127.3	12.81	37.6	3.79	−29.6
Poultry	87.5	5.68	29.4	1.91	−33.6
Mutton/lamb	157.8	43.57 (p $litre^{-1}$)	59	16.3 (p $litre^{-1}$)	−37.6
Milk	171.2	1.22 (p dozen $eggs^{-1}$)	73.3	0.52 (p dozen $eggs^{-1}$)	−42.6
Eggs	30.3	3.96	11.3	1.44	−36.4

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Table 5
Summary of components of full costs of the UK food basket (average for 1999–2001)

	Annual costs (£ M yr^{-1})	Costs per person (p $person^{-1}wk^{-1}$)	Proportion of total externalities (%)
Agricultural externalities	1514	81.2[a]	18.8
Domestic road transport (from farm to shop)	2348	75.7	29.2
Sea, internal water and air transport for imports	17	0.005	<0.01
Shopping (from shop to home)	1276	41.1	15.8
Waste disposed to landfill	7	0.002	<0.01
Total externalities	5162	198	
Government subsidies	2883	93	
Price paid for food basket (including eating out)	89,500	2479	
Full cost of food basket (total externalities and subsidies)	8045	291	–
Full cost (including externalities and subsidies)	97,545	2770	–

[a] The agricultural costs per person are not simply annual costs divided by population, as account has been taken of imports and exports to and from the UK.

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Table 7
Comparison of various transport scenarios for conventional and organic food baskets

	Total cost of individual food basket (price + externalities) (£ wk^{-1})	% increase in total cost over price paid	Saving per person over current full costs (£ wk^{-1})
Total current food basket costs (price + externalities arising from conventional agriculture, national and car transport, waste to landfill, and subsidies)[a]	£27.71	11.8	–
Current food basket with different transport scenarios			
+ local food + walk/cycle	£26.60	7.3	£1.11
+ local food + home delivery	£26.78	8.0	£0.93
+ local food + bus	£26.65	7.5	£1.06
+ national road + car	£27.70	11.7	£0.01
+ national rail + bus	£26.84	8.3	£0.87
+ continental Europe + car	£28.03	13.1	(£0.32)
+ global air + car	£33.30	34.3	(£6.59)
All organic food basket with different transport scenarios			
+ local food + walk/cycle	£25.06	1.1	£2.65
+ local food + home delivery	£25.24	1.8	£2.47
+ local food + bus	£25.10	1.3	£2.61
+ national road + car	£26.15	5.5	£1.56
+ national rail + bus	£25.30	1.2	£2.41
+ continental Europe + car	£26.48	6.8	£1.23
+ global air + car	£31.76	28.1	(£4.05)

[a] From Tables 4 and 5.

It is clear then that for environmental reasons a food system based on organic and local food is good.

It is also good from a nutritional perspective. Vitamin C is susceptible to loss from harvest onwards. Vitamin C losses in leafy vegetables are up to 18% 2hrs after harvest; 60% after 8hrs and 90% after 24hrs

Vitamin A is also susceptible to loss over time even in good storage conditions - whilst Riboflavin and Vitamin E are sensitive to light, oxygen and heat. Conventional nutritionists point out that such losses are largely irrelevant because there are other sources of these vitamins in our diet. But the point is that transporting many food products over time and distance is virtually guaranteed to reduce nutritional quality.

I was asked to address **the relationship of soil quality and food quality and health**: and consider the need to make this connection in the public mind. The pioneers of organic agriculture had no doubt of the necessity to do this. Lady Eve Balfour, for example, wrote in her seminal book “The Living Soil”, "My subject is food, which concerns everyone; it is the soil, which concerns everyone - even if they do not realise it - and it is the history of certain recent scientific research linking these three vital subjects."

She wanted this message to reach as she put it "the legislator, politician, voter, tax and rate -payer, farmer, gardener, veterinary surgeon, doctor, sanitary inspector, public health authority, school teacher, priest, Tinker, Tailor, Soldier, Sailor - in fact, the Citizen".

This was a tall order back in the early 1940s but it is arguably more problematic in our urban, suburban, globalised, sanitised, consumer-ised, pre-packed, shrink-wrapped, shrunk brained, clichéd and disconnected modern world – where kids do not know that milk comes from cows, how can they know the full significance of soil?

Here is a poem by the Liverpool poet Roger McGough that highlights the problem. It's called ***Soil:***

we've ignored each other for a long time
and I'm strictly an indoor man
anytime to call would be the wrong time
I'll avoid you as long as I can

When I was a boy
We were good friends
I made pies out of you
When you were wet
And in childhood's glorious
Summer weather
We just rough and tumbled together
We were very close

just me and you and the sun
the world a place for having fun
always so much to be done

But gradually
I grew away from you
Of course you were still there
During my earliest sex-capades
When I rough and fumbled
Not very well after bedtime
But during my first pubescent winter
You seemed very wet and dirty
So I stayed indoors
And acquired a taste
For girls and clean clothes

we found less and less to say
you were jealous so one day
I simply upped and moved away

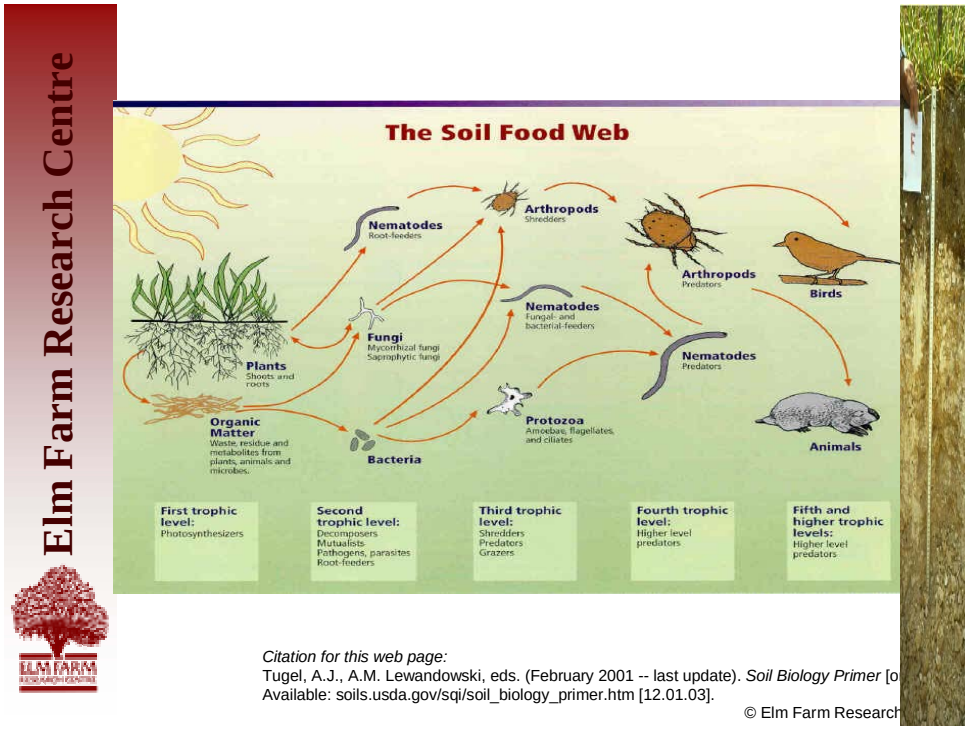
I still called to see you on occasions
But we had little now in common
And my visits grew less frequent
Until finally
One cold bright April morning
Many years ago
A handful of you
Drummed on my father's
Wax-worked coffin

at last it all made sense
there was no need for pretence
you said nothing in defence

And now just recently
While travelling from town to town
Past where you live
I have suddenly become aware
Of you watching me out there
Quietly waiting
Playing patience with the trees

we've avoided each other for a long time
and I'm strictly a city man
anytime to call would be the wrong time
I'll avoid you as long as I can

A modern view of soil: something to play in, to build on, be buried in - and avoided because it's dirty. Although, maybe there is also a hint of recognition that there is ultimately an elemental connection: a hint that might give us hope that all is not yet lost.



But there is certainly no recognition of the complexity, intricacy and sheer wonder of **a living soil**; no recognition of the many living processes within soil; no recognition of, as the slide shows, that the soil food web is directly connected to our own nutrition and wellbeing.

I want now to consider firstly, soil of itself and as representative of everything that makes up the biological basis for our existence; secondly the relationship between soil fertility and food quality and nutrition; and finally the place of soil in the holistic concept of health that underpins the organic movement.

To start with, let us recognise that the driving force of our society, our civilisation, its organising principle, is not the husbanding of primary resources but their exploitation in the pursuit of economic growth.

Most of us now have only a distant relationship with the biological base of our planet. Yet those primary resources and our relationship with them mainly through the provision and distribution of food are ultimately the key to our wellbeing**. Our history shows dramatically what happens when man loses touch with or abuses those resources.** An analysis of this is graphically presented by Michael Crawford and David Marsh in their book “The Driving Force”, which is subtitled "Food, Evolution and the Future".

Whilst it was the development of agriculture that spawned what we regard as the first civilisations, its mismanagement and over exploitation was probably responsible for their collapse. Destruction of tree cover and over grazing are thought to be the start of the process of desertification which precipitated loss of soil fertility, nutritional collapse and climate change. These factors played a major part in the destruction of the great Middle Eastern and Mediterranean cultures.

Aristotle, for example, noted some of the earliest examples of climate change " The same parts of the earth are not always moist or dry, but they change according as rivers come into existence or dry up. And so the relation of the land to sea changes too, and a place does not remain land or sea throughout all time..."

Plato described the scene in his own day in Athens: " The Acropolis is quite bare of soil which was washed away in one appalling night of flood..... The soil washed away from the highland in these periodical catastrophes forms no deposit of consequence in other places, but is carried out and lost in the deeps.....You are left with something like the skeleton of a body wasted by disease; the rich, soft soil has all run away leaving the land nothing but skin and bone."

He contrasts this to an earlier period in Athenian history." But in those days the damage had not taken place, the hills had high crests, the rocky plains of Phelleus were covered with rich soil and the mountains were covered by thick woods. For some mountains which today will only support bees produced not so long ago trees that when cut provided roof beams for huge buildings whose roofs are still standing."

And most notably he sums up: "This, then, was the general nature of the country, and it was cultivated with the skill you could expect from a class of genuine full-time agriculturists, with good natural talents, an abundant water supply and a well-balanced climate."

This picture changed when the buoyant Greek society and culture moved into its expansionist phase, disregarded its husbandry, and sought to push outward through trade and conquest.

The same story can be told of Rome, but even more dramatically. Rome began as a nation of farmers but she pursued growth, trade and wealth beyond her own and Italy's boundaries. At the height of her Empire, Rome was unable to feed herself. Grain was brought from as far away as Spain and Britain and above all from North Africa. Half a million tons of grain a year were sent to Rome from North Africa. But the farmers either knew little or had forgotten the principles of soil husbandry and as trees and ground cover was cleared the topsoil and its fertile mineral supply was washed away. Harvest failures became frequent.

Rome itself became full of unemployed people living on a dole of bread, olive oil and wine and it was no longer possible for ordinary people to make a living off the land. More and more small landowners found it impossible to pay their taxes and still keep a subsistence for themselves. Increasingly they sold out to larger landowners until eventually most of the land was owned by a few hundred families, who found it more profitable to put it into pasture and raise cattle - commodity production for trade not food.

During the protracted struggle to hold on to Empire, Rome one by one lost her sources of supply. She was hindered by the increasing difficulty of getting crops off the great North African wheat fields as their top soils degenerated and harvests failed. The elaborate Roman engineering and infrastructure of roads, aqueducts and storage tanks were no real substitute for a sound ecology. Eventually Rome, having outstripped her resources, was severed from her food supplies by a simple blockade of the Tiber and fell in a week..

Is this history or current affairs? What are the key characteristics in the decline and destruction of these great civilisations? And are there any similarities with today?

Well, what about **overstretched food supplies**? In recent years the world's food stocks have fallen to the lowest level on record - to 48 days supply, in comparison with the previous low of around 60 days; A projection of world food supply and demand over the next 35 years suggests a deficit of around 600 million tons of grain on the world market, roughly the entire current grain consumption of the United States and China, and about three times the total of world grain exports today . "Deficit" is a polite word for starvation.

And what about **overstretched water supplies**? Some of the main grain-producing regions, such as the US Southern Great Plains, the North China Plain and the Indian Punjab are dependant on underground water reserves, which are now falling and in some regions are close to depletion. The capacity of rivers to provide more water for irrigation, for instance in the Central Asian Republics and the Colorado River Basin, is at or close to its limit, not least because of the increased demand for water from towns and industry. There is a compelling view that one of the consequences of global warming will be that grain-growing areas will suffer drought.

What about the **loss of fertile land**? The world grain growing area declined from 735 million hectares (mh) in 1981 to less than 600 mh today; in China it has been reduced by one-tenth from its 1976 peak, and the current one per cent per annum fall is expected to continue for the foreseeable future. All the industrialising countries are losing agricultural land rapidly; in Japan and South Korea, it has fallen by one third since 1960 and 1977 respectively. Much of the agricultural land which has so far been spared from urbanisation is subject to erosion and salination. Around 30 per cent of irrigated land is estimated to suffer from moderate or serious erosion. A World Bank report on four developing countries (Costa Rica, Malawi, Mali and Mexico) indicates that annual losses of agricultural productivity due to soil erosion are equal to 1-1.5 per cent of their gross domestic product.

What about the **separation of the land and production from the produce consuming community and the emphasis of production for commodity trading not for food**? Overall, Western Europe consumes nutrients from nearly 5 times its agricultural area - most in the form of animal feed and most going into intensive factory farming of pigs and poultry products.

Commodity trading is critically important in today's world food system. No more than 15 Transnational Corporations account for the bulk of this activity with only 6, (5 of them privately owned) dominating. They account for 90% of trade in pineapples, 65% of bananas, 85% of tea, 90% of cocoa beans, 70% of rice, 85% of coffee, 85% of corn, 60% of sugar, 85% of wheat. It is instructive to look at their operations how they position themselves be feed supplier, banker, buyer of finished cattle, butcher and wholesaler - everything but the farmer.

Do you think I have made the point? I admit to stretching it in places but I believe there is an alarming similarity between the relationship our civilisation has with its resource base, its soil, its agriculture, its food system and the one those destroyed civilisations had with theirs. And I believe we have come to this dire situation for the same reason

In the drive for greater and ever expanding economic wealth, we have ignored the limitations set by our environment and have become abusive towards and divorced from civilisation's biological base including the soil.

In my naïve years I believed that converting as many farmers as possible to organic production was an effective way of facing up to this. But as we have seen the globalisation of the organic market confuses things. However, **we can be more positive about organic agriculture when considering the relationship between soil fertility and food quality and nutrition**.

I am grateful to Kirsten Brandt of Newcastle University for the next few slides.

Traditional conventional view of how different production systems are important for human health

Organic	Conventional
Plant foods have more:	
Dry weight %, minerals	Nitrate
Vitamin C	Protein
% essential amino acids	β-carotene
Natural pesticides	Synthetic pesticides*
Animal foods have more:	
Unsaturated fatty acids, CLA	Resistant bacteria
Processed foods have more:	
	Food additives*

Un-traditional view (still within main-stream scientific concepts) of how different production systems may be important for health

Organic	Conventional
Plants have more:	
Intrinsic resistance to diseases and pests	Easily available nutrients
Resilience to stress	Susceptibility to post-harvest infections
Animals have more:	
Exercise	Stress
"Green" fodder	Susceptibility to infections
Processed foods have more:	
	Low quality raw materials

This is what we know; it is recognised in numerous scientific papers and, as at least trends and tendencies, is acknowledge by all but the most Neanderthal or hired hacks.

Leaving aside the obviously important issue of residues, it is clear from a nutritional aspect that fertilisation and the role of soil fertility is hugely significant. In particular, how the complexes in the soil mediate the turnover, movement and uptake of nutrients. Soluble nutrients tend to bypass these soil complexes and force themselves onto the plant. It makes little difference if these nutrients are organic or synthetic chemicals, the enforced take-up is the same and the consequences are similar. Poor and inappropriate use of inputs will lead to poor quality, nutritionally unbalanced produce and pest and disease problems in certified organic, as it will conventional production.

I would now like to illustrate this with some examples.

These apples are all certified organic but are grown under different conditions where they have a surplus or deficiency of nitrogen,

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Differences with consequences for health.

Example 2:
Effect of nutrient supply on quality of apples

High N (Annual clovergrass)

Medium N (Perennial clovergrass)

Low N (Perennial grass)

You should be able to see that the apples look different. On one side they have suffered less from disease. They have not been sprayed and the differences are due to the nitrogen levels.

Analysis for phenolic compounds showed small differences but not enough to explain the large observable differences in quality.

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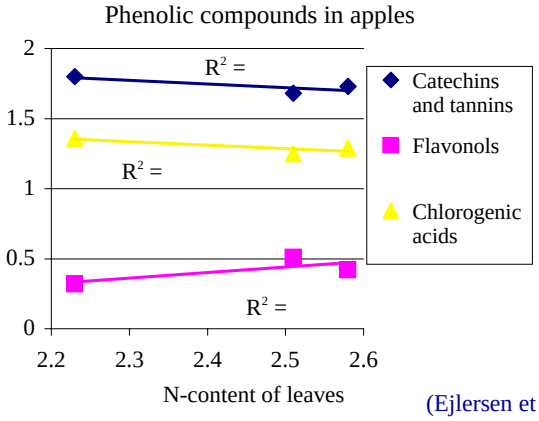
Differences with consequences for health.

Effects of nutrient supply on chemical composition of apples



(Ejlersen et al., 2002)

However, as you can see there were large differences in pests and disease, which the researchers interpreted as indicating the existence of some other secondary metabolites than the phenolic compounds that are having an influence.

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Differences with consequences for health.

Effect of nutrient supply to apples on resistance to diseases and pests

Treatment % of fruit with:	Annual clovergrass (high N)	Perennial clovergrass (medium N)	Perennial grass (low N)
Apple scab	17.9	8.9	2.3
Sooty blotch	11.8	8.7	8.0
Apple saw fly	8.4	5.8	4.6

(Berthelsen & Pedersen 2002)

As I said before these apples are all certified organic but it is clear that, as in conventional systems, different nitrogen regimes have an effect on quality.

Research on **secondary metabolites** is beginning to consistently show differences between organic and conventional systems.

In a two year study looking at aromatic compounds in carrots, clear and definitive differences favouring organic production were found. These compounds are known for their taste but they are also known to defend carrots against diseases and pests.

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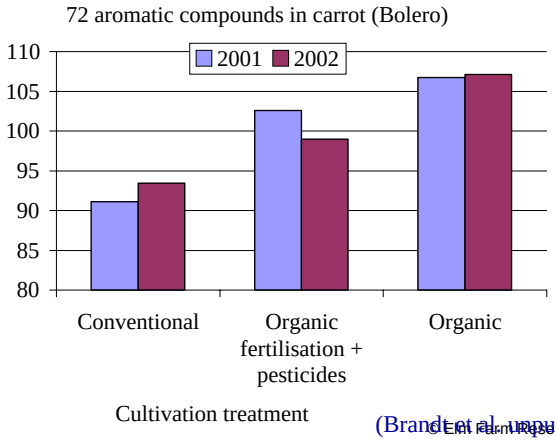
Differences with consequences for health.

Example 3:

Effect of cultivation system on carrots



(Brandt et al. unpublished)

There is significantly less infestation of organic carrots even though some of the conventional ones were sprayed with pesticides.

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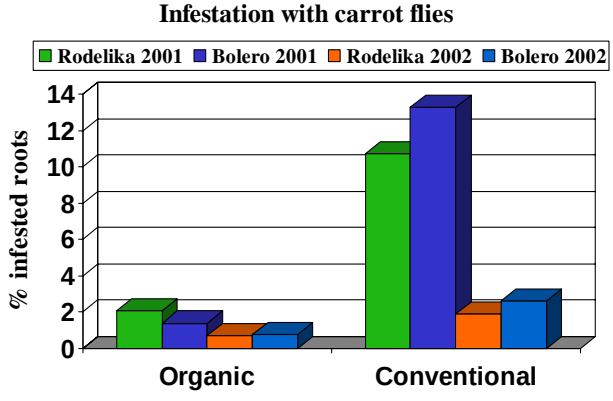
Differences with consequences for health.

Effect of cultivation system on resistance to (or health of?) carrot flies



(Bjørn & Fruekilde unpublished)

Organic plants seem to be more resilient to stress and in this context show differences in natural toxin levels to conventional plants. Here a very strong toxin, furanocumarin is produced in differing levels in organic and conventional celeriac and parsnip.

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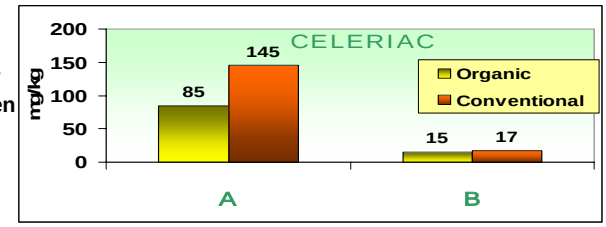
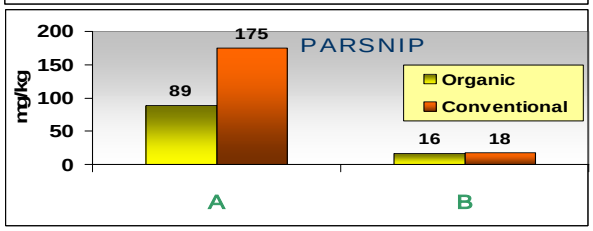
Differences with consequences for health.

Example 4:
Furanocoumarins – influence of stress conditions

A = samples mechanically injured / rotten
B = fresh crop





(Slanina et al. 2003)

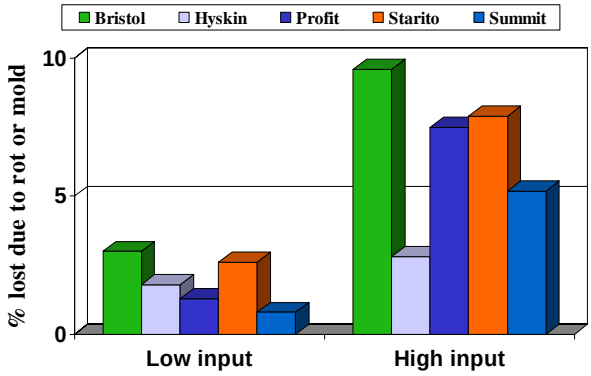
The normal crop showed no difference between the organic and conventional. However in damaged plants the conventional ones rose to much larger toxin levels than the organic ones, actually to levels which are clearly above what is normally is accepted as safe in food.

But again to reiterate that even within a certified organic system the level and type of input – especially nitrogen – can lead to significant quality differences.

Differences with consequences for health.

Example 5:

Effect of growing conditions on incidence of storage diseases in onion varieties



(Bjørn & Frøkilde 2003)

The great variation that exists in the quality in organic farming and organic food is one reason why it has been difficult to amass definitive evidence to answer the question is organic food healthier than conventional. Nonetheless, even though the practice of organic food production is not as good as we would like; even though some certified organic food is unworthy of the words – organic and food, nonetheless, organic agriculture is the only farming system that has as its underpinning philosophy a concept of health and making that concept a viable reality as its goal.

- **"the health of soil, plant, animal and man is one and indivisible.“**
- **there was a quality in the diets of the healthiest peoples which was absent from the least healthy; "that the food in all these diets is, for the most part, fresh from its source, little altered by preparation, and complete; and that, in the case of foods based on agriculture, the natural cycle is complete. Animal and vegetable waste - soil - plant - food - animal - man; no chemical or substitution stage intervenes."**
- ***Organic Agriculture should sustain and enhance the health of soil, plant, animal and human as one and indivisible.***

Even after the passage of more than sixty years it is hard to find a better description of that concept than the one given by Lady Eve Balfour; **"the health of soil, plant, animal and man is one and indivisible."**

She was a disciple of Sir Robert McCarrison, one of the pioneers of human nutrition who, having systematically observed many peoples and many diets, realised that there was a quality in the diets of the healthiest peoples which was absent from the least healthy; "that the food in all these diets is, for the most part, fresh from its source, little altered by preparation, and complete; and that, in the case of foods based on agriculture, the natural cycle is complete. Animal and vegetable waste - soil - plant - food - animal - man; no chemical or substitution stage intervenes."

Others reached similar conclusions and the concept - that health was part of a continuum through soil, plant, animal and man; and that by recycling nutrients through this chain, productivity could be maintained over time and health could be enhanced at all stages - this concept became a foundation stone of the international organic movement.

Or possibly a millstone! Because this concept is rooted in another and very problematic one; that of wholeness (the two words wholeness and health share the same origin after all): problematic, because in the words of Dr. Innes Pearce one of the founders of the Pioneer Health Centre and the renowned “Peckham Experiment”, “biological wholes,…..unlike their parts, cannot be examined a-part; hence cannot be analysed; nor are they definable in terms of quantification.”

Whether in agriculture, food and nutrition or healthcare this problem has dogged the practioners of what might, somewhat unsatisfactorily, be called “holistic science”.

The methodologies available to those researchers, and indeed lay people, who are interested in the dynamics of whole biological systems and their relationship to the whole quality of food have been lacking. They have allowed us only a partial look and yielded largely indicative information.

This has been valuable but it has not told us enough about the nature of health and how to enhance it; nor about the relationship between the health of the living organisms (including humans) that share the same living biological systems; to put it another way, about the essence of living.

I ought to clarify what I mean by the term **health.**

Health is the maintenance of physical, mental and social well-being and not simply the absence of disease or illness. It is a continual process that accumulates and distributes the materials and energy necessary for the function of all living organisms. Mutuality, resilience, self-regulation and regeneration are key characteristics of this process.

McCarrison spoke about an extra quality in the diet of the healthiest people; Scott Williamson and Pearce wrote about health being a biological process not a state; others have referred to vitality being transferred between living organisms. To learn about these things, if they exist, we must surely develop new insights and methodologies.

Fortunately, some dedicated people have been working on this problem and now we have for the first time two government validated, holistic methods that might give us a tool to study living organisms without taking them to pieces. The German government has accepted these – hitherto wild and wacky, alternative methods – and accepted that they are repeatable, they are statistically valid, they do work and there are legitimate.

One of these methods is the measurement of delayed luminescence using which organic and conventional crops may be compared. The premise is that all living organisms transmit energy that can be measured as low-level light, measuring this can detect a quality or character of that organism that has hitherto remained unacknowledged but might be important to the vitality of the organism.

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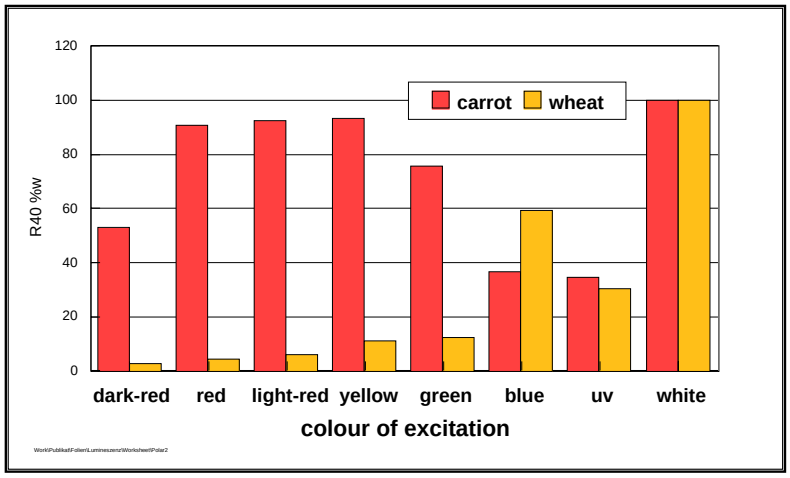
Spectrum



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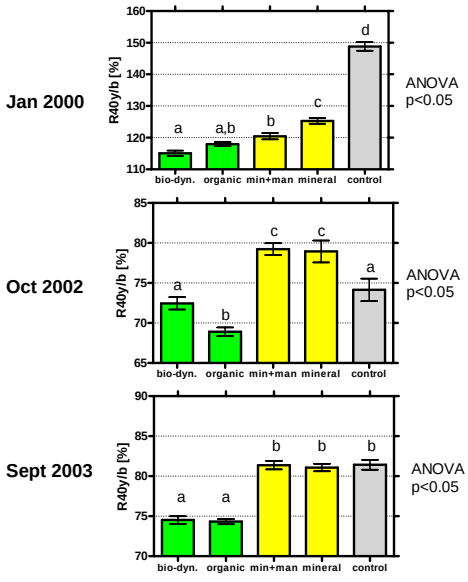
Results – Wheat DOK FiBL 3 series

Samples:

- Bio-dynamic
- Organic
- Mineral+manure
- Mineral
- Control (untreated)

evaluated value:
R40yellow / R40blue



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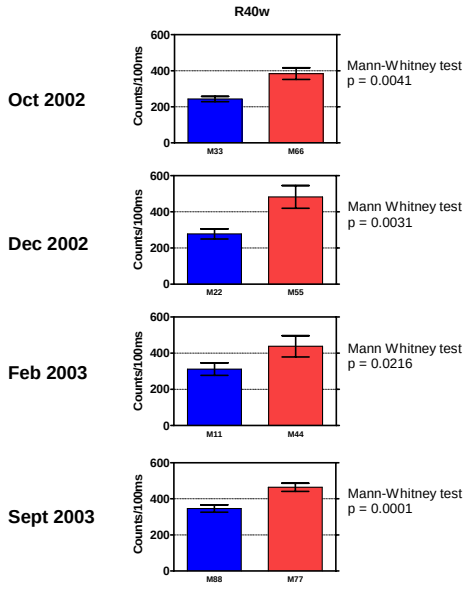
Results – Carrots: non fertilized and 150 kg N / ha

Carrots - samples from Fleck, University Kassel harvests 2002 and 2003

non fertilized

150 kg N / ha



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Answers to questions

4. What is the meaning of measured differences ?

There are clear tendencies that:

- **organic farming leads to seeds which are more seed-like**
- **organic farming leads to fruits which are riper**

5. Does organic farming have an “extra quality” ?

- **Yes – products are more species-typical**

The idea that “the health of soil, plant, animal and man is one and indivisible” is a revolutionary one. Why revolutionary?

Because in order to give form, shape and structure to that concept we would have to fundamentally alter the way our civilisation relates to the biological base of the planet; we would have to fundamentally alter our civilisation's relationship to all our primary resources; and, probably more difficult, alter the way we relate to each other as communities, regions and as individuals.

The answer to the question posed by the conference – what is our role, as farmers, as consumers, as citizens? – is to develop that concept, to make it a reality, to lead and to oppose the siren voices.

This certainly means opposing globalisation.

In the words of EF Schumacher: "..to replace our growth and consumption based economy "by evolving a new lifestyle, with new methods of production and new patterns of consumption: a lifestyle designed for permanence". This lifestyle must be built upon the principle of limitation, "because the environment in which it is placed is strictly limited". It must only employ methods and equipment "which are cheap enough so they are accessible to virtually everyone; suitable for small-scale application; and compatible with Man's need for creativity." Out of these three characteristics "is born non-violence and a relationship of Man to nature which guarantees permanence".

A local and organic food economy seems to be a good place to start.

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