



CHINA INDEPENDENT STUDY

China, like many industrialized country, is facing problems with the increased use and dependence on fertilizer. The Ministry of Agriculture entrusted the Chinese Academy of Agricultural Sciences (CAAS) to conduct research to help achieve China's mission to reduce it's fertilizer consumption. In the Jan.4th, 2010, *The Real Cost of Nitrogen Fertilizer* was released by Wen Tie jun, President of Agricultural and Rural Development Institute of China People's University, and an international environmental group. It reviewed and analyzed the industrial chain and application fact of Nitrogen fertilizer in China, reaching an conclusion that China's farm land is facing a serious problem of excess intake of this kind of chemical element. He also pointed out that China should manage to reduce at least 30% of Nitrogen fertilizer consumption by 2020.

Twenty three field tests were carried out in nine provinces.

Test design: Each crop was tested in two places, and every test include five treatments and repeated three times.

Types of soils covered

- Brown calcic soil, chestnut soil ,brown soil, moisture brown soil, black soil, moisture alkaline soil, rice soil, lateritic red soil, etc.

Thirteen crops tested

- Cereal: Wheat, Corn, Rice
- Oil Crop: Soybean, Sunflower Seed
- Cash Crop: Cotton, Tobacco, Sugar Cane, Rubber
- Grass Crop: Clover
- Fruit: Banana
- Vegetable: Cucumber, Tomato

CHINESE ACADEMY
OF AGRICULTURAL
SCIENCES (CAAS)
STUDY

ORYKTA® IS THE
VERY 1ST FOREIGN
MINERAL SOIL
AMENDMENT
REGISTERED IN
CHINA

“ Orykta® is the exact product that match China's Agriculture strategy and China's efforts to protect the environment.”

Summary of Test Results

- ✓ All the tests results ... showed prominent yield increase (more than 5%) which proved that Orykta® has a general applicability in China. The optimal usage of Orykta® range from 50 to 150kg/mu for most crops and 200 to 300kg/mu for vegetables. The yield increase rate can be as high as 44%.
- ✓ Analysis of the soil samples collected after the harvest showed that Orykta® made the soil more balanced and nutritious. Organic Material (OM) and Cationic Exchange Capacity (CEC) level increased, too . These are all critical factors to achieve better yield.
- ✓ Organic Material (OM) level is too difficult to increase under regular fertilization. Yet only one year of Orykta® application can raise the OM level by more than 0.05%.
- ✓ Orykta® can reduce salt level in soil.

**AS ORYKTA® CONTAIN
50-60% OF
MONTMORILLON WHICH
HAS A SPECIAL PROPERTY
OF ABSORB, PRESERVE
AND RELEASE INORGANIC
ION AND ORGANIC
MOLECULE, IT ALSO
SERVED AS
AN EXCELLENT SLOW-
RELEASE AGENT FOR
NITROGEN FERTILIZER.**

Crop	Venue	Soil Texture (O – Organic Matter)	Production Increased 1 mu (0.165 acre, .4 HA)	Effect
Wheat	Shandong	Brown soil 0-1.1, N- 48, P-31, K-55, pH 5.7	24.6-31.6 kg/mu 5.6-7.2%	More pre-winter tillers
	Beijing	Fluvo-aquic soil 0-1.6, N-82, P-83, K-88	25.6-29.0 kg/mu 6.8-7.7%	Less nonproductive tiller; higher content of chlorophyll and weight of thousand grains increased
Corn	Heilongjiang	Black soil 0-5.1, N-154, P-15 , K-141 pH6.51	10.0-37.8kg/mu 11.2%	Early earing and maturity date, 2- 3 days ahead.
	Shandong	Fluvo-aquic soil medium fertility 0-1.1 N-50, P-34, K-99 pH 7.2	17.8-31.9kg/mu 4.6-8.2%	
Soybean	Heilongjiang	Lessive meadow soil 0-3.41 N-126, P- 24, K-73 pH6.02	20kg/mu 9.5%	Taller plant ... more branching, segment and larger pod
	Shandong	Fluvo-aquic soil - medium fertility 0-1.1 N-43, P-41, K-89 pH-7.1	1.1-15.5 kg/mu 6.5-6.7%	
Sunflower Seed Oil	Qinghai	Chestnut colored soil 0-1.6 N-151, P- 35, K-145 pH-8.12	7.3-10.7kg/mu 3.3-4.84%	increase weight of hundred grains
	Mongolia	Alkaline Meadow soil 0-1.06 N-18, P-5, K-85 pH-8.6	16.7- 75.8kg/mu 9.7-44.2%	
Cotton	Shandong	Fluvo-aquic soil 0- 1.05 N-38, P-30, K-85 pH-7.3	2.1-7.4kg/mu 1.9-6.7%	

Crop	Venue	Soil Texture (O – Organic Matter)	Production Increased 1 mu (0.165 acre, .4 HA)	Effect
	Hebei	Medium Alkaline Fluvo-aquic soil (0.36%) 0-0.9 N-22, P-19, K-86 pH-7.82	3.34-27.7 kg/mu 13.5-16.0%	Increase seedling rate between 36.6-67.3%
Rice	Hubei	Rice paddy soil	28.3-66.7 kg/mu 13.2-31.2%	More tillers higher weight of thousand grains
	Anhui	Rice paddy soil 0-3.2 pH-5.28	23.9-46.7 kg/mu 5.03-9.83%	More productiv tiller, higher mature rat, increase weight of thousand grains. early tiller date ,4 days ahead
Tomato	Beijing		80.3-106.0 kg/mu 9.7-12.9%	
	Shandong	Brown soil 0-0.9 N-73, P-35, K-183 pH-5.4	206-239 kg/mu 5.8-7.2%	
Cucumber	Beijing		354-503 kg/mu 4.8-6.8%	
	Shandong	Brown Soil O-1.64 N-96, P-142, K-236 pH-5.4	175-247 kg/mu 8.2- 11.6%	
Clover	Mongolia	Brown soil 0-0.9 N-41, P-16, K-105 pH-8.0	90.0-173.3 kg/mu 14.2-27.3%	
	Qinghai	Chestnut colored soil 0-2.0 N- 96, P-20, K-105 pH-8.0	Less than 3%	
	Hubei	Brown soil , 800 m above sea level	1.4-5.0 kg/mu 1.3-3.7%	

Crop	Venue	Soil Texture (O – Organic Matter)	Production Increased 1 mu (0.165 acre, .4 HA)	Effect
Tobacco	Quang Xi	Cie paddy soil -medium fertility O-2.5 N-203 , P-17, K-26 pH-5.08	2.50-4.17 kg/mu 1.60-2.67%	Increase weight of high quality tobacco 111 small amount
Sugar Cane	Quang Xi	Latosolic red soil – medium fertility O-2.15 N-99, P-27, K-223 pH-5.2	160-557kg 2.92-10.1 6%	productive canes increased by 43- 103cane/mu . sugar content in the cane increased by 0.69-0.93(BX)
Banana	Quang Xi	Latosolic red soil – medium fertility O-3.6 N-125, P-7.4, K-61 pH-5.45 CEC-20.49 coml/100g	84.2-177.3 kg 3.17-6.68%	Early budding at, 3-6 days ahead plant height , stem width&length, width of bud, length of fruit improved. more fruit, increase average fruit weight
Rubber	Quang Xi	Latosolic red soil – medium fertility O-2.22 N-75, P-0.6, K-22 pH-4.64	6.27- 10.53kg/ mu 3.98- 6.68% Increase latex by 42.5-125.4	Rubber hydrocarbon content in latex increased by 0. 7-1.4%

Eight soil sample packages of cucumber, tomato, sunflower seed oil, soybean and cotton from three provinces: ShanDong, Mongolia and He Bei were received. Each package included three samples: untreated soil before harvest(BEFORE), fertilized soil without Orykta® after harvest(CK) and fertilized soil with Orykta® (AFTER).

The analysis items were OM, available N,P,K, CEC, micro-nutrition, conductivity ,total salt and PH .

As the demonstration tests are conducted on large fields, the result might varied according to the soil condition , fertilizing and management, and might not be as scientifically accurate as those of small-scale tests. However, the general list (Chart 1) shows that Orykta® improved the soil as well as yields as it did in small-scale tests . Chart 1.General Analysis OM and CEC are key criteria when assessing the soil quality.

CHART 1 - General Analysis OM and CEC

crop	place		OM %	CEC Coml (+) /kg	N mg/kg	P mg/kg	K mg/kg	Zinc mg/kg	Copper mg/kg	Iron mg/kg	boron mg/kg	conductivity us/cm	Total salt %	pH
Cucumber	SHANDONG	BEFORE	1.37	16.9	89.9	186	553	5.85	2.13	15.4	1.23	273	0.087	8.09
		CK	1.37	15.8	94.8	225	598	6.63	1.73	17.3	1.5	462	0.148	7.85
		AFTER	1.47	15.8	93.4	217	622	6.06	1.87	18.7	1.26	505	0.162	7.74
	HE BEI	BEFORE	2.89	13.3	112	347	165	6.33	3.77	19.6	1.55	380	0.122	8.33
		CK	3.17	13.9	117	357	175	8.04	4.53	24.9	2.03	335	0.107	8.34
		AFTER	3.19	14	124	412	192	8.7	4.08	27.5	2.42	388	0.124	8.16
Tomato	SHANDONG	BEFORE	1.79	14.3	127	225	375	3.03	3.07	21.5	1.03	257	0.082	7.24
		CK	1.89	15.3	116	222	342	4.49	2.73	25.5	1.54	300	0.096	7.63
		AFTER	2.15	15	125	262	355	5.3	3.16	30	1.51	378	0.121	7.43
	HE BEI	BEFORE	1.8	13.6	80.4	140	244	3.98	3.8	10.8	2.39	900	0.288	7.98
		CK	1.43	12.1	82.1	154	172	4.9	2.08	12.2	1.84	343	0.11	8.5
		AFTER	1.6	12.6	85	186	152	4.68	2.17	13.5	1.6	342	0.109	8.47
Cotton	SHANDONG	BEFORE	0.901	9.8	48.4	6.3	152	0.78	1.37	8.36	0.9	2310	0.739	7.82
		CK	1.68	11.7	106	64.5	143	1.87	1.29	10.9	1.38	294	0.094	8.31
		AFTER	1.91	13	110	77.5	170	2.19	1.32	10.9	1.46	422	0.135	8.19
	HEBEI	BEFORE	1.35	12.7	59	5.7	352	1.62	2.66	19	1.3	5330	1.706	7.65
		CK	1.6	13.6	123	6.9	352	4.63	2.69	22.8	1.64	2120	0.678	8.09
		AFTER	1.55	12.6	128	5.9	430	7.12	2.79	24.5	1.83	2050	0.656	8.65
SunflowerOil	MONGOLIA	BEFORE	0.95	9.4	58.3	8.6	129	0.62	0.76	7.04	0.58	512	0.164	8.21
		CK	0.643	8.4	37.2	5.4	102	0.66	0.55	6.74	0.46	95	0.03	8.79
		AFTER	0.654	7.9	41.4	6.8	115	0.79	0.54	6.4	0.49	99	0.032	8.52
Soybean	SHANDONG	BEFORE	1.29	13.6	66	15	113	1.06	1.44	8.36	0.85	188	0.06	8.33
		CK	1.41	13.3	72.3	13	89.3	1.24	1.16	6.48	0.89	139	0.044	8.67
		AFTER	1.31	14.1	66.7	15	102	1.05	1.28	6.04	0.89	135	0.043	8.79

As seen in Chart 2 ,Orykta® balanced the negative influence of fertilizers. The data fully proved that Orykta® increased the yield without decrease the fertility, and the OM and CEC are all raised.

CHART 2- Comparison of OM and CEC Change

crop	place	treat	OM %	OM change (-)		CEC Coml (+) /kg	CEC change (-)	
				AFTER v. BEFORE	AFTER v. CK		AFTER v. BEFORE	AFTER v. BEFORE
CUCUMBER	SHANDONG	BEFORE	1.37	--		16.9	--	
		CK	1.37	+ 0.00	--	15.8	- 1.1	--
		AFTER	1.47	+ 0.10	0.10	15.8	- 1.1	+ 0.0
	HEBEI	BEFORE	2.89	--		13.3	--	
		CK	3.17	+ 0.28	--	13.9	+ 0.6	--
		AFTER	3.19	+ 0.30	+ 0.02	14	+ 0.7	+ 0.1
TOMATO	SHANDONG	BEFORE	1.79	--		14.3	--	
		CK	1.89	+ 0.1	--	15.3	+ 1.0	--
		AFTER	2.15	+ 0.36	+ 0.26	15	+ 0.7	- 0.3
	HEBEI	BEFORE	1.8	--		13.6	--	
		CK	1.43	- 0.37	--	12.1	- 1.5	--
		AFTER	1.6	- 0.20	+ 0.17	12.6	- 1.0	+ 0.5
COTTON	SHANDONG	BEFORE	0.9	--		9.8	--	
		CK	1.68	+ 0.78	--	11.7	+ 1.9	--
		AFTER	1.91	+ 1.01	+ 0.23	13	+ 3.2	+ 1.3
	HEBEI	BEFORE	1.35	--		12.7	--	
		CK	1.6	+ 0.25	--	13.6	+ 0.9	--
		AFTER	1.55	+ 0.20	- 0.05	12.6	- 0.1	- 1.0
SUNFLOWER OIL	MONGOLIA	BEFORE	0.95	--		9.4	--	
		CK	0.643	- 0.307	--	8.4	- 1.0	--
		AFTER	0.654	- 0.296	0.011	7.9	- 1.5	- 0.5
SOYBEAN	SHANDONG	BEFORE	1.29	--		13.6	--	
		CK	1.41	+ 0.12	--	13.3	- 0.3	--
		AFTER	1.31	+ 0.02	- 0.10	14.1	+ 0.5	+ 0.8

As seen in chart 3,

- Hydrolysable nitrogen: Comparing with BEFORE (untreated), AFTER (fertilized soil with Orykta after harvest) increased at rates from 1.1% to 127.3%; comparing with CK, the increase rates are from 3.5% to 7.8%.
- Available phosphor: Comparing with BEFORE, AFTER increased at rates from 3.5% to 1130.2%; comparing with CK, at rates from 15.4% to 25.9%
- Available potassium: there are ups and downs, but applying Orykta is obviously better than using fertilizer only. Comparing with CK, AFTER increased at rates from 14.2% to 22.2%.

CHART 3 - Macro-Nutrition Change

Crop	Place	treat	N mg/kg	Change of N (+)		phosphor mg/kg	Change of P (+)		K mg/kg	Change of K (,)	
				AFTER	AFTER		AFTER	AFTER		AFTER	AFTER
				v. BEFORE	v. CK		v. BEFORE	v. CK		v. BEFORE	v. CK
CUCUMBER	SHANDONG	BEFORE	89.9	--		186	--		553	--	
		CK	94.8	+ 4.9	--	225	+ 39	--	598	+ 45	--
		AFTER	93.4	+ 3.5	-1.4	217	+ 31	-8	622	+ 69	+ 24
	HEBEI	BEFORE	112	--		347	--		165	--	
		CK	117	+ 5	--	357	+ 10	--	175	+ 10	--
	AFTER	124	+ 12	+ 7	412	+ 65	+55	192	+ 27	+ 17	
TOMATO	SHANDONG	BEFORE	127	--		225	--		375	--	
		CK	116	- 11	--	222	-3	--	342	-33	--
		AFTER	125	- 2	+ 9	262	+ 37	+40	355	-20	+ 13
	HEBEI	BEFORE	80.4	--		140	--		244	--	
		CK	82.1	+ 1.7	--	154	+ 14	--	172	-72	--
	AFTER	85	+ 4.6	+2.9	186	+ 46	+32	152	-92	-20	
COTTON	SHANDONG	BEFORE	48.4	--		6.3	--		152	--	
		CK	106	- 57.6	--	64.5	- 58.2	--	143	-9	--
		AFTER	110	61.6	4	77.5	- 71.2	13	170	+ 18	+ 27
	HEBEI	BEFORE	59	--		5.7	--		352	--	
		CK	123	+ 64	--	6.9	+ 1.2	--	352	0	--
	AFTER	128	+ 69	5	5.9	+ 0.2	- 1.0	430	+ 78	+ 78	
SUNFLOWER OIL	MONGOLIA	BEFORE	58.3	--		8.6	--		129	--	
		+			+			+			
		CK	37.2	- 21.1	--	5.4	- 3.2	--	102	- 17	--
		AFTER	41.4	- 16.9	+4.2	6.8	- 1.8	1.4	115	- 4	+ 13
	+			-			+				
SOYBEAN	SHANDONG	BEFORE	66	--		15	--		113	--	
		CK	72.3	+ 8.3	--	13	- 2	--	89.3	-23.7	--
		AFTER	66.7	+ 0.7	-7.6	15	0	+ 2	102	-11	+ 12.7

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As seen in Chart #4

- Zinc: Comparing with BEFORE, AFTER increased at rates from 27.4% to 339.5%; comparing with CK, the increase rates are from 19.7% to 53.8%. among all the samples, Orykta® works the best on the high ph soil.
- Copper: Comparing with BEFORE, AFTER reduced 3.6-42.9%, yet the decrease amount are lower than those of CK.
- Iron: Comparing with BEFORE, AFTER increased at rates from 30.4% to 41.9%; comparing with CK, the increase rates are form 10.7% to 21.6%.
- Boron: Comparing with BEFORE, AFTER increased at rates from 2.4% to 56.1%; comparing with CK, the increase rates are from 6.5% to 19.2.

CHART 4 - Micro-Nutrition Change

crop	place	Zinc mg/kg	Change of Zinc (+, -)		Copper mg/kg	Change of Copper (+, -)		Iron mg/kg	Change of Iron (+)		Boron mg/kg	Change of Boron (+, -)		
			treat	Av. B		Av. CK	Av. B		Av. CK	Av. B		Av. CK	Av. B	Av. CK
CUCUMBER	SHANDONG	B	5.85	--		2.13	--		15.4	--		1.23	--	
		CK	6.63	0.78	--	1.73	-0.4	--	17.3	+ 1.9	--	1.5	0.27	--
		A	6.06	0.21	-0.57	1.87	-0.26	0.14	18.7	+ 3.3	+ 1.4	1.26	0.03	-0.24
	HEBEI	B	6.33	--		3.77	--		19.6	--		1.55	--	
		CK	8.04	1.71	--	4.53	0.76	--	24.9	+ 5.3	--	2.03	0.48	--
		A	8.7	2.37	0.66	4.08	0.31	-0.45	27.5	+ 7.9	+ 2.6	2.42	0.87	0.39
TOMATO	SHANDONG	B	3.03	--		3.07	--		21.5	--		1.03	--	
		CK	4.49	1.46	--	2.73	-0.34	--	25.5	+ 4.0	--	1.54	0.51	--
		A	5.3	2.27	0.81	3.16	0.09	0.43	30	+ 9.0	+ 5.5	1.51	0.48	-0.03
	HEBEI	B	3.98	--		3.8	--		10.8	--		2.39	--	
		CK	4.9	0.98	--	2.08	-1.72	--	12.2	+ 1.4	--	1.84	-0.55	--
		A	4.68	0.7	-0.22	2.17	-1.63	0.09	13.5	+ 2.7	+ 1.3	1.6	-0.79	-0.24
COTTON	SHANDONG	B	0.78	--		1.37	--		8.36	--		0.9	--	
		CK	1.87	1.09	--	1.29	-0.08	--	10.9	2.54	--	1.38	0.48	--
		A	2.19	1.41	0.32	1.32	-0.05	0.03	10.9	2.54	0	1.46	0.56	0.08
	HEBEI	B	1.62	--		2.66	--		19	--		1.3	--	
		CK	4.63	3.01	--	2.69	0.03	--	22.8	+ 3.8	--	1.64	0.34	--
		A	7.12	5.5	2.49	2.79	0.13	0.1	24.5	+ 5.5	+ 1.7	1.83	0.53	0.19
SUNFLOWER OIL	MONGOLIA	B	0.62	--		0.76	--		7.04	--		0.58	--	
		CK	0.66	0.04	--	0.55	-0.21	--	6.74	0.3	--	0.46	-0.12	--
		A	0.79	0.17	0.13	0.54	-0.22	-0.01	6.4	-0.64	-0.34	0.49	-0.09	0.03

crop	place	Zinc mg/kg treat	Change of Zinc (+, -)		Copper mg/kg	Change of Copper (+, -)		Iron mg/kg	Change of Iron (+)		Boron mg/kg	Change of Boron (+, -)		
			Av. B	Av. CK		Av. B	Av. CK		Av. B	Av. CK		Av. B	Av. CK	
SOYBEAN	SHAN	B	1.06	--		1.44	--		8.36	--		0.85	--	
	DONG	CK	1.24	0.18	--	1.16	-0.28	--	6.48	-1.9	--	0.89	0.04	-
		A	1.05	-0.21	-0.19	1.28	-0.16	+ 0.12	6.04	-2.32	-0.44	0.89	+ 0.04	0

Change in the Salt Level

We can see clearly in the Chart 1 that ORYKTA® act the most efficiently in saline soils .It reduces the total salt level, making the crop healthier.

Cotton soil from He Bei(saline soil): the whole salt level reduced from 1.706% to 0.656% at a rate of 61.5%. Vegetable soil from He Bei: reduced 62.29%.