

# ORGANIC FOOD AND FARMING: HIDDEN AGENDAS.

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## Outline

- Synthetic pesticide distraction.
- Natural pesticides are potentially higher in organic.
- Organic farming-claims and reality.

## CURRENT PROBLEMS?

- Those who wish to eat or farm organically are entitled to do so. But when claims are made as to superiority they need testing.
- Fundamentalism is a basic political problem that should be rejected. Farming should not be ideological. The claims of superiority were made without evidence.
- Basic problems with UK agriculture are managerial ability (standards of excellence). If environment is the issue then no-till IFM agriculture easily better. A farmer with high internal standards will deliver better than one driven into organic by the lure of money. Corners can be cut.
- Base agriculture on science or back to reading entrails.

# THE ENVIRONMENTAL CANCER DISTRACTION; ARE SYNTHETIC PESTICIDES OF ANY MEASURABLE RELEVANCE TO HEALTH? The evidence.

- UK overall cancer rates have been in continuous decline for over 50 years. (Coggons and Inskip BMJ 1994). Conventional diet 50 years long.
- Major current risk factors for public UK cancer are smoking, obesity, lack of exercise, sunshine. Ibid. (Ames and Gold, 1999).
- Effects of any damaging effects in diet are seen first in young and middle aged. (Doll, R 1992). Cancer rate declines biggest in this group.
- Life expectancy continues to increase linearly as it has done from 1840 onwards (Oeppen and Vaudel, 2002). UK centenarians are now 10 times more common than 50 years ago.
- Farmers (foresters, millers) most exposed to concentrated pesticides have over-all cancer rates about one half that of the rest of the population. Children less asthma. 12 separate investigations. 300,000 surveyed. Maroni and Fait, 1993 and others.

# CANCER RATES IN THE UK FROM 1950 ONWARDS.

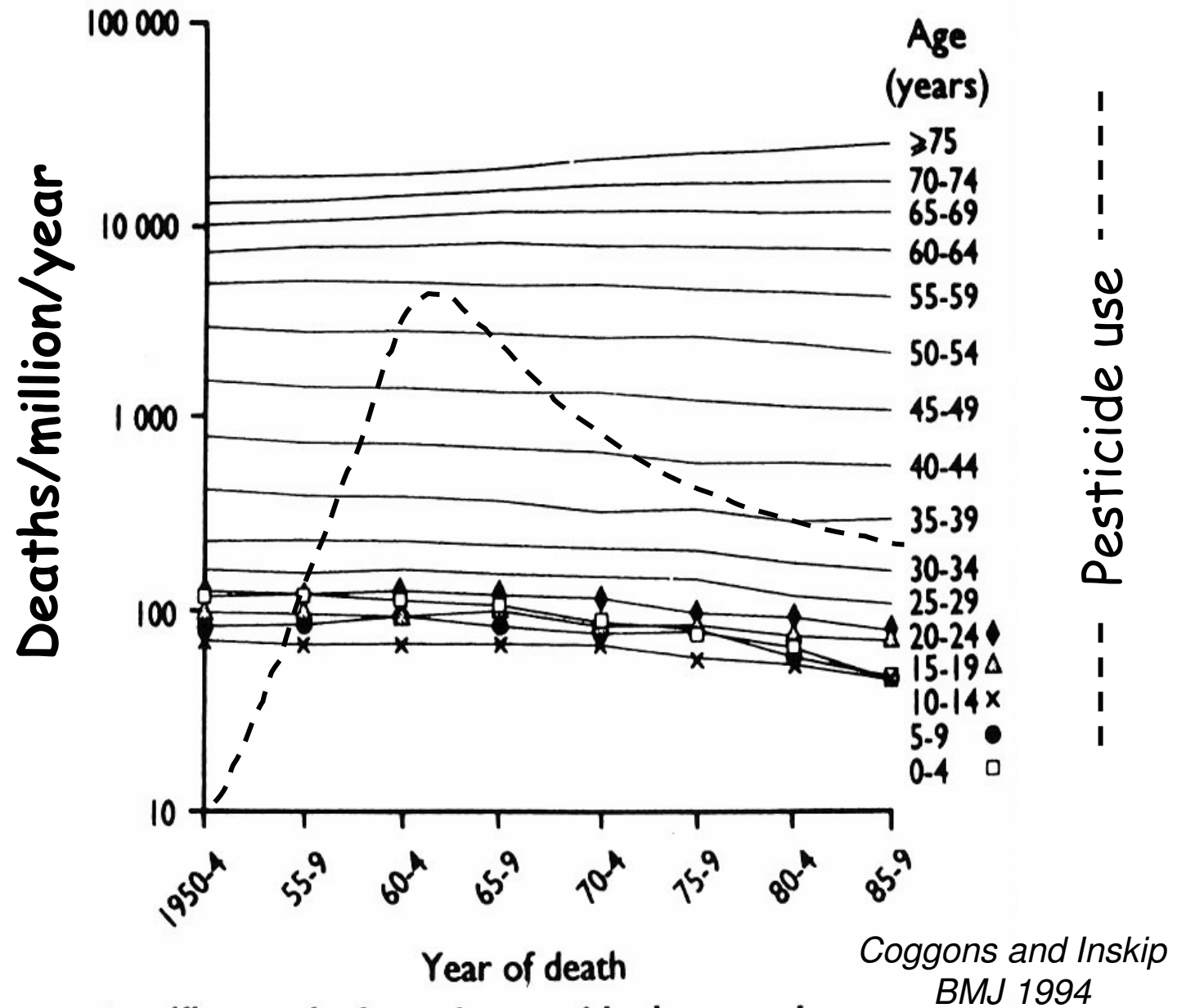
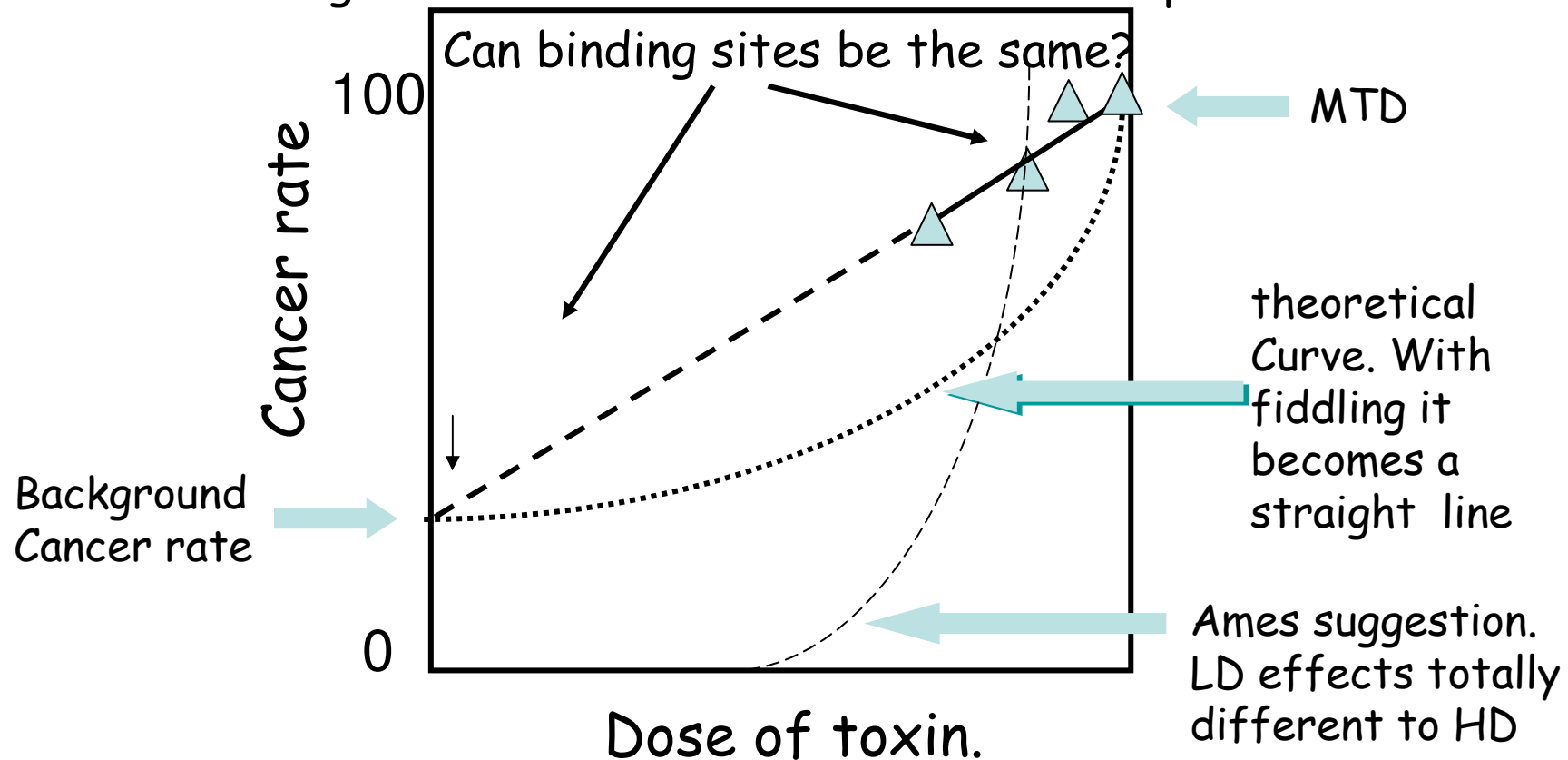


Fig 1—All cancer death rates by year of death, age, and sex

Coggons and Inskip  
BMJ 1994

# THE EPA TEST OF SAFETY IS A MATHEMATICAL CONSTRUCT : NOT A BIOLOGICAL REALITY

The linear no threshold hypothesis (LNT) requires extrapolation of results over a 100 million fold effect! High dose effects limited only to high doses-no relevance to low dose exposure



Normally one in a million is accepted as "safe". Further reduction of 100 fold in safe level is used for human variation and different test animal. But the model is based on incorrect assumptions.

# PROTECTIVE EFFECT OF CONVENTIONAL FRUITS AND VEGETABLES ON CANCER RATES.

- Gladys Block et al (1992) summarised 200 investigations, cohort studies, in Europe and North America. **Average cancer rate was reduced by one half from a diet high in fruit and vegetables.**
- All these studies were with **conventional fruit and vegetables containing pesticide traces**. More you consume of both fruit and pesticide traces , healthier you become (up to a limit of course).
- Only 22% of UK population eat sufficient fruit and vegetables for protection (FSA). **BUT!!! Price determines consumption-increase price (as per organic) and health deterioration will result!!!!**
- World food price has dropped by over half in the last 50 years the result of efficient conventional agriculture. The worlds poorest benefit most. Organic worldwide would plough remaining tropical forest with severe consequences for global warming.

## THE ERRORS OF RACHEL CARSON 1962.

"For the first time in the history of the world, every human being is now subject to contact with dangerous chemicals from the moment of conception until death" Carson 1962.

This is wrong!!: the vast bulk of chemicals humans are exposed to are natural and **for every chemical some amount is toxic.**

Plants synthesise some 100,000 natural pesticides. Present in all fruits and vegetables (1-5% dry wt). Every day we consume several thousand. Plants synthesise them to kill insects (herbivores) and the **amount increases enormously with pest damage and disease!**

We use limonene, pyrethrum, nicotine, rotenone, cucurbitacin, etc as insecticides. Act at the same sites as synthetic pesticides. E.g. **DDT /pyrethrum... sodium channel. Malathion/solanine... acetyl cholinesterase.**

## EVERY DAY WE CONSUME THE FOLLOWING:

**Carcinogens-** 60% natural pesticides test as rodent carcinogens same proportion as synthetic pesticides.

**Teratogens- Examples:** solanidine and chaconine in potato. Solanidine accumulates in liver/kidneys, body half life 2 months. Released during pregnancy.

**Oestrogen mimics-** flavanoids and isoflavones in fruit/vegetables increase female oestrogens by 4% and modifies the menstrual cycle. Soy milk formula increases infant oestrogen exposure 10 fold. Dibutylphthalate (plastic) by 0.0006%; dioxin 0.000001%.

**Sterility induction-** Chocolate, 2% dry weight theobromine-gossypol both cause testicular atrophy in test animals.

**Chromosome breakers.** 40% of all natural pesticides in cultured cells. Allyl isothiocyanate at 1/50,000<sup>th</sup> spring onion concentration. Chlorogenic acid in coffee at 1/100<sup>th</sup> concentration.

## EVERY DAY WE CONSUME THE FOLLOWING:

**Nerve toxins-** tomatine, solanine, cucurbitacin, carotoxin. Solanine 30 fatalities, 2000 established cases of severe poisoning. Cucurbitacin poisonings in New Zealand; organic courgettes.

**Blood disorders-** coumarins (fruit and vegetables). Oxalate. Leafy veg. 40gm spinach will induce symptoms in sensitive adults.

**Goitrogens-** glucosinilates in fruit and vegetables.

**Skin damage-** psoralen in figs, parsnip, celery.

**NATURAL DOES NOT MEAN NATURALLY GOOD FOR YOU!!**

DAILY CONSUMPTION OF NATURAL PESTICIDES is 2-3gms.

DAILY CONSUMPTION OF SYNTHETIC PESTICIDES is 100µgms.

**20,000 FOLD DIFFERENCE !**

## ORGANIC CROPS HAVE HIGHER NATURAL PESTICIDE CONTENTS.

- There is a trade off between defence and yield. Measurements of natural pesticide contents of 14 domesticated, high-yielding crops show reductions of 2-10 fold. Conventional crops are therefore safer for human consumption but need supplement of synthetic pesticide to protect.
- Many wild crops cause human diseases. Lupus (alfafa): foetal damage via teratogens in milk (lupin, bracken): neurotoxicity, (lathyrus): cirrhosis, liver/lung lesions, (herbal teas): hemolytic anemia (broad bean): death, (wild yams, cassava): cancer, (euphorbs).
- Organic farmers prefer pest resistant lines. In the only three cases examined, natural pesticide content has been reversed or higher than wild type. Natural pesticide content not regulated. Organic growth conditions divert metabolism into carbon rich compounds such as wall, starch, many natural pesticides.
- **Double whammy. Higher price, higher risk.**

# NATURAL PESTICIDES ARE CARCINOGENS

•Chemicals tested.	% carcinogenic
naturally occurring chemicals	73/127 (57%)
synthetic chemicals	257/432 (59%)
•Chemicals in roasted coffee (1000)	19/28 (68%)

"Its my choice not to have chemicals in my body". Every meal results in thousands of natural chemicals entering the blood stream and fat soluble ones will accumulate. If you don't like chemicals in your body don't eat fruit and vegetables.

•Ames and Gold report that all cancer-inducing chemicals actually induce cell division but only at high concentrations and it is only this that makes them carcinogens. Not carcinogens at low concentration!!  
Gold et al., 2000.

•Capsaicin. 1 chile pepper/day increase stomach cancer risk by 8 fold.

## ORGANIC "NATURAL " PESTICIDES: BENIGN?

**Mancozeb**, the synthetic copper pesticide is much less toxic than its organic equivalent pesticide, **Copper Sulphate**.

	<b>Mancozeb</b>	<b>Copper</b>
<b>Human health</b>		
LD <sub>50</sub> .	>5000mg.kg	50mg.kg
EPA class.	practically non toxic	corrosive and toxic
Health effects.	Non toxic by oral route	kidney and liver damage
<b>Ecotoxicity</b>		
Earthworms.	low toxicity	very toxic
Birds.	low	moderately toxic
Small mammals.	non-toxic	harmful
DT <sub>50</sub> soil.	6-15 days	non degradable

Rotenone-Parkinsons disease. Bt spores respiratory problems.

## IS ORGANIC FOOD HEALTHIER?

There have been various measurements of vitamin C, some minerals, lycopene, vitamin E. Sporadic increases that average out to 1-10% or less.

Varietal variation and growth conditions can change these constituents by 2-10 fold.

However intake is not the same as uptake. Organic tomatoes fed to volunteers did not increase plasma lycopene or vitamin C. RPC.

No individual food provides all nutrients; **only diets can be healthy.** A balanced varied conventional diet provides all necessary constituents for excellent health.

"There appears to be a wide perception amongst consumers that such (organic) methods result in foods of higher nutritional quality. The present review concludes that evidence that can support or refute such perceptions is not available in the scientific literature"  
**Williams**-Proceedings Nutrition Society.(2002).

## ORGANIC FARMING.

Organic yields are only 50-70% conventional.  
(thus major reason for higher price)

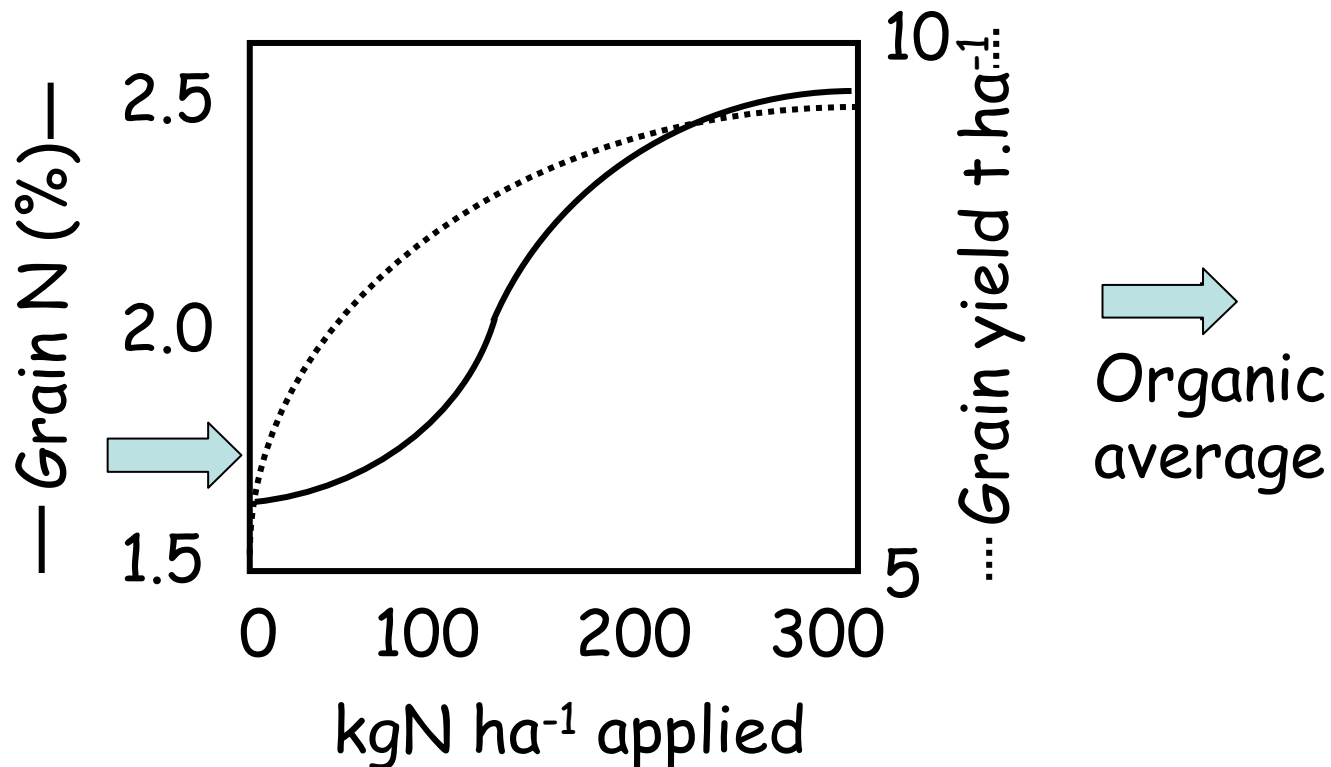
(TONNES/HA)

	Winter wheat	Winter oats	Winter beans	Dried peas
Organic	4.82	4.87	2.60	2.13
Conv.	7.12	5.75	3.60	3.47

*Leake, A. CWS experiments. 1989-1996.*

# THE SUPPLY OF N LIMITS ORGANIC YIELDS BECAUSE MANURE BREAKDOWN DOES NOT SYNCHRONISE WITH CANOPY EXPANSION.(1)

Even though organic soils contain 300kgN/ha compared to conventional 244kgN/ha, yield is usually 50-60%.



Organic does not provide N when most needed at maximum canopy expansion.

## SOIL STRUCTURE-IS ORGANIC BETTER? (2)

"It is not the farming system per se that is important in promoting better physical conditions but the amount and quality of organic matter returned to the soil" "Comparing like with like, organic farms had at least as good and sometimes better soil structure (soil scientist criteria) than conventionally managed farms". *Shepherd et al., 2002*

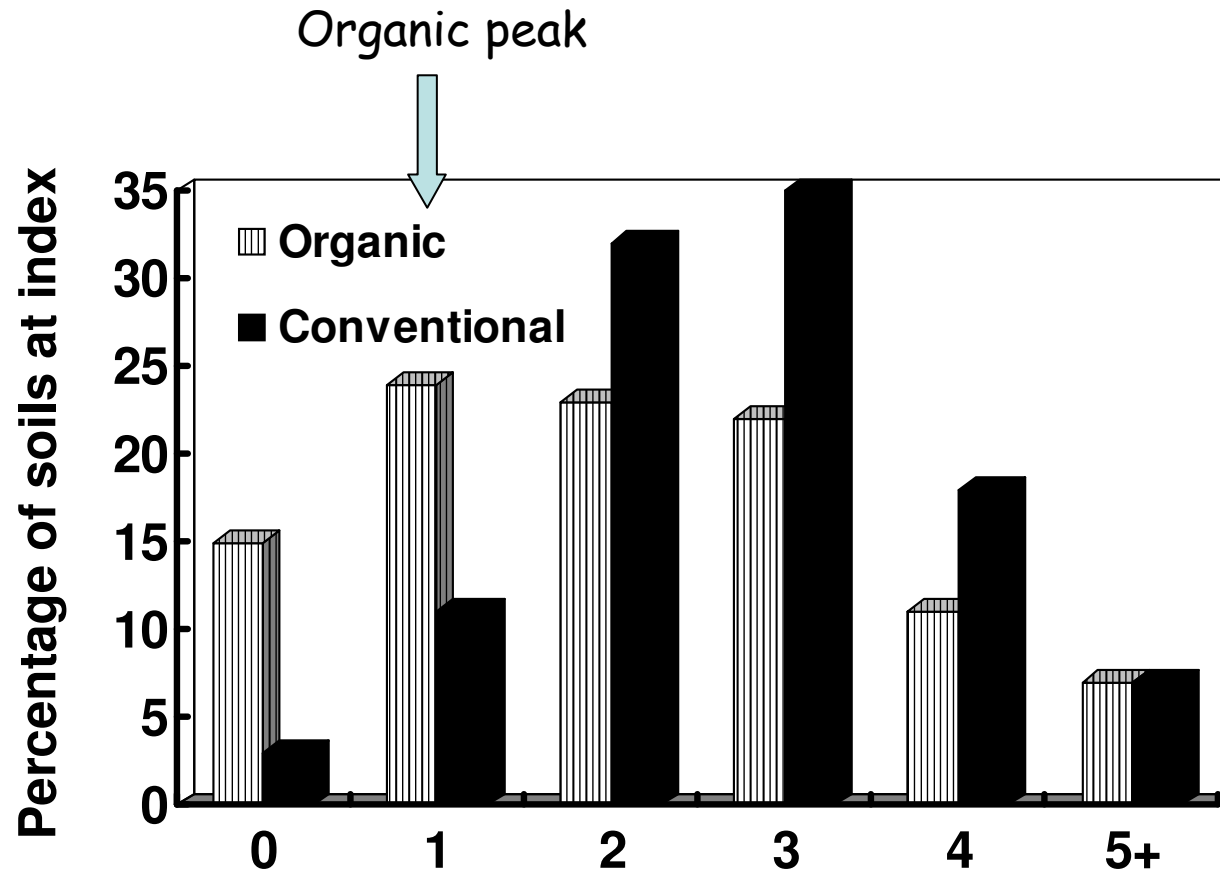
"Soil fertility is defined as an ability of a soil to provide the conditions required for plant growth" " We conclude that although nutrient management in organically managed soils is fundamentally different to soils managed conventionally, the underlying processes supporting soil fertility are not"  
*Stockdale et al., 2002. Soil Use and Management. Volume 18 supplement.*

Crops interrogate the soil and respond accordingly. Better yields has strong implications about the fertility of soil.

## IS ORGANIC SOIL SUSTAINABLE? (3)

- A well-grown crop of potatoes (60 t/ha) for example if sold removes from the farm, 29,338,12,4 and 5 kg/hectare of P, K, Mg, Ca, Na and micronutrients in the tubers which must be replaced from outside, **otherwise the soil is mined!** (*McKerron et al., 1999*).
- *There are only three organic sources of minerals available.*
- UKROPS permit mined  $\text{CaCO}_3$ , KCl,  $\text{MgSO}_4$ , rock phosphate, trace elements, and eight other **non-renewable** inorganic chemicals for a **supposedly chemical-free agriculture? Over 30 additives or aids are allowed in organic food processing.** (*Elm Farm Research Centre*)
- An alternative is to purchase manure and /or hay from a conventional farm. A form of agriculture which organic associations claims is unsustainable but which in its absence organic will be equally unsustainable. **However organic farms are supposed to be self-sufficient in manure and straw-no excess for other farms.**
- Rock weathering!?

# MINERAL DEFICIENCIES IN ORGANIC AND CONVENTIONAL SOILS. (4)



Phosphorus index for soils farmed conventionally and organically. 3 is satisfactory-2,1,and 0 are increasing degrees of deficiency.

*Goulding et al., (2000)*

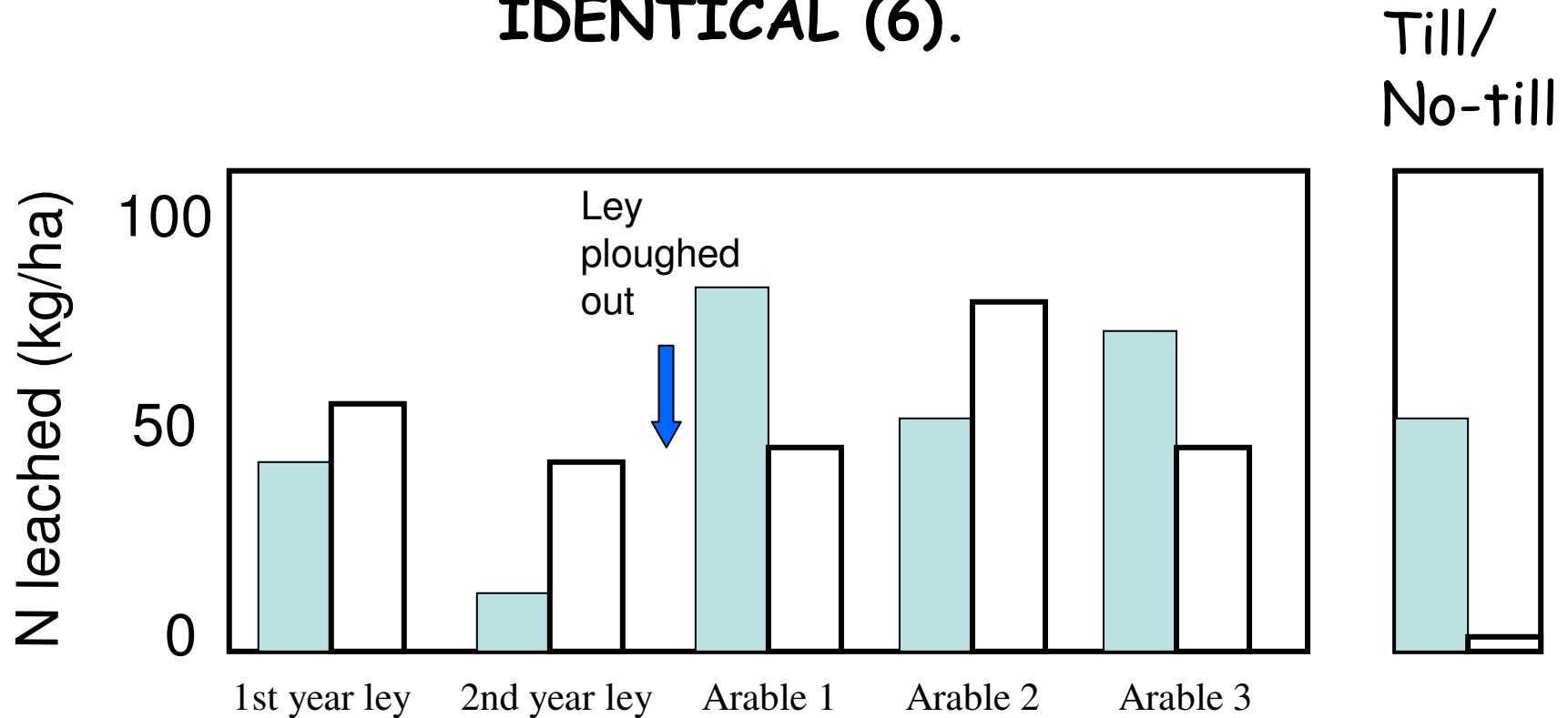
# NUTRIENT AND TRACE ELEMENT CONCENTRATIONS IN DRY FEEDLOT MANURE CAN VARY 20 FOLD (5).



While organic material is good for soil structure, it is poor as a reliable fertiliser.

Nutrient	Range	Average
N	0.55-4.00	1.9
P	0.12-1.60	0.65
K	0.29-3.20	2.00
Ca	0.17-3.60	1.30
Mg	0.19-1.50	0.69
Na	0.10-2.80	0.74
Fe	0.12-1.25	0.56
Zn	0.001-0.14	0.008
Cu	0.0001-0.003	0.002
Mn	0.006-0.115	0.038
B	0.014	0.014

*Concentrations in %*

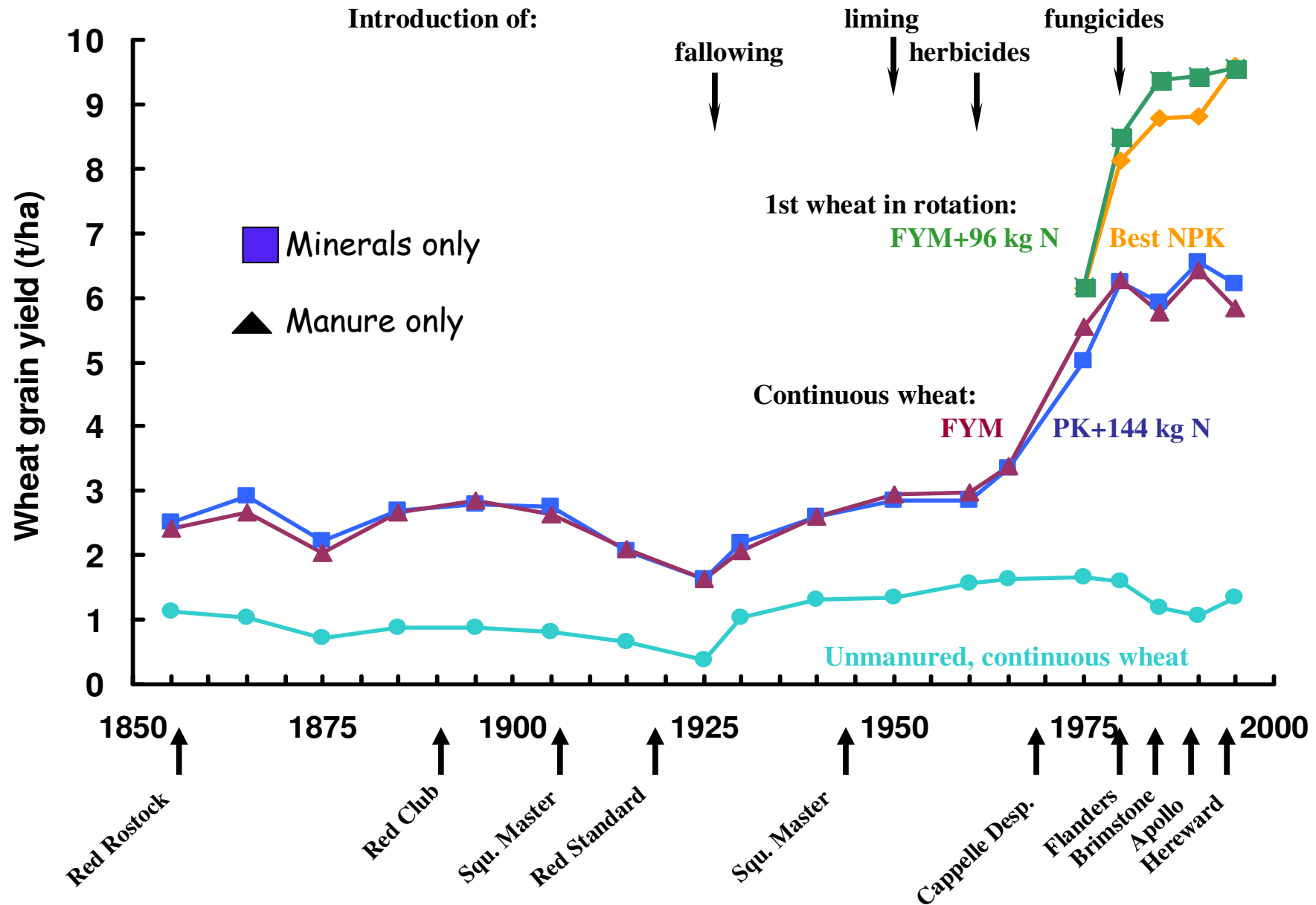
# MEASUREMENTS SHOW NITRATE LEACHING FROM ORGANIC AND CONVENTIONAL SOILS IS IDENTICAL (6).



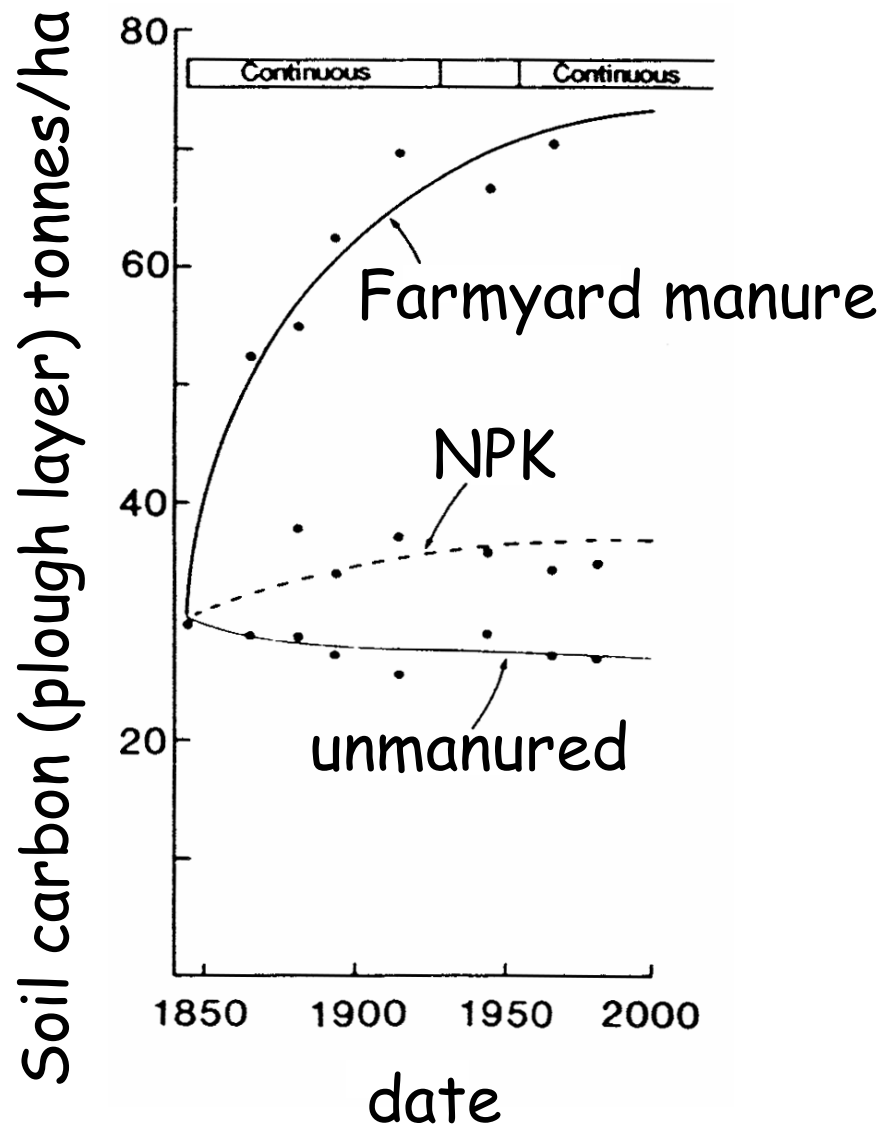
	Mean loss kg/ha	N loss/yeild
 <b>Organic</b>	<b>50</b>	<b>71</b>
 <b>Conventional</b>	<b>51</b>	<b>51</b>

*Lord et al., (1997)*  
*Goulding et al., (2000)*

# DO MINERALS DAMAGE THE SOIL. Broadbalk expt (7)?



# IS SOIL CARBON DIRECTLY RELATED TO YIELD? (9)



The measurements here show the soil carbon content of the Broadbalk experiment in the previous slide. Even when no manure has been added for 140 years, soil carbon has accumulated, the result of leaving roots in the soil and root secretions of mucilage. A single rye plant has been calculated to leave 300 miles of root in one season in the soil. Yields of manured and NPK identical

**ON A YIELD BASIS, ORGANIC IS 3X WORSE IN DRAFT ENERGY USE THAN INTEGRATED AND 2.5X WORSE THAN CONVENTIONAL FARMING.(1)**

Farming system	kWhrha <sup>-1</sup>	Tonnes	energy required /tonne
Organic	3573 (3573)	18.9	200 (200)
Integrated	1838 (2538)	27.4	67 (92)
Conventional	2235 (3635)	28.7	78 (130)

Figures in brackets indicate total energy used in farming (pesticides and minerals)

*Leake. Aspects Appl.Biol. 62, 253 (2000)*

# AN ASSESSMENT OF THE TOTAL EXTERNAL COSTS OF UK AGRICULTURE (2).

Pretty et al Agric systems.

Category	average conv.	organic	no-till
Pesticide	120	10	20
Soil erosion N, P C-loss	177	139	24
Gas emissions	1113	449	136
Medical	192	192	90
Environment	125	100	60
all above in $\text{£} \times 10^{-6}$ for $11 \times 10^6$ ha.			
<b>Costs/person/year</b>	<b>£154</b>	<b>£79</b>	<b>£29</b>
Food costs /person/year	<b>£1500</b>	<b>£2100up</b>	<b>£1500</b>

Agricultural benefits not considered-**Food security, Life expectancy**  
increase from 45 to 80 years.

# BIODIVERSITY ON WELL MANAGED FARMS(1)

80-85% of biodiversity found in margins and hedgerows.  
(*Higinbotham et al., 2000*). Higher weed levels on organic fields  
(*Fuller et al. 2005*)

Carabid beetles generally (but not always) higher in numbers on organic farms but increase almost solely *Pterostichus madidus* (common black beetle that eats earth worms). Staphylinids and Coccinellids (ladybirds) higher on conventional farms. Overall beetle biodiversity index higher on conventional farms. *Moreby et al 1994*.  
*Shah et al., 2003*.

Collembola (pest predatory mites) and microarthropod numbers highest on IFM (no-till) fields ( 5-10x).

Small mammal activity identical on conventional, IFM and Organic farms. Species density highest on conventional fields. (*Higinbotham et al., 2000*)

Mosaic of habitats on farms as found on Leaf (IFM) and organic farms determines species richness. *Bengtsson et al., (2005)*

## EFFECT OF CULTIVATION SYSTEMS ON BIRD POPULATIONS (2)

Total bird territories of 13 species.

Year	91	92	93	94	95	96	97	98
Organic	29	37	34	45	51	49	42	31
Convention.	31	35	24	36	45	38	29	33

*Boarded Barns*

## EFFECT ON WINTERING BIRDS OF IFM NO-TILL

	Skylark	Tree sparrow	Chaffinch	Yellow Hammer
No-till	157	117	35	159
Till	7	0	0	0

*Highinbotham et al., 2000*

# NO-TILL AGRICULTURE (1)

Edward Faulkner (1943) "Plowmans Folly"

"Had we not originally gone contrary to the laws of nature by plowing the land, we would have avoided the problems...**the erosion, the sour soils, the mounting floods, the lowering water table, the vanishing wildlife, the compact and impervious surface**".

Uptake of No-till has been slow because of the difficulty of dealing with weeds. Herbicides helped but real benefits only follow from many years of use.

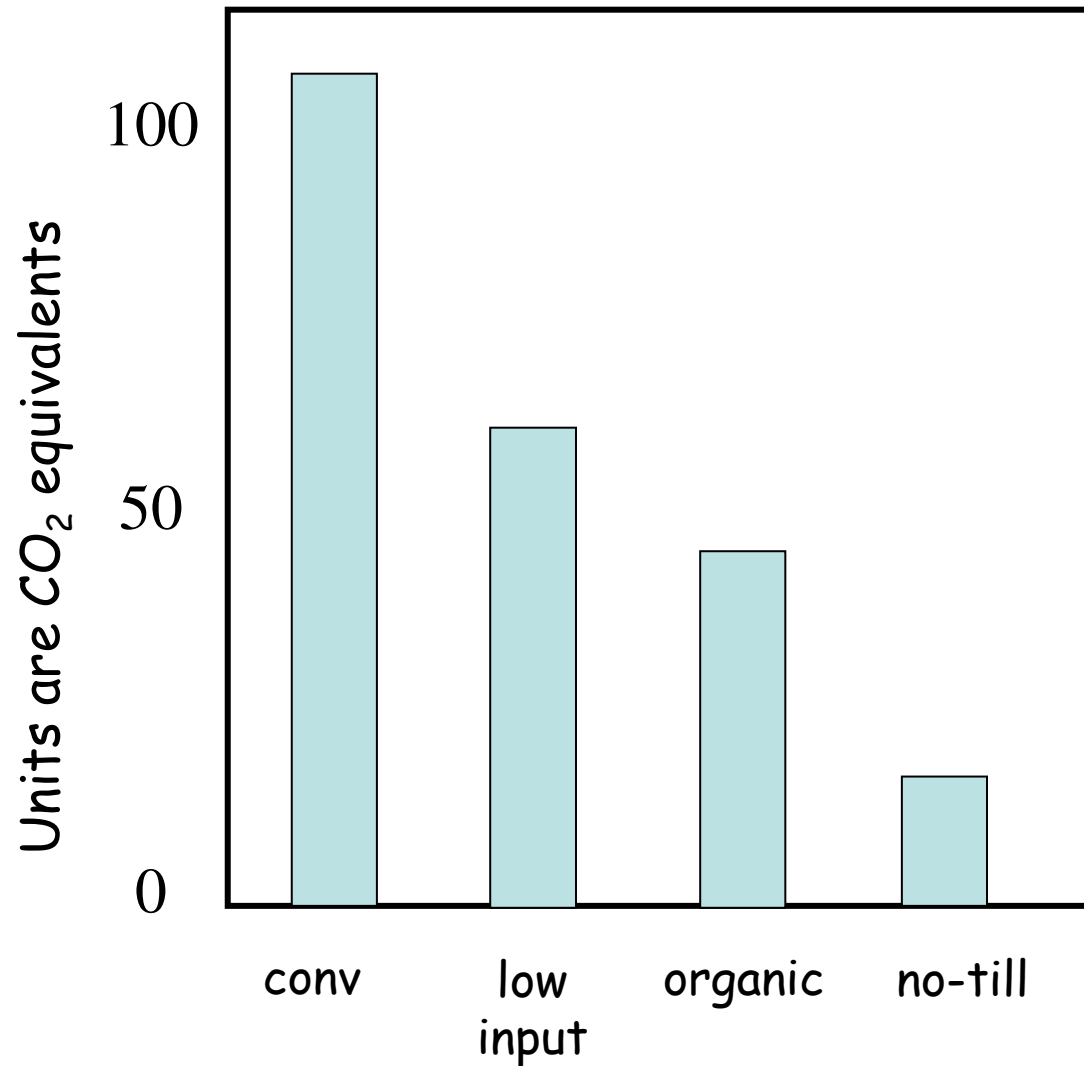
**But no-till really does mimic the seasonal change in prairie or meadow.** No form of agriculture natural but this is nearest. Nothing natural about organic!

Organic weeding limited to ploughing. Or hand weeding (banned in California because of health problems. Or flaming or soil steaming (fossil fuel use and soil damage).

## **NO-TILL BENEFITS COMPARED TO TILL (2)**

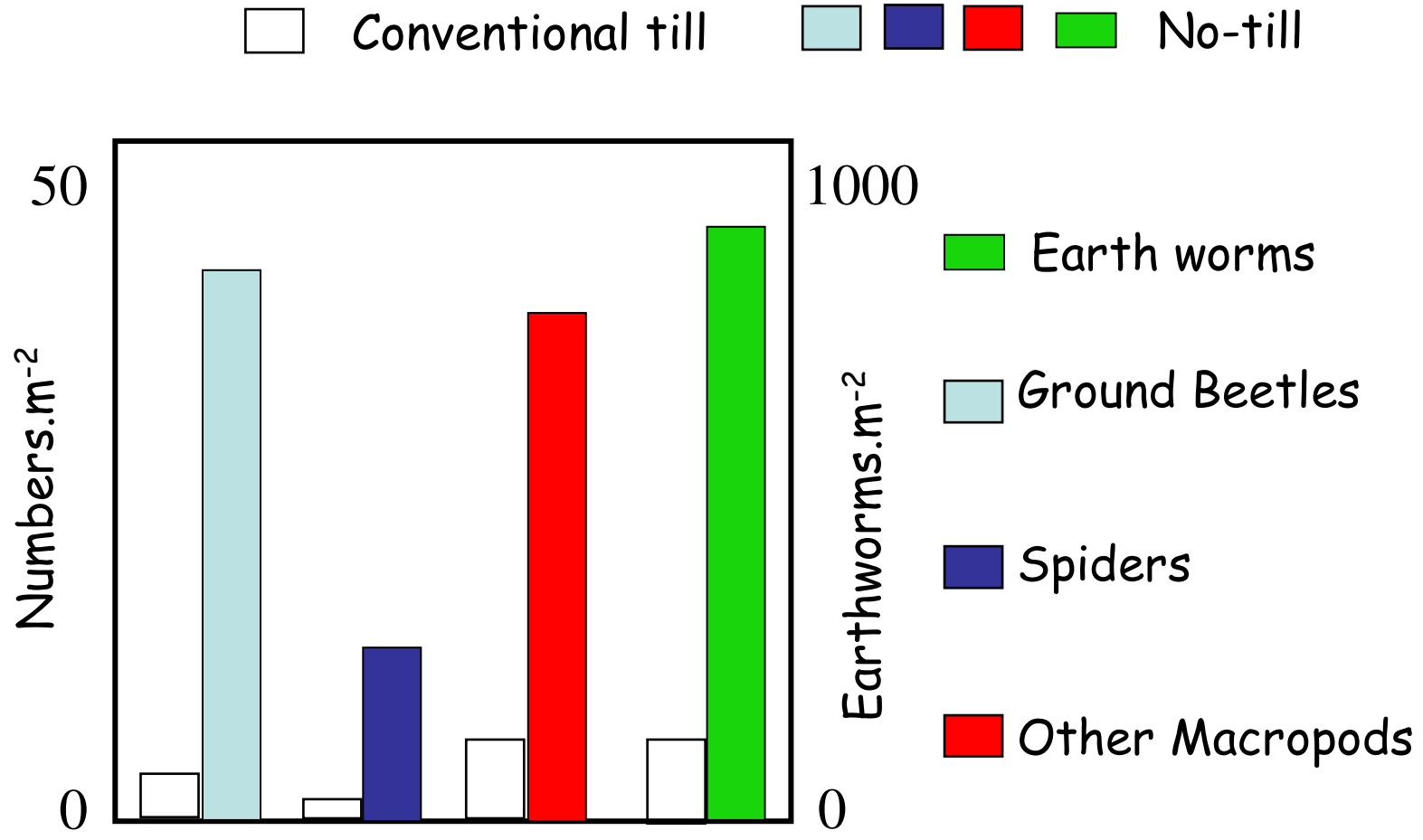
1. Farm fossil fuel use 1/3<sup>rd</sup>.
2. Erosion reduced to 5% ploughed field. Soil nutrition, structure and drainage vastly better. Soil moisture better balanced in drought and flood.
3. Pest predators and large earthworms up 6 fold.
4. Birds and nest increase anywhere from 3-100 fold. Time requirements for young bird feeding reduced five fold.
5. Preventing sediment losses improves aquatic habitat. Run off greatly diminished. Herbicides no longer detectable in soil drainage. Nitrate 1/20<sup>th</sup>.
6. **Soil carbon accumulates- released on ploughing when introduction of oxygen breaks down organic material. 1/3<sup>rd</sup> global warming potential of organic.**
7. Mimicks seasonal change in meadow and prairie.

RELATIVE GLOBAL WARMING POTENTIAL BASED ON SOIL  
CARBON SEQUESTRATION, AGRONOMIC INPUTS AND  
TRACE GAS FLUXES.



Robertson Paul and Harwood 2000

# EFFECT OF TILLAGE ON CARABIDS, SPIDERS, EARTHWORMS AND MACRO-ARTHROPODS



## IFM. A PRAGMATIC NON-IDEOLOGICAL ATTITUDE.

- High quality, affordable, food. Reliably-produced with minimal environmental impact embracing traceability and generating sufficient profit for the farmer to be economically viable. Both conventional and organic fail on one or other points.
- The integrated system which is neither locked into a philosophy or locked into a technology shows the greatest potential but is currently under-developed, under-researched and under-funded.

- Regulation of any dangerous chemical is essential.  $RISK$  (probability) =  $HAZARD \times EXPOSURE$ . Hazard and exposure are thousands of times higher for natural pesticides which remain unregulated.
- 
- Unfortunately regulation allows political groups with anti-technology agendas to play on the fears of the public. For example "Toddlers exposed to daily pesticide threat" "New research by FOE shows that up to 220 young children a day could have been exposed to potentially dangerous levels of pesticides just from eating a single pear or apple". FOE claimed traces of synthetic pesticides (hormone disrupters, nerve agents) can occasionally breach the one in a hundred million safety regulation on an individual apple or pear.
- 
- "Very little is known about the long term effects on the immune, hormone or nervous system when young children are exposed to short term high?? levels of (synthetic) pesticides." FOE.
- When have apples or pears ever been free of pesticides and in enormous abundance over traces of synthetic ones?
-