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BIO-COMPOSTING OF ORGANIC SOLID WASTES AND IT'S ROLE IN THE REBUILDING UP OF SOIL HEALTH

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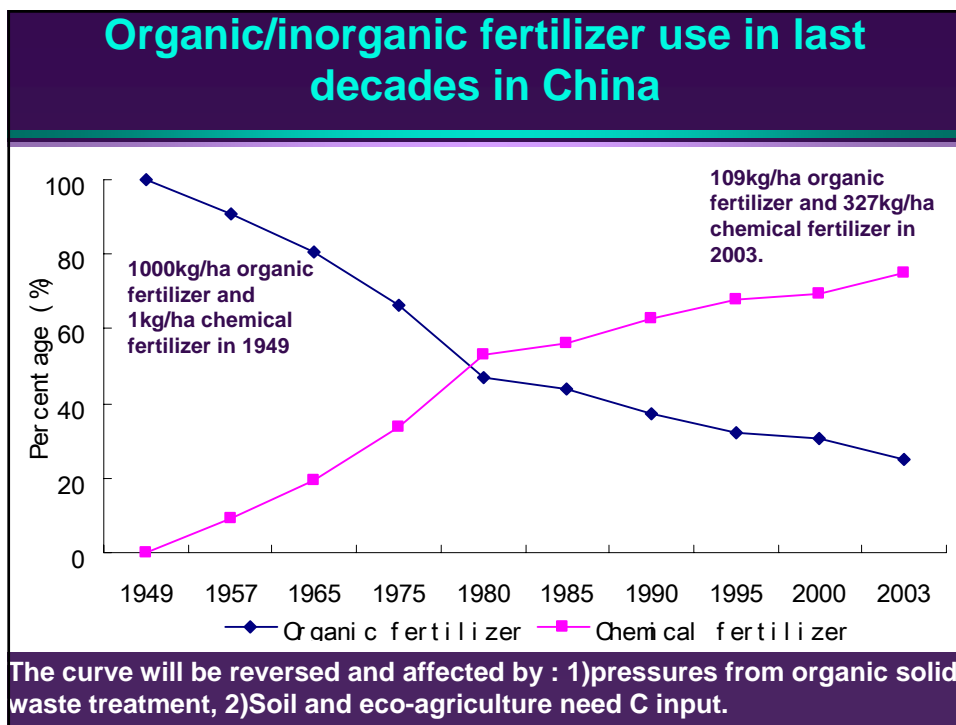
The composting of organic solid wastes in China

Compost making in 1960s

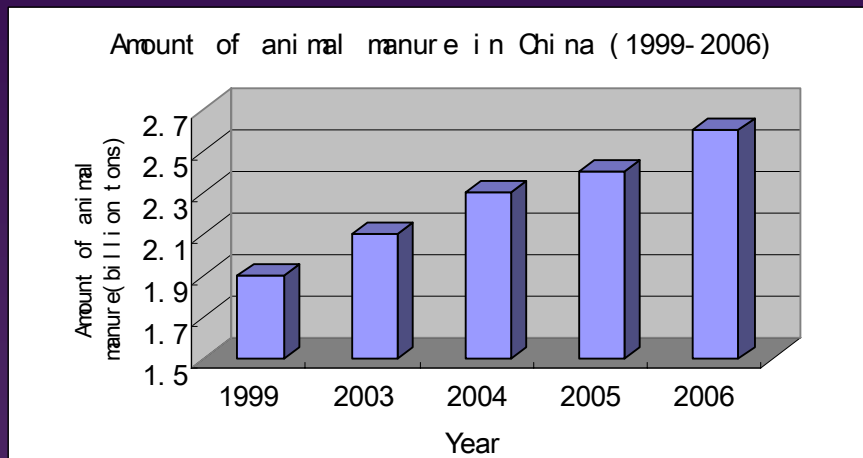


The composting method was recorded by Chen Fu in his book "Chenfu Agricultural Book" as early as the year of 1149, when he may first described the composting method by using oilcake amending with crop residues.





Generation of animal manure



1.8 to 2.5 billion t!

Short information

1. Long history of composting and well practiced in rural regions even now.
2. Potential to develop composting is very large, due to the pressures from environmental protection and the demand of organic fertilizer.
3. Composting Industry is at beginning stage, but grew quickly, from 500 factories in 2002 to 1500 in 2007.

Long-term field experiments on compost use

Quzhou Agricultural Experimental Station, CAU



Since 1973

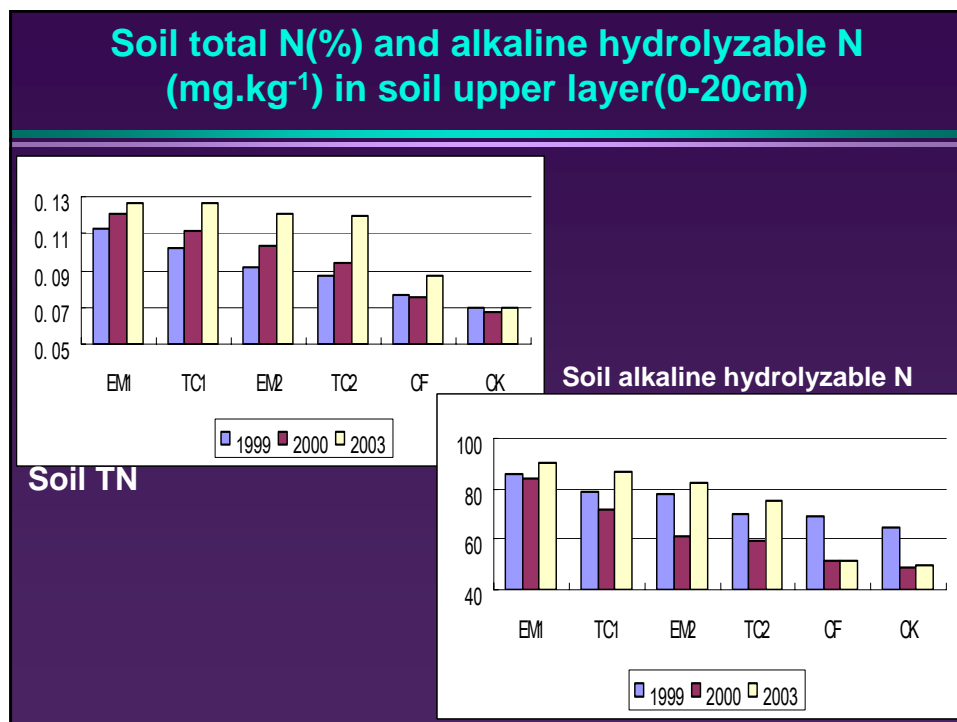
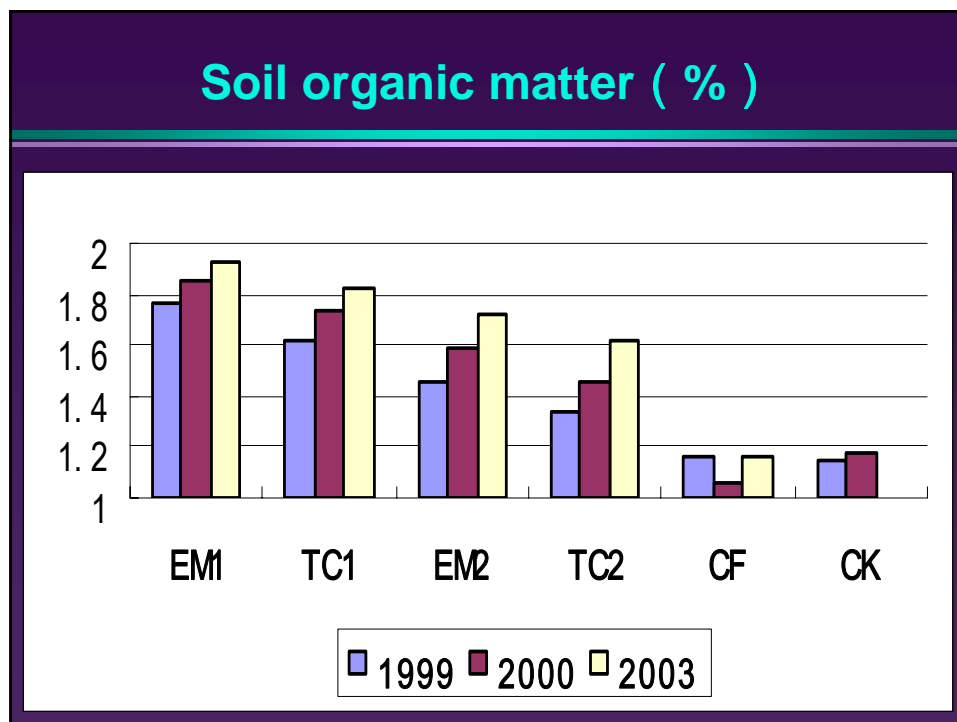


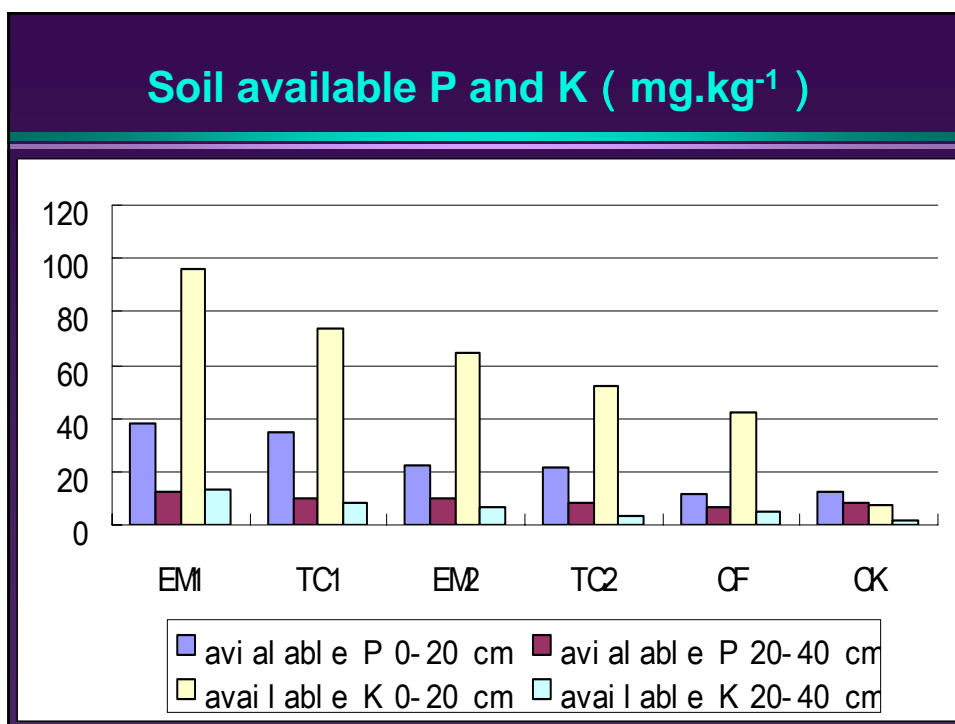
Field trial design

EM1 : EM compost 15t/ha ;
 TC1 : traditional compost 15t/ha ;
 EM2 : EM compost 7.5t/ha ;
 TC2 : traditional compost 7.5t/ha ;
 CF : conventional fertilizer CK(1.8t/ha, gross chemical
 fertilizers) ;
 CK : no fertilization , CK ;

6 treatments, 4 replicates
 Each plot: 10.5m×3m

N input:
 EM compost 15t/ha=300 kg/ha;
 Conventional CK=258 kg/ha

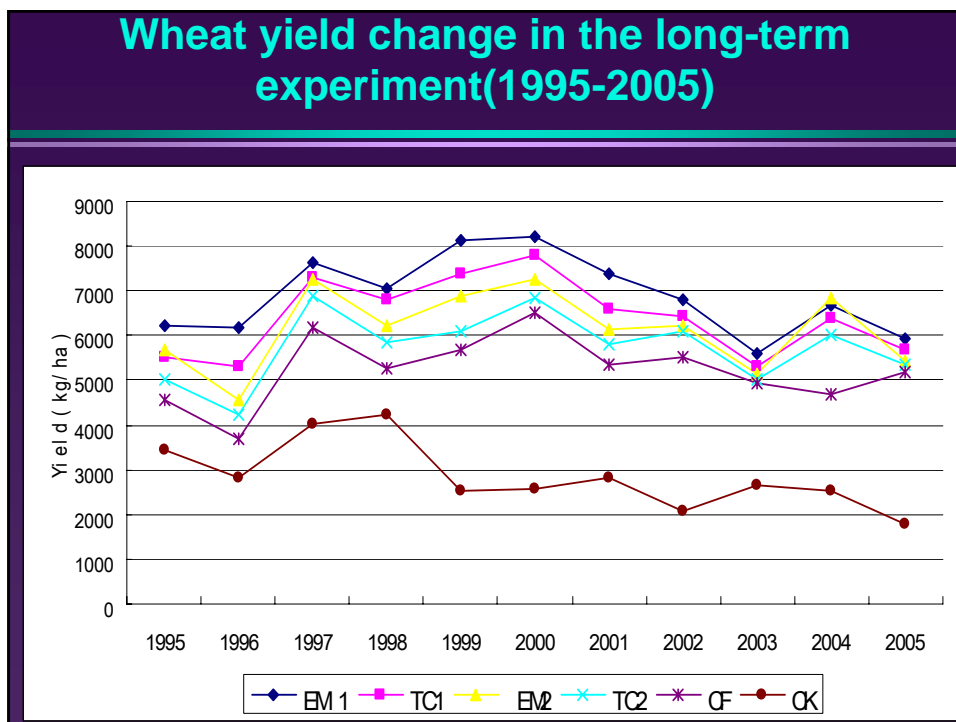
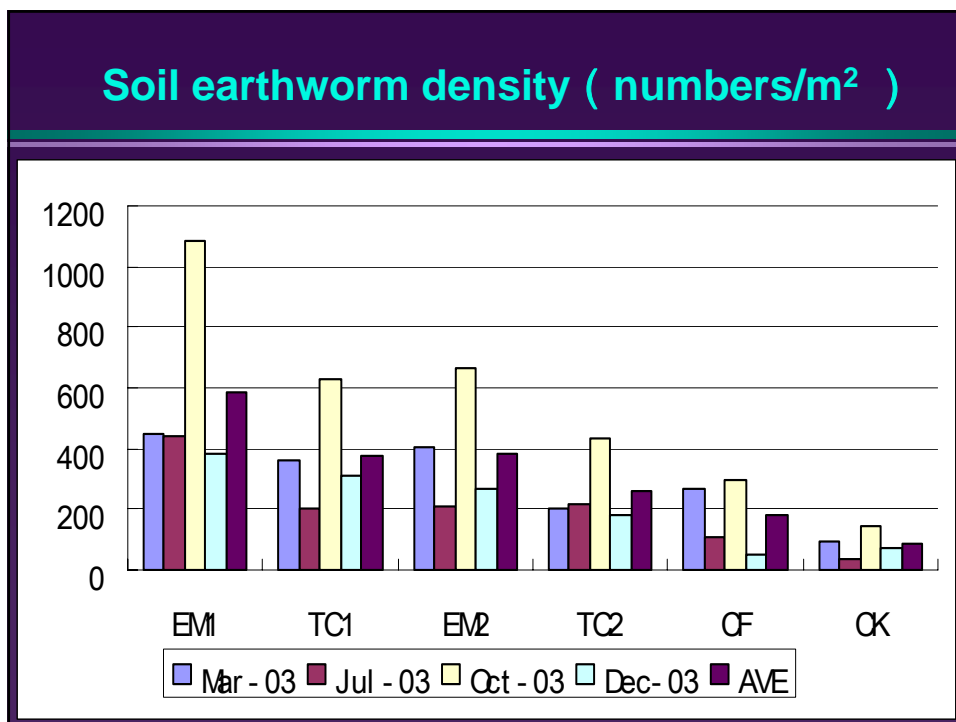


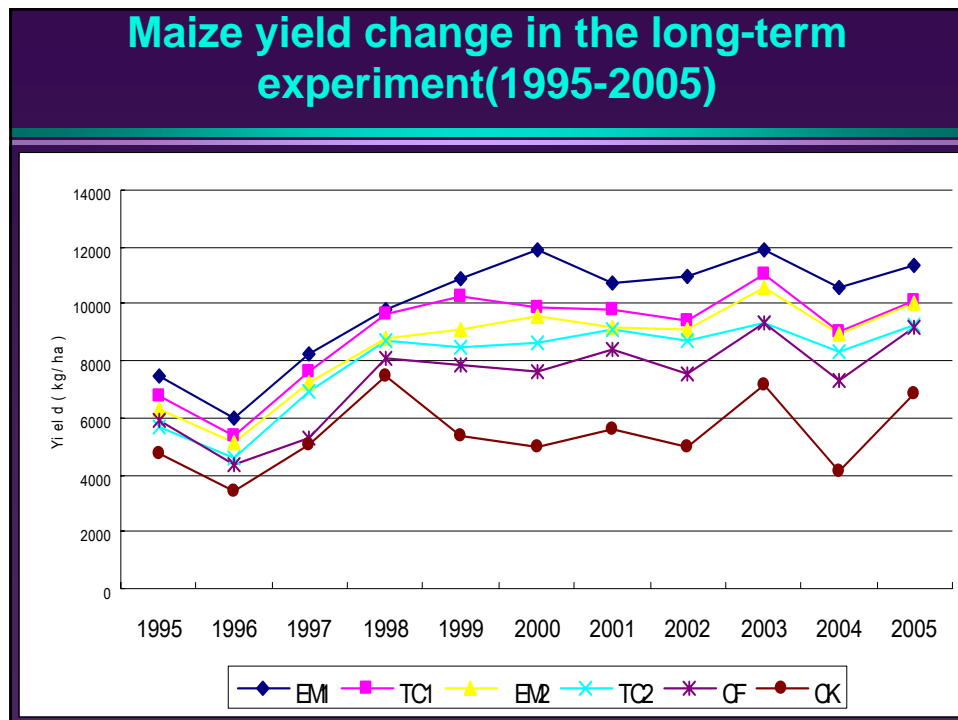


Soil microbial biomass C (mg.kg⁻¹)

Sampling time	EM1	TC1	CF	CK
Jun (2004)	233.10± 10.17a	225.67± 9.35a	145.99± 4.99b	123.48± 9.35b
Jul (2004)	327.16± 13.16a	294.91± 30.80a	159.65± 7.34b	128.25± 7.18b
Aug (2004)	268.14± 8.29a	243.79± 6.68b	156.81± 4.31c	144.89± 6.25c
Sep (2004)	242.38± 10.30a	214.24± 2.45b	125.45± 2.64c	108.79± 8.00c
Oct (2004)	299.96± 13.65a	256.34± 11.36a	140.14± 10.86b	129.15± 19.33b
Nov (2004)	353.58± 7.83a	337.74± 6.61a	148.49± 15.56b	147.16± 3.58b
Mar (2005)	283.59± 11.59a	255.72± 11.76a	169.14± 1.69b	153.51± 8.84b
Apr (2005)	385.99± 10.31a	349.31± 9.57b	206.41± 10.29c	207.24± 7.57c
May (2005)	344.08± 6.42a	302.37± 10.15b	232.00± 14.18c	189.77± 9.85d
Jun (2005)	298.35± 8.47a	277.84± 5.53a	199.80± 14.13b	175.93± 5.19b
Average	303.633	275.793	168.388	150.817
+%		10.09	80.32	101.33

*For 0-20 cm soil layer





- ### Greenhouse vegetable trial
1. **CONVENTIONAL:** all conventional adopted from local farm
 2. **LOW-INPUT:** reduced chemicals inputs
 3. **ORGANIC:** organic, biocompost (by using EM), Biocontrol

Experimental greenhouse



Cropping patterns

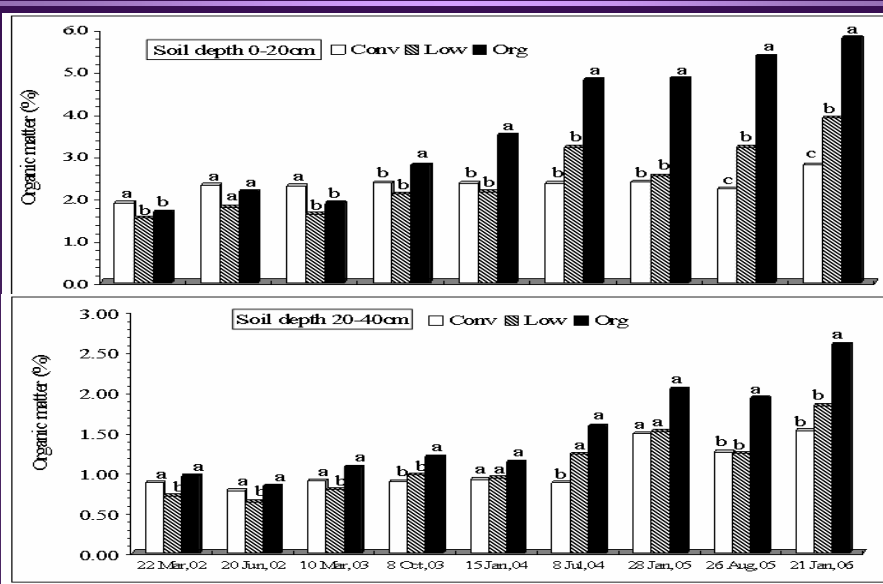
Cropping season	Planting crop
Autumn, 2002	Cucumber
Spring, 2003	Tomato
Autumn, 2003	Celery
Spring, 2004	Tomato
Autumn, 2004	Cucumber
Spring, 2005	Tomato
Autumn, 2005	Cucumber
Spring, 2006	Tomato

Nutrients inputs

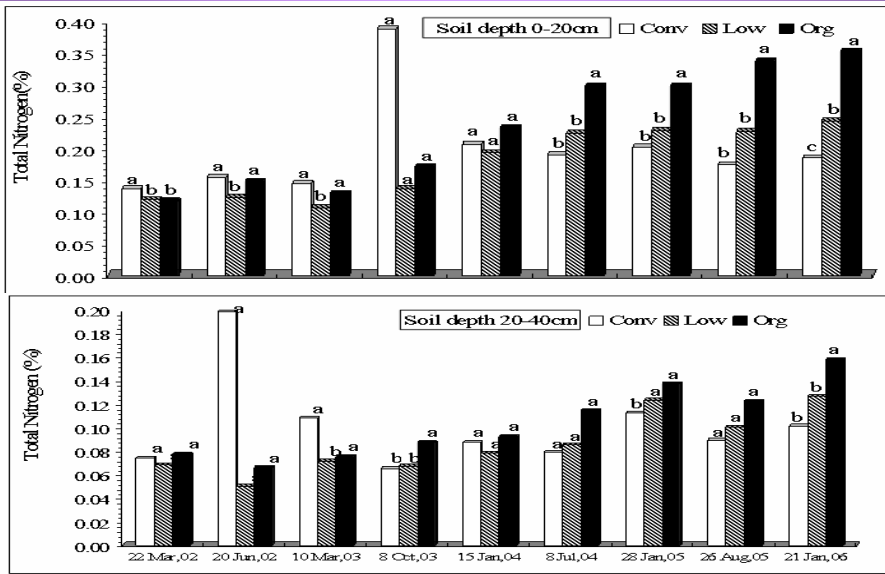
Table 1 The application rate of nutrients (kg ha⁻¹)

Cropping system	Fertilizer sources	Total N	Total P	Total K	Total
Conv	Chemical F.	861.50	327.00	281.25	1469.75
	Organic F.	0.00	0.00	0.00	0.00
	Total fertilizer	861.50	327.00	281.25	1469.75
Low	Chemical F.	338.75	107.00	218.75	664.50
	Organic F.	444.88	193.60	641.12	1279.60
	Total Fertilizer	783.63	300.60	859.87	1944.10
Org	Chemical F.	0.00	0.00	0.00	0.00
	Organic F.	889.75	387.19	1282.24	2559.18
	total fertilizer	889.75	387.19	1282.24	2559.18

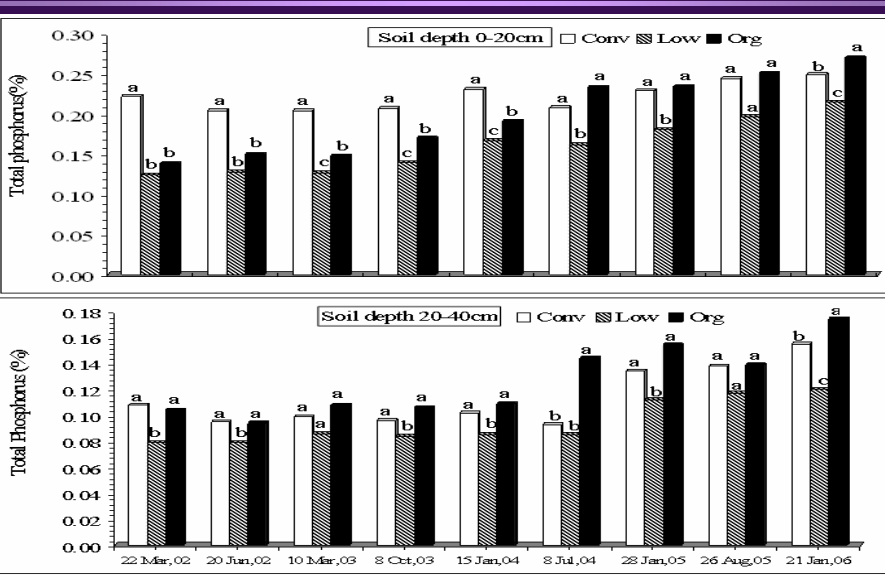
Organic matter content(%)



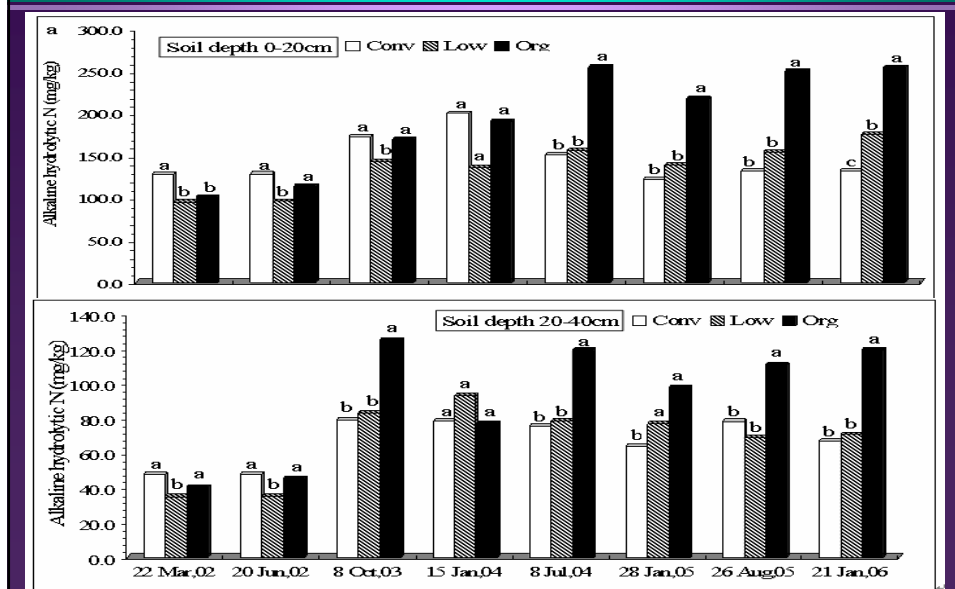
Soil total Nitrogen(%)



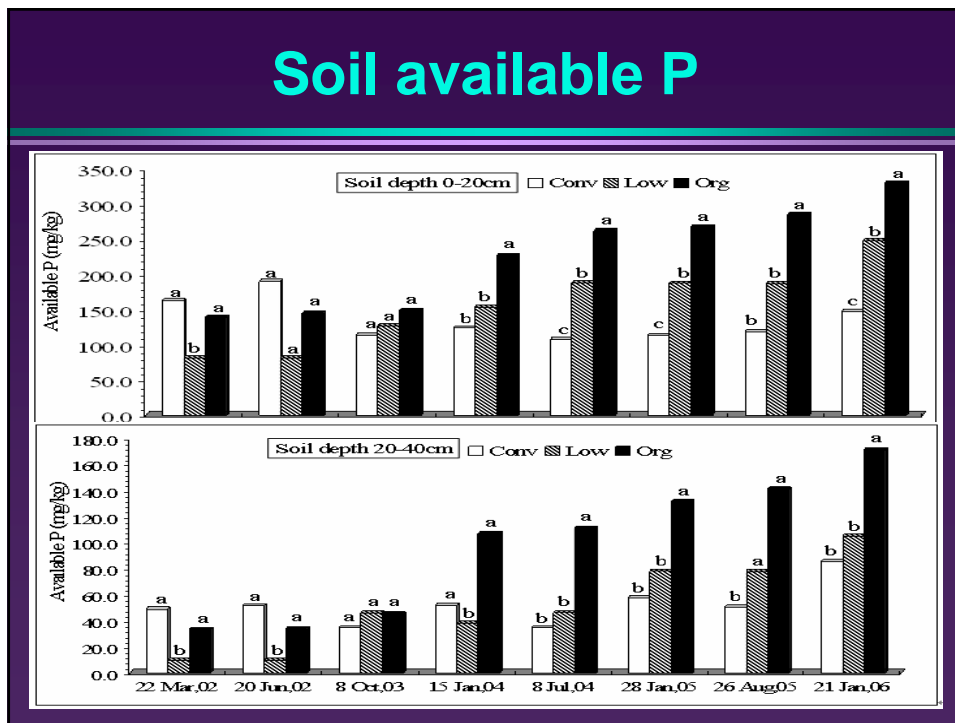
Soil total Phosphorus (%)

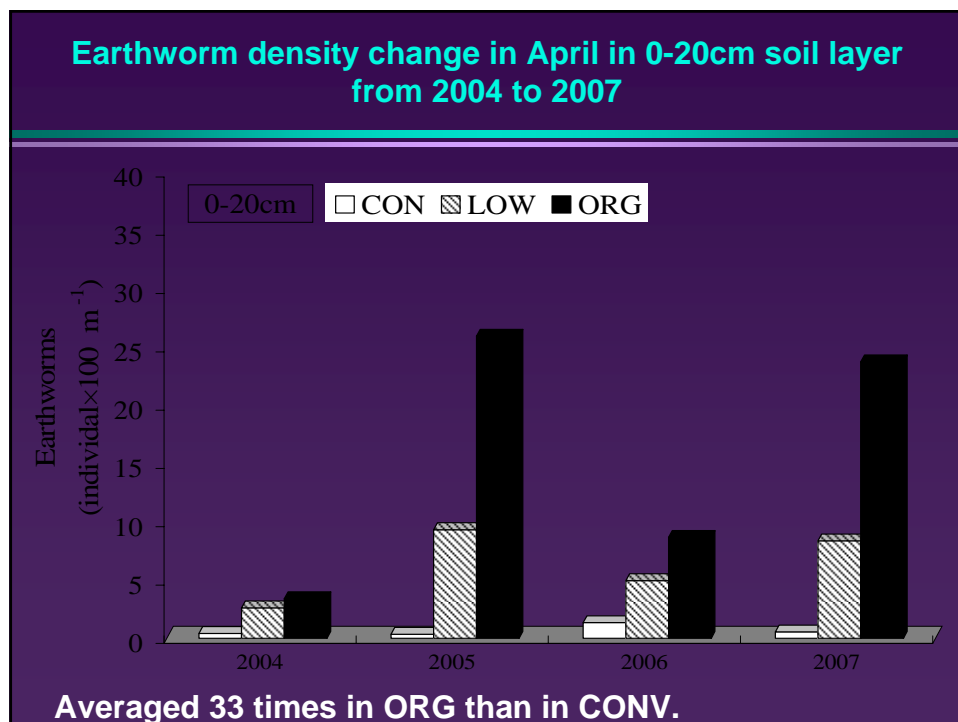
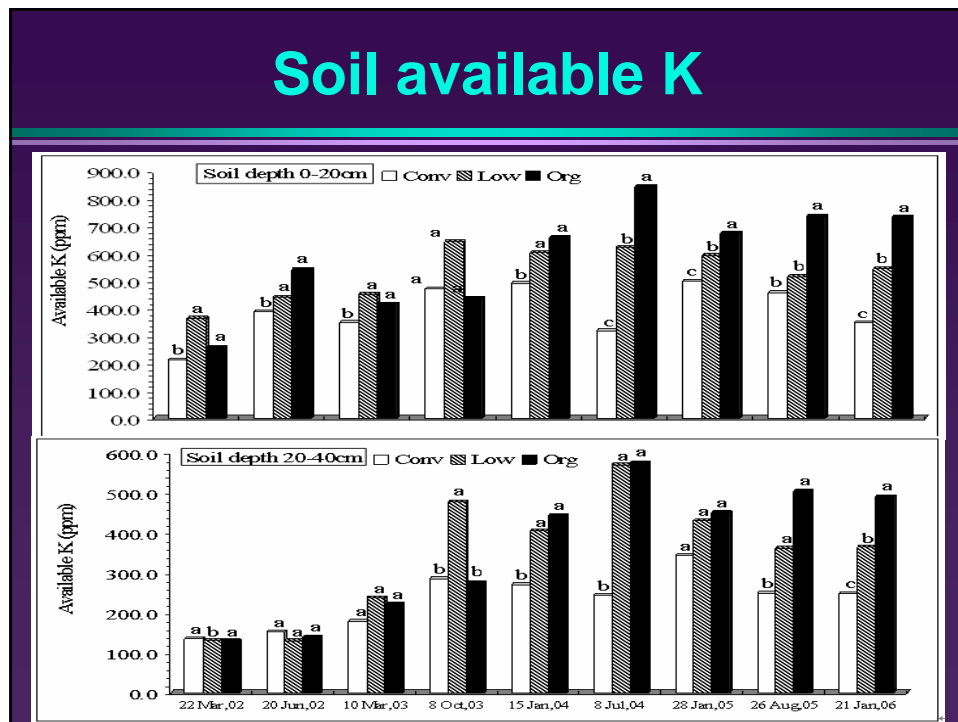


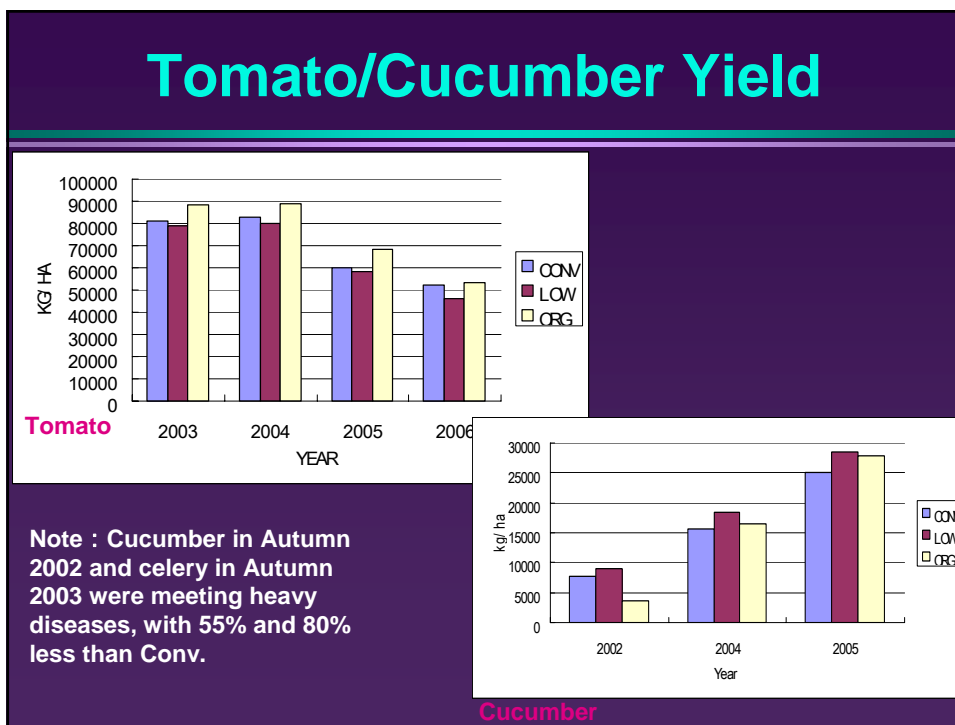
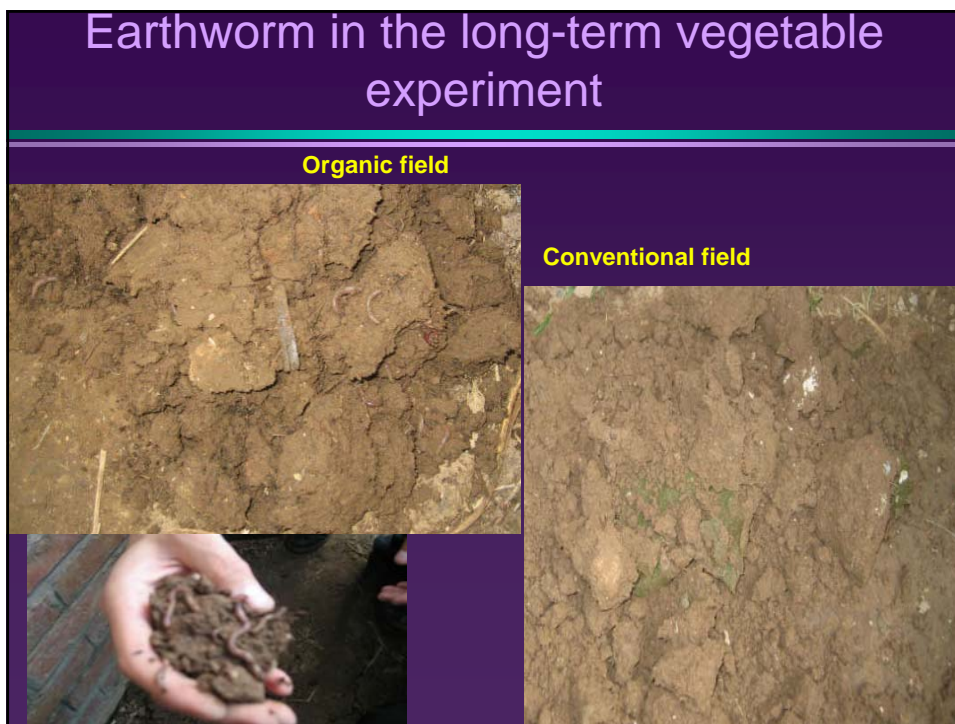
Soil alkaline hydrolyzable N (mg/kg)



Soil available P









Main results

1. Crop production compatible in both grain/vegetable cropping systems.
2. Soil fertility, as SOM and nutrients all improved substantially.
3. Soil biological indicators, as microbial biomass, earthworm density all increased a lot.
4. Compost amendment had significant effects on soil fertility and soil biodiversity.
5. Nutrients balance/soil microbial communities need to be paid more.

Ecological engineering on the recycling use of organic wastes

Eco-engineering in the composting of organic wastes

<p>Inoculants used in the rapid composting compound microorganisms</p> 	<p>Bio-fertilizer Nutrients balance Resistance to soilborne pathogens</p> 
<p>Process and facility development Solar energy use/greenhouse type Tunnel/bed composting</p>	<p>Bioremediation Degradation of pollutants Maintain/Build-up soil health</p>

Composting factory demonstration



Value-added compost manufactured from compound fertilizer production line



National composting technology and engineering training workshops(2004-,annually)



Next-stage directions

1. Strengthen up the inoculants research for a stable effects in speeding up the process and control the odor.
2. Soil-born disease reduced/reasons
3. International collaboration to understand the mechanisms in rebuilding up of soil health.
4. New methods communication, especially on the soil ecology, microbial ecology

Thanks !

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