Vital Earth Resources
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2009 Crop Results

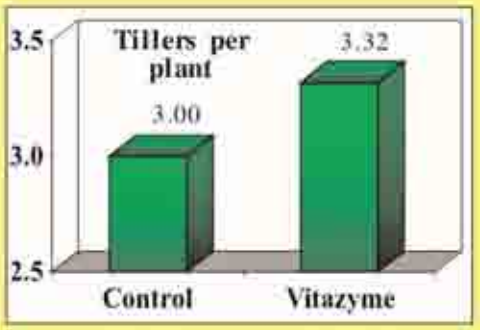
Vitazyme on Rice

Researcher: Wang Ahongyan, Hunan Horticultural Research Institute, and Liu Shibia, Changde Jingshi Agriculture Bureau; Liu Shi, Zhang Jinping, and Song Jianping, Changde Jingshi Agriculture Bureau.
Location: Xinzhou, Jinshi, Hunan, China *Variety*: Xiangzaoxian 17 *Seeding rate*: unknown
Planting date: March 26, 2009
Experimental design: A rice field was divided into Vitayme treated and untreated plots (0.4 ha each), and the two treatments were replicated three times. The purpose of the study was to determine the effects of Vitazyme, applied twice, on crop growth and yield.

1. Control **2. Vitazyme**

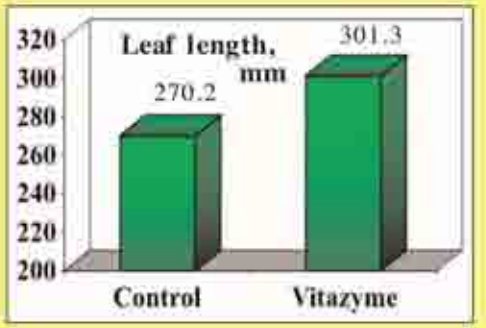
Fertilization: unknown
Vitazyme application: (1) 5% seed soak for 24 hours before planting; (2) 1.0 liter/ha sprayed on the leaves at the early boot stage (June 9); (3) 1.0 liter/ha sprayed on th leaves at early flowering (June 16)
Growth results:

Tillers



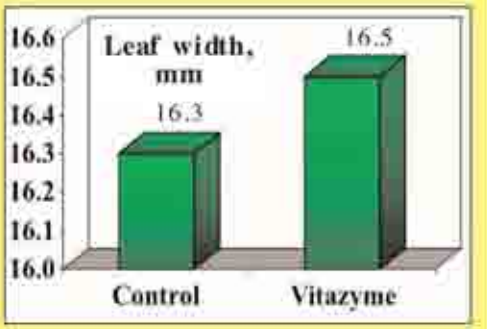
Increase in tillers with Vitazyme: 11%

Length of Last Leaf



Increase in last leaf length with Vitazyme: 12%

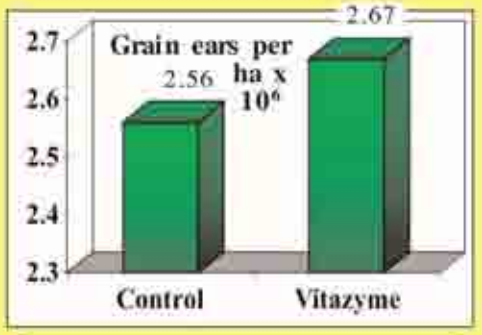
Width of Last Leaf



Increase in last leaf width with Vitazyme: 1.2%

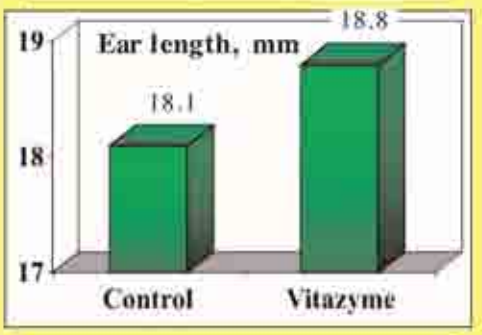
Yield results:

Effective Leaves



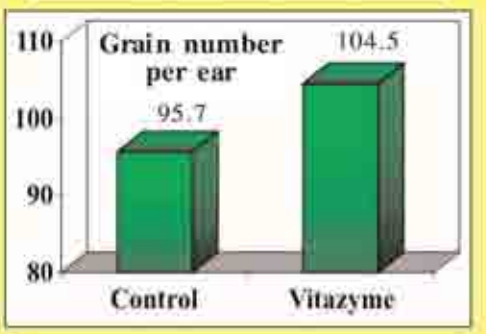
Increase in effective ears per ha with Vitazyne: 4.3%

Ear Length



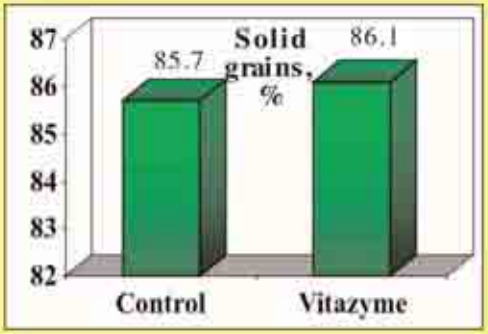
Increase in ear length with Vitazyme: 4%

Grains Per Ear



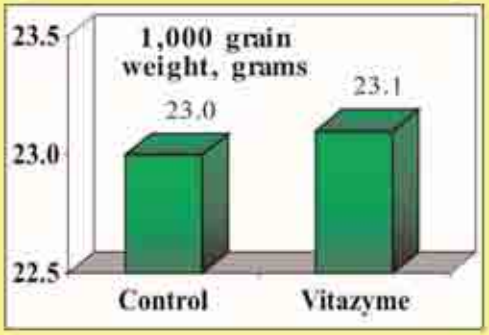
Increase in grains per ear with Vitazyme: 9%

Percent of Solid Grains



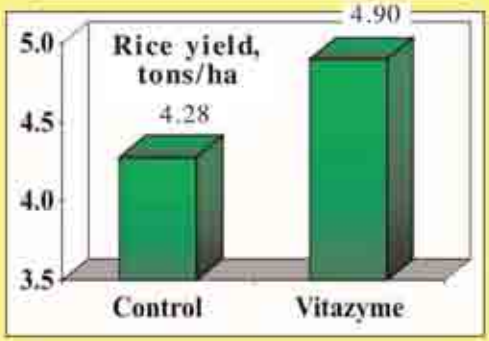
Increase in percentage of solid grains with Vitazyme: 0.5%

Weight of 1,000 Grains



Increase in 1,000 grain weight with Vitazyme: 0.4%

Grain Yield



Increase in rice grain yield with Vitazyme: 14%

Income results: See below.

Treatment	Income	Income change
	RMB/ha	RMB/ha
1. Control	7,704	—
2. Vitazyme	8,820	1,116 (+15%)

Increase in income with Vitazyme: 15%

Conclusions: This replicated rice trial in China revealed that Vitazyme improved rice yield by 14% (0.62 tons/ha). Moreover, income was increased by 15%. This improvement was the result of a broad spectrum of improvement of the rice plants, as summarized on the left. Vitazyme is proven to be a most excellent product for the improvement of rice yield and quality in China.

Parameter	Increase with Vitazyme
Tillers	11%
Length of last leaf	12%
Width of last leaf	1.2%
Effective leaves	4.3%
Ear length	4%
Grains per ear	9%
Percent of solid grains	0.5%
1,000 grain weight	0.4%
Grain yield	14%

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2009 Crop Results

Vitazyme on Rice

Researcher: agronomists at AGPPS, Long Xuyen town, An Giang Province, South Viet Nam
Location: Ba Tri, Ben Tre Province, South Viet Nam *Variety*: VD20
Planting date: Nov.-Dec., 2008 *Soil type*: unknown *Seeding rate*: unknown
Experimental design: A Vitazyme study was designed in Ba Tri Province to evaluate the effect of Vitazyme on rice height, leaf width, panicle length, and grain yield, using plots of 1,000 m^2 for each of the following three treatments.

Treatment	Vitazyme, days after planting			Rate
	20	40	60	liters/ha
Control	O	O	O	0
Vitazyme 1	X	O	X	1.0
Vitazyme 2	X	X	X	1.2

Fertilization: unknown
Vitazyme application: Rates were 1.0 or 1.2 liters/ha, applied 20, 40, or 60 days after planting to the soil and leaf surfaces of the plots. "Vitazyme 2" is termed the "Farmer treatment", likely because it is close to the program a typical farmer would use in the area.
Growth results: During plant growth the height, leaf width, and panicle length of the plants were measured.

Treatment	Plant Height		Leaf Width		Panicle Length	
	Height	Change	Width	Change	Length	Change
	cm	cm	cm	cm	cm	cm
Control	98.89	—	1.27	—	22.49	—
Vitazyme 1	100.65	1.76(+2%)	1.34	0.07 (+6%)	22.84	0.35 (+2%)
Vitazyme 2	99.05	0.16 (+0%)	1.29	0.02 (+2%)	22.79	0.30 (+1%)

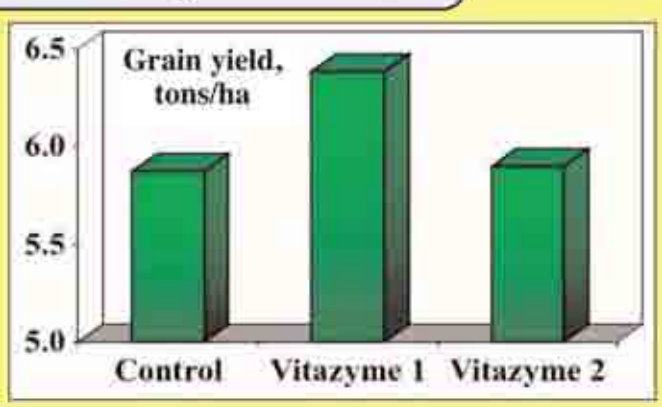
Increase in plant height with Vitazyme: 2%

Increase in leaf width with Vitazyme: 2 to 6%

Increase in panicle length with Vitazyme: 1 to 2%

Yield results:

Treatment	Rice yield	Yield change
	tons/ha	tons/ha
Control	5.87	—
Vitazyme 1	6.38	0.51 (+9%)
Vitazyme 2	5.90	0.03 (0%)



Conclusions: This Vietnamese rice test, using two different Vitazyme programs, of 1 liter/ha twice or 1.2 liters/ha three times, showed that this product increased plant height by up to 2%, leaf width by from 2 to 6%, but panicle length very little, from 1 to 2%. The yield of grain was boosted very little with the 1.2 lter/ha applications, but by 9% by Vitazyme applied twice at 1.0 liter/ha, showing the considerable efficacy of this biostimulant to improve rice growth and yield.

Increase in yield with Vitazyme
1 liter/ha twice ..... +9%

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2009 Crop Results

Vitazyme on Rice

Researcher: Ngo Dang Vu (Mekong Delta), Viet Nam
Location: An Phu Village, Chau Doc District, An Giang Province
Variety: OM6561
Soil type: alluvial
Planting date: December 15, 2008
Soil fertility level: low

Experimental design: A rice field was divided into two treatments, the Vitazyme plot having a reduced fertilizer regime, to determine the effect of Vitazyme on rice yield. The control plot was the farmer's usual practice.

1. Control (farmer's practice) **2. Vitazyme (farmer's practice with reduced fertilizer)**

Fertilizer applications:

Time	Control	Vitazyme
days after sewing	kg/ha	kg/ha
10	50 urea + 80 DAP*	50 urea + 80 DAP*
20	100 urea + 80 DAP*	80 urea + 50 DAP*
30	50 urea + 50 NPK**	None
50	50 urea + 50 KCl***	50 urea + 50 KCl***

*DAP = diammonium phosphate (18-46-0% N-P_2O_5-K_2O)
**NPK = mixed fertilizer (16-16-8% N-P_2O_5-K_2O)
***KCl = potassium chloride (0-0-60% N-P_2O_5-K_2O)

Total nutrients applied

Treatment	N	P_2O_5	K_2O
	kg/ha	kg/ha	kg/ha
Control	152	82	34
Vitazyme	106	60	30
Percentage reduction, Vita	30%	27%	12%

Vitazyme application: (1) 1 liter/ha on the soil one hour before sowing; (2) 1 liter/ha on the leaves and soil 30 days after sowing; (3) 1 liter/ha on the leaves and soil 50 days after sowing

Yield results: Actual yields are not available, but the Vitazyme treated plot yielded 600 kg/ha more rice than the normal farmers' practice.

Increase in rice yield with Vitazyme + reduced fertilizer: 600 kg/ha

Fertilizer savings with Vitazyme: Fertilizer was reduced with Vitazyme applications by the following amounts:

Days after sowing	Fertilizer savings with Vitazyme
	kg/ha
10	0
20	20 urea + 30 DAP
30	50 urea + 50 NPK
50	0

Conclusions: This Vietnamese rice study revealed that Vitazyme applied three times — an hour before sowing, 30 days after sowing, and 50 days after sowing, each time at liter/ha — together with reductions in fertilizer from the farmers' tradition practices of 30% N, 27% P_2O_5, and 12% K_2O, resulted in a 600 kg/ha increase in grain production. Vitazyme contributed to improved nitrogen, phosphorus, and potassium utilization, which resulted in a substantial yield improvement, thus saving the farmer on import costs and improving his total salable crop.

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2009 Crop Results

Vitazyme on Rice

Researcher: agronomists at AGPPS, Long Xuyen town, An Giang Province, South Viet Nam
Location: Tieu Can, Tra Vinh Province, South Viet Nam *Variety*: OM 4900
Planting date: Nov.-Dec., 2008 *Soil type*: unknown *Seeding rate*: unknown
Experimental design: A Vitazyme study was designed in Tra Vinh Province to evaluate the effect of Vitazyme on rice height, leaf width, panicle length, and grain yield, using plots of 1,000 m^2 for each of the following three treatments.

Treatment	Vitazyme, days after planting			Rate
	20	40	60	liters/ha
Control	O	O	O	0
Vitazyme 1	X	O	X	1.0
Vitazyme 2	X	X	X	1.2

Fertilization: unknown
Vitazyme application: Rates were 1.0 or 1.2 liters/ha, applied 20, 40, or 60 days after planting to the soil and leaf surfaces of the plots. "Vitazyme 2" is termed the "Farmer treatment", likely because it is close to the program a typical farmer would use in that area.
Growth results: During plant growth the height, leaf width, and panicle length of the plants were measured.

Treatment	Plant Height		Leaf Width		Panicle Length	
	Height	Change	Width	Change	Length	Change
	cm	cm	cm	cm	cm	cm
Control	69.48	—	1.52	—	20.13	—
Vitazyme 1	71.30	1.82 (+3%)	1.54	0.02 (+1%)	21.06	(-)0.07 (0%)
Vitazyme 2	71.35	1.87 (3%)	1.62	0.10 (+7%)	20.28	0.15 (+1%)

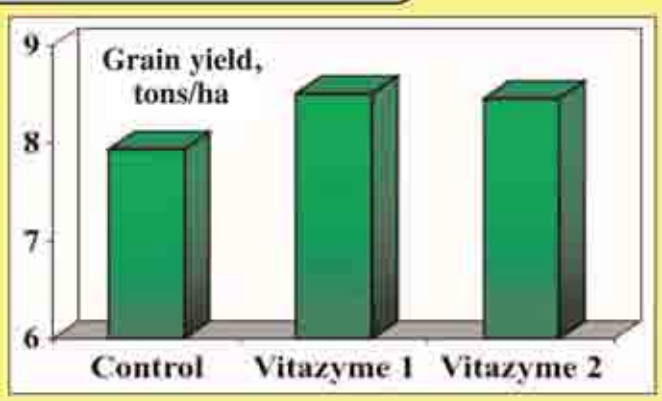
Increase in plant height with Vitazyme: 3%

Increase in leaf width with Vitazyme: 1 to 7%

Increase in panicle length with Vitazyme: 1%

Yield results:

Treatment	Rice yield	Yield change
	tons/ha	tons/ha
Control	7.94	—
Vitazyme 1	8.50	0.56 (+7%)
Vitazyme 2	8.45	0.51 (+6%)



Increase in yield with Vitazyme	
1 liter/ha twice	+7%
1.2 liters/ha three times	+6%

Conclusions: This Vietnamese rice test, using two different Vitazyme programs, of 1 liter/ha twice or 1.2 liters/ha three times, showed that this product increased plant height by 3%, leaf width by up to 7%, but panicle length very little. The yield of grain was boosted by 6 to 7%, showing the considerable efficacy of this biostimulant to improve rice growth and yield.

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2009 Crop Results

Vitazyme on Rice

Researcher: agronomists at AGPPS, Long Xuyen town, An Giang Province, South Viet Nam
Location: Thu Thua, Long An Province, South Viet Nam *Variety*: OM4625
Planting date: Nov.-Dec., 2008 *Soil type*: unknown *Seeding rate*: unknown
Experimental design: A Vitazyme study was designed in Long An Province to evaluate the effect of Vitazyme on rice height, leaf width, panicle length, and grain yield, using plots of 1,000 m^2 for each of the following three treatments.

Treatment	Vitazyme, days after planting			Rate
	20	40	60	liters/ha
Control	O	O	O	0
Vitazyme 1	X	O	X	1.0
Vitazyme 2	X	X	X	1.2

Fertilization: unknown
Vitazyme application: Rates were 1.0 or 1.2 liters/ha, applied 20, 40, or 60 days after planting to the soil and leaf surfaces of the plots. "Vitazyme 2" is termed the "Farmer treatment", likely because it is close to the program a typical farmer would use in the area.
Growth results: During plant growth the height, leaf width, and panicle length of the plants were measured.

Treatment	Plant Height		Leaf Width		Panicle Length	
	Height	Change	Width	Change	Length	Change
	cm	cm	cm	cm	cm	cm
Control	79.40	—	1.27	—	1.32	—
Vitazyme 1	86.44	7.04 (+9%)	1.34	0.07 (+6%)	1.34	0.02 (+2%)
Vitazyme 2	84.32	4.92 (+6%)	1.29	0.02 (+2%)	1.32	0 (0%)

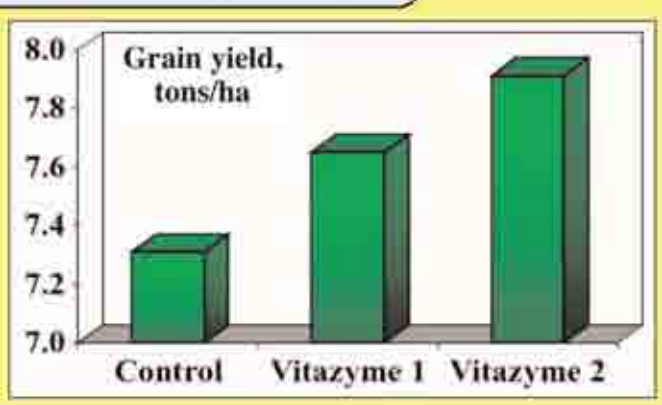
Increase in plant height with Vitazyme: 6 to 9%

Increase in leaf width with Vitazyme: 2 to 6%

Increase in panicle length with Vitazyme: 2%

Yield results:

Treatment	Rice yield	Yield change
	tons/ha	tons/ha
Control	7.31	—
Vitazyme 1	7.65	0.34 (+5%)
Vitazyme 2	7.91	0.60 (+8%)



Conclusions: This Vietnamese rice test, using two different Vitazyme programs, of 1 liter/ha twice or 1.2 liters/ha three times, showed that this product increased plant height by 2 to 6%, but panicle length very little. The yield of grain was boosted by 5 to 8%, showing the considerable efficacy of this biostimulant to improve rice growth and yield.

Increase in yield with Vitazyme	
1 liter/ha twice	+5%
1.2 liters/ha three times	+8%

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2009 Crop Results

Vitazyme on Rice

Researcher: unknown *Location*: Cianjur, West Java, Indonesia *Variety*: Cigeulis (local variety)
Soil type: unknown *Population*: unknown *Planting date*: spring, 2009

Experimental design: A replicated plot trial on rice was established in Indonesia to evaluate the effect of Vitazyme on rice yield, with full and reduced fertilizer applications. These replications were used in a randomized complete block design. An additional treatment called "farmer practice" was used to compare with the other three treatments.

1. Normal fertilizer **2. Normal fertilizer + Vitazyme** **3. 50% fertilizer + Vitazyme**
4. "Farmer practice"

Fertilization: Normal (100%) level: 250 kg/ha urea (45% N), 200 kg/ha superphosphate 36 (48% P_2O_5), and 50 kg/ha KCl (60% K_2O). The 50% application for Treatment 3 received 50% of these levels.

Vitazyme application: 1.0 liter/ha applied twice

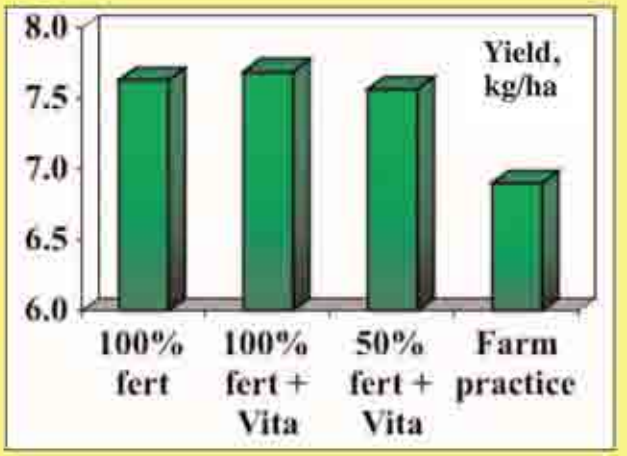
Growth results: The number of tillers and plant height were measured at eight different times during the growth cycle, but none of the data revealed significant differences; thus, this data is not presented. One-thousand grain weight, the number of productive panicles, and panicle length also showed no significant differences.

Yield results: The plots were harvested in June of 2009.

Grain Yield

Treatment	Rice yield*	Yield change**
	tons/ha	tons/ha
1. 100% fertilizer	7.63 a	0.73 (+11%)
2. 100% fert + Vita	7.69 a	0.79 (+11%)
3. 50% fert + Vita	7.56 a	0.66 (+10%)
4. Farmer practice	6.90 b	—

* Means followed by the same letter are not significantly different at P=0.05.
**The comparisons here are made with the "farmer practice".



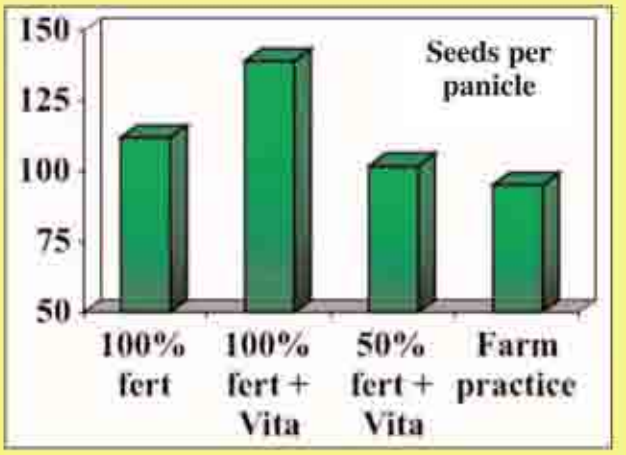
Rice yield increase above "farm practice"

100% fertilizer + Vitazyme 11%
100% fertilizer only 11%
50% fertilizer + Vitazyme 10%

Seeds Per Panicle

Treatment	Seeds**	Seed change**
	tons/ha	tons/ha
1. 100% fertilizer	112 ab	17 (+18%)
2. 100% fert + Vita	139 a	44 (+46%)
3. 50% fert + Vita	102 b	7 (+7%)
4. Farmer practice	95 b	—

* Means followed by the same letter are not significantly different at P=0.05.
**The comparisons here are made with the farm practice.



Seeds per panicle above "farm practice"

100% fertilizer + Vitazyme 46%
100% fertilizer 18%

Conclusions: In this Indonesian rice study, using normal (100%) fertilizer, with and without Vitazyme, and 50% fertilizer with Vitazyme, all three treatments were statistically equal in yield, and all significantly exceeded the "farm practice" treatment. This result proved that Vitazyme applied twice, along with a 50% reduction in fertilizer, produced a yield equal to the 100% fertilizer treatment without fertilizer. This result is highly important for Indonesian rice farmers, who need to minimize fertilizer inputs due to high costs.

Vitazyme applied with 100% fertilizer also greatly improved seed number per panicle of rice at harvest, being 46% above the farm practice and 28% greater than the 100% fertilizer treatment; this great seed per panicle increase was not observed with the 50% fertilizer plus Vitazyme treatment.

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2008 Crop Results

Vitazyme on Rice

Researcher: unknown
Location: Heip Hoa and Bac Giang, Viet Nam
Variety: Khang Dan
Soil Type: "exhausted" soil
Planting date: in 2007
Planting rate: unknown

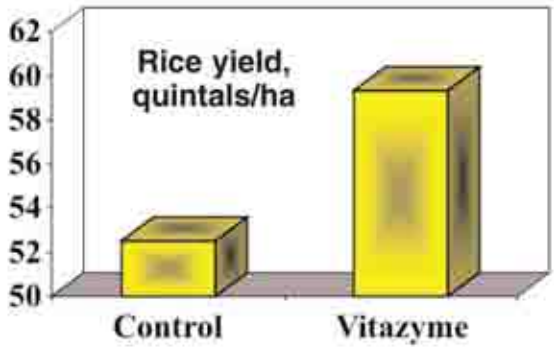
Experimental design: A field of rice was divided into a Vitazyme treated area and an untreated control alongside to evaluate the product's effects on rice yield.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: two applications of 1 liter/ha each time (times unknown)
Harvest date: unknown
Yield results:

Treatment	Rice yield	Change
	quintals/ha	quintals/ha
Control	52.53	—
Vitazyme	59.33	6.80 (+13%)

Yield increase with Vitazyme: 13%



Income results: an increase of 2,105,000 Vnd/ha with Vitazyme
Conclusions: Despite the fact that few details on the conduct of this Vietnamese study are available, Vitazyme increased the yield of rice on this "exhausted" soil by 13%, an excellent improvement. The income increase was likewise very good.

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2008 Crop Results

Vitazyme on Rice

Researcher: unknown
Variety: Khang Dan
Planting date: spring, 2008
Location: Tan lap and Dan Phurong, Viet Nam
Soil Type: alluvial soils of the Red River
Planting rate: unknown
Experimental design: Two rice fields were divided into Vitazyme treated and untreated areas to determine effects of the product on rice yield.

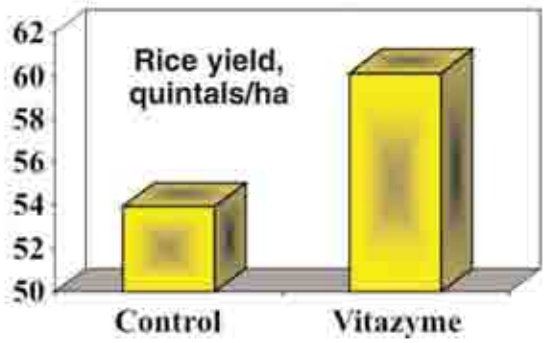
1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: two applications of 1 liter/ha each time (times unknown)
Harvest date: unknown, in 2008
Yield results:

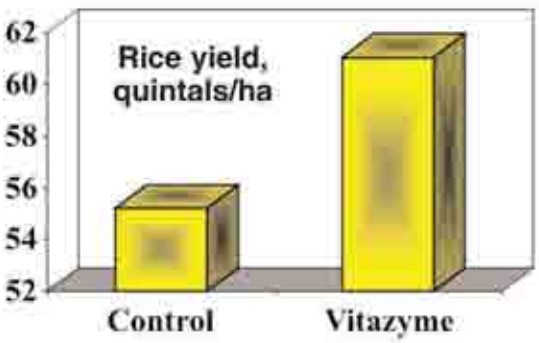
Field 1

Treatment	Rice yield	Change
	quintals/ha	quintals/ha
Control	53.95	—
Vitazyme	60.15	6.20 (+11%)

Increase in rice yield: 11%



Field 2



Treatment	Rice yield	Change
	quintals/ha	quintals/ha
Control	55.20	—
Vitazyme	61.05	5.85 (+11%)

Increase in rice yield: 11%

Income results: an income increase of 3,150,000 Vnd/ha for Field 1, and of 2,895,000 Vnd/ha for Field 2
Conclusions: In 2008 on an alluvial soil, this Vietnamese rice study with Vitazyme showed an excellent 11% grain yield increase for both fields investigated. The yields brought an excellent income increase in both cases as well. The nearly identical results for the studies shows that the product performs consistently, as it did in similar studies in Nhur Quynh, Hung Yen, Heip Hoa, and Bac Giang in 2007, where 11% and 13% yield increases on this same variety of rice were achieved.

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2008 Crop Results

Vitazyme on Rice

Researcher: unknown
Variety: Khang Dan
Planting date: in 2007
Location: Nhur Quynh and Hung Yen, Viet Nam
Soil Type: alluvial soils of the Red River
Planting rate: unknown

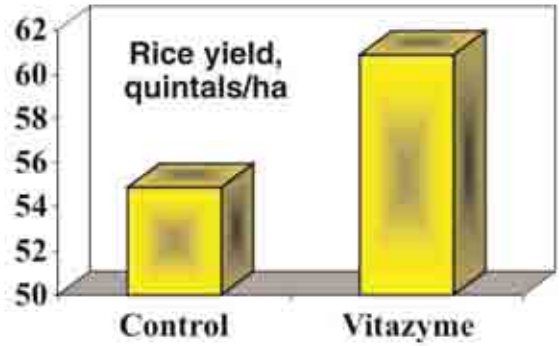
Experimental design: A field of rice was divided into a Vitazyme treated area and an untreated control alongside to determine the effect of the product on yield.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: two applications of 1 liter/ha each time (times unknown)
Harvest date: unknown
Yield results:

Treatment	Rice yield	Change
	quintals/ha	quintals/ha
Control	54.88	—
Vitazyme	60.90	6.02 (+11%)

Yield increase with Vitazyme: 11%



Income results: an increase of 1,793,000 Vnd/ha with Vitazyme

Conclusions: Despite the fact that few details on the conduct of this Vietnamese study are available, Vitazyme increased the yield of rice on this alluvial soil by 11%, an excellent improvement. The income increase was likewise very good.

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2007 Crop Results

Vitazyme on Rice

Effects of Vitazyme with reduced nitrogen levels

Researcher: Le Nhu Kieu *Location*: Viet Nam

Few details of this study are known except for the levels of fertilization. Several farmers were involved in testing Vitazyme with different levels of nitrogen in two soil areas: an "infertile" and a "fertile" alluvial area. Only the yield was determined at different nitrogen levels.

"Infertile" Soil

Treatment	Vitazyme	Nitrogen	Phosphorus	Potassium
	liters/ha	kg/ha N	kg/ha P_2O_5	kg/ha K_2O
1	0	80 (100%)	60	80
2	1.5	40 (50%)	60	80

Yield results:

Treatment	Farmer*/Yield					Average**	Change
	A	B	C	D	E		
	kg/ha						
1	4,217	3,667	3,290	3,895	4,120	3,838 b	—
2	4,275	3,727	3,408	4,200	4,381	3,998 a	160 (+4%)

**Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.

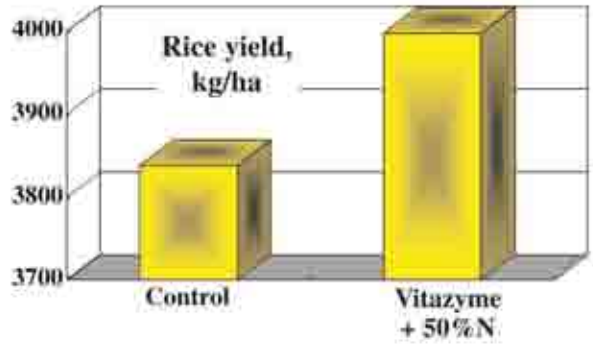
*A, Duong Van Chuyen (1,500m^2, cv. Khang dan); B, Cao Thi Hai (2,110 m^2, cv. Huong thom); C, Pham Nguyet Ha (2,102 m^2, cv. Huong thom); D, Doan Thi Phu (2,308 m^2, cv. Khang dan); E, Le Thi Phung (2,400 m^2, cv. Khang dan).

Statistics using locations as replicates	
Block P value	0.0014**
Main effect P value	0.0361*
Model P value	0.0018**
Coefficient of variation	2.09%
$LSD_{0.05}$	143 kg/ha (Student-Newman-Keuls Test)

Conclusions: On these "infertile" large area tests, Vitazyme gave excellent responses for rice with only 50% of the usual nitrogen. Despite this major reduction in nitrogen application (by 50%), the Vitazyme treatments produced an average of 4% more yield. This increased utilization of nitrogen with Vitazyme is typical of the response gained on other crops besides rice, enabling the farmer to obtain equal or greater yields while reduc-

ing costly nitrogen applications by 20 to 50%.

Increase in yield with Vitazyme at 50% N: 4%



"Fertile" Alluvial Soil

Treatment	Vitazyme	Nitrogen	Phosphorus	Potassium
	liters/ha	kg/ha N	kg/ha P_2O_5	kg/ha K_2O
1	0	90 (100%)	60	80
2	1.5	45 (50%)	60	80

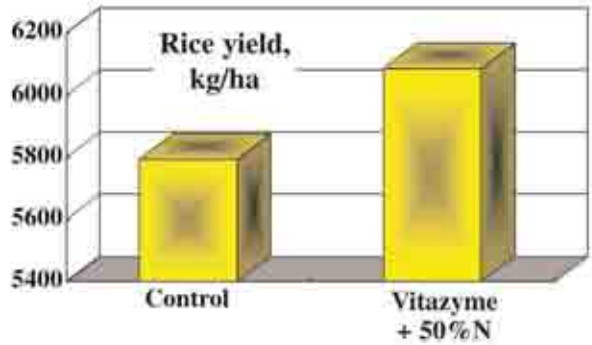
Yield results: All field used the variety Q5.

Farmer	Area of test	Control*	Vitazyme*
	m^2	kg/ha	kg/ha
Trinh Van Khoan	1,260	5,590	6,563
Nguyen Thi Hong	720	6,092	5,844
Tran Thi Hien	540	6,195	5,731
Do Thi Hop	180	5,631	5,428
Nguyen Van Hieu	540	5,699	5,387
Tran Van Dien	360	6,099	5,610
Vu Thi Bac	720	5,075	5,704
Nguyen Thi Kien	360	5,900	5,844
Nguyen Thi Nghia	360	5,764	6,379
Nguyen Thi Hoa	540	5,590	6,300
Tran Van Huan	720	5,780	6,626
Trinh Van Chu	1,152	6,269	6,481
Trinh Van Toan	360	5,893	6,300
Vu Van Tuan	360	5,741	6,242
Nguyen Van Tien	540	5,695	6,226
Nguyen Thi Thue	360	5,670	6,105
Mean		5,793 b	6,048 a
Change		—	255 (+4%)

Statistics using locations as replicates	
Block P value	0,43
Main effect P value	0.05*
Model P value	0,30
Coefficient of variation	5,76%
$LSD_{0.05}$	257 kg/ha (Student-Newman-Keuls Test)

*Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.

Increase in yield with Vitazyme at 50% N: 4%



Conclusions: With these fairly large rice plots the yield of rice treated with Vitazyme + 50% of the high nitrogen level increased significantly (P=0.05). This increase was 4% above the untreated control. Because such an excellent yield response was gained while reducing nitrogen fertilizer, the obvious benefits for farmers and the entire nation are readily apparent. Great savings in fertilizer cost and increases in grain sales provide the most ideal combination for Viet Nam to prosper in the age of modern agriculture.

Income results: Using the price of rice at $1,000/metric ton (Viet Nam, May, 2008), and the cost of urea at $450/metric ton (or $1.00/kg of nitrogen), the following calculations are made.

Treatment	Yield	Grain value	Increase in value	Nitrogen rate	Nitrogen cost	Nitrogen savings	Increased income with Vitazyme
	tons/ha	$/ha	$/ha	kg/ha	$/ha	$/ha	$/ha
				"Infertile" Soil			
Control	3.838	3,838.00	—	80	80.00	—	—
Vitazyme	3,998	3,998.00	160.00	40	40.00	40.00	200.00
				"Fertile" Alluvial Soil			
Control	5.793	5,793.00	—	90	90.00	—	—
Vitazyme	6.048	6,048.00	255.00	45	45.00	45.00	300.00

Increased income with Vitazyme using 50% nitrogen fertilizer

- ❑ **"Infertile" soil area: $200.00/ha**
- ❑ **"Fertile" Alluvial soil area: $300.00/ha**

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2007 Crop Results

Vitazyme on Rice

Effects of Vitazyme with reduced nitrogen levels

Researcher: Le Nhu Kieu *Location*: Viet Nam

Few details of this study are known except for the levels of fertilization. Several farmers were involved in testing Vitazyme with different levels of nitrogen in two soil areas: an "infertile" and a "fertile" alluvial area. Only the yield was determined at different nitrogen levels.

"Infertile" Soil

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	liters/ha	kg/ha N	kg/ha P_2O_5	kg/ha K_2O
1	0	80 (100%)	60	80
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Yield results:

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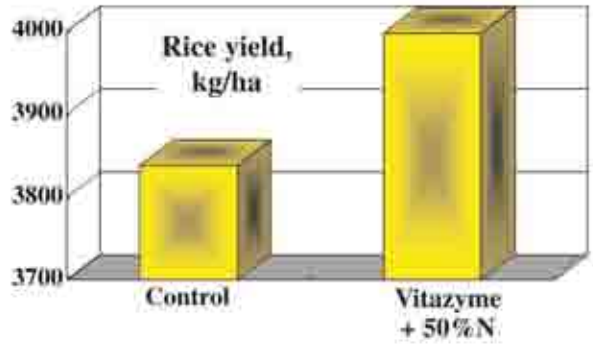
Increase in yield with Vitazyme at 50% N: 4%



"Fertile" Alluvial Soil

Treatment	Vitazyme	Nitrogen	Phosphorus	Potassium
	liters/ha	kg/ha N	kg/ha P_2O_5	kg/ha K_2O
1	0	90 (100%)	60	80
2	1.5	45 (50%)	60	80

Yield results: All field used the variety Q5.

Farmer	Area of test	Control*	Vitazyme*
	m^2	kg/ha	kg/ha
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Mean		5,793 b	6,048 a
Change		—	255 (+4%)

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Block P value	0,43
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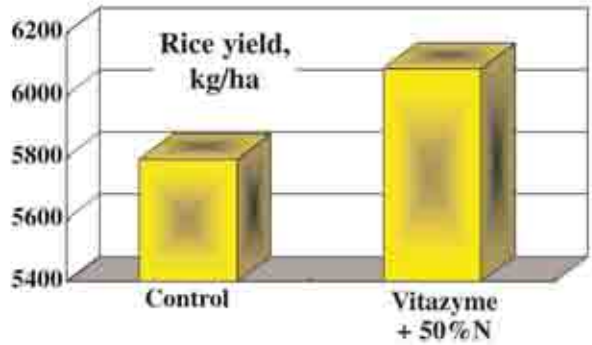
Increase in yield with Vitazyme at 50% N: 4%



Conclusions: With these fairly large rice plots the yield of rice treated with Vitazyme + 50% of the high nitrogen level increased significantly (P=0.05). This increase was 4% above the untreated control. Because such an excellent yield response was gained while reducing nitrogen fertilizer, the obvious benefits for farmers and the entire nation are readily apparent. Great savings in fertilizer cost and increases in grain sales provide the most ideal combination for Viet Nam to prosper in the age of modern agriculture.

Income results: Using the price of rice at $350/metric ton, and the cost of urea at $450/metric ton (or $1.00/kg of nitrogen), the following calculations are made.

Treatment	Yield	Grain value	Increase in value	Nitrogen rate	Nitrogen cost	Nitrogen savings	Increased income with Vitazyme
	tons/ha	$/ha	$/ha	kg/ha	$/ha	$/ha	$/ha
				"Infertile" Soil			
Control	3.838	1,343.30	—	80	80.00	—	—
Vitazyme	3,998	1,399.30	56.00	40	40.00	40.00	96.00
				"Fertile" Alluvial Soil			
Control	5.793	2,027.55	—	90	90.00	—	—
Vitazyme	6.048	2,116.80	89.25	45	45.00	45.00	134.25

Increased income with Vitazyme using 50% nitrogen fertilizer

- ❑ **"Infertile" soil area: $96.00/ha**
- ❑ **Alluvial soil area: $134.25/ha**

Vital Earth Resources
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2007 Crop Results

Vitazyme on Rice

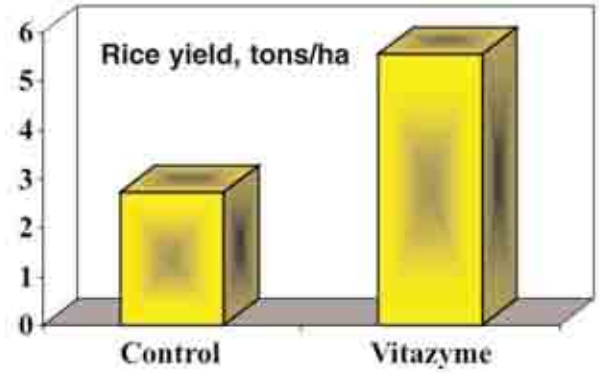
Researcher: Roberto Alvarez, Deputy Director
Location: Antonio Rojas Cooperative Farm, Hector Molina Sugar Enterprise, Cuba
Variety: unknown *Planting date*: unknown
Experimental design: A rice field of 0.5 ha was treated with Vitazyme and compared to an untreated field alongside to evaluate effects on rice yield.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: seed soaking of 5% Vitazyme for 48 hours, plus 1 liter/ha 32 days after planting
Yield results:

Treatment	Yield	Change
	-------- tons/ha--------	
Control	2.72	—
Vitazyme	5.55	2.83 (+104%)

Increase in rice yield: 104%



Conclusions: This commercial rice test in Cuba revealed that a 5% seed soak plus 1 liter/ha additional Vitazyme increased grain yield by 104%. The product's active yeasts presumably allowed the plants to make better use of soil nitrogen and other nutrients, and increase crop yield accordingly. Vitazyme is shown to be an excellent adjunct to rice culture in Cuba.

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2006 Crop Results

Vitazyme on Rice

Researcher: unknown *Location*: Arroz de Riego, near Guayaquil, Ecuador

Experimental design: Few details are available on this study, although two levels of fertilizer nitrogen, 100% and 75%, were applied with Vitazyme to investigate the effect on yield and crop profitability.

1. **100% nitrogen only**
2. **75% nitrogen + Vitazyme**
3. **100% nitrogen + Vitazyme**

Fertilization: 75% and 100% of the usual nitrogen rate applied to different portions of the test field

Vitazyme application: 1 liter/ha at planting on the seedbed; 1 liter/ha on the leaves at emergence of the heads

Yield and income results: Yield was increased substantially above the 100% nitrogen control for both the 75% and 100% nitrogen treatments with Vitazyme. However, actual yield numbers were not available. Income increases above the control were substantial, as noted below.

Income increase with Vitazyme + 100% nitrogen: $128.62/ha
Income increase with Vitazyme + 75% nitrogen: $94.38/ha

Conclusions: Despite a reduction in nitrogen fertilizer by 25%, Vitazyme boosted income above the control nearly as much as did the 100% nitrogen treatment. Both treatments proved that Vitazyme, applied at planting and at head initiation, is a highly effective yield and income enhancer in Ecuador.

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2005 Crop Results

Vitazyme on Rice

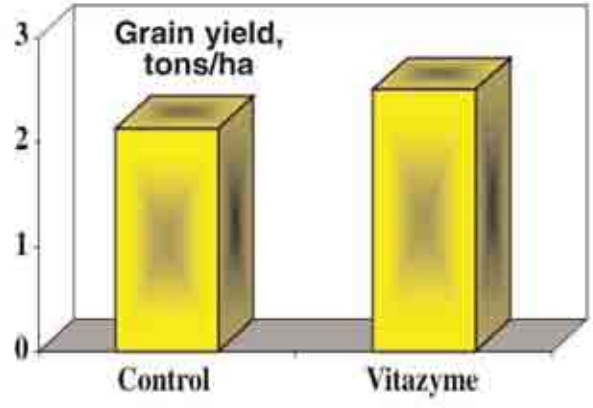
Researcher: Miguel Socorro Quesada *Location*: CAI rice growers, Ruta Invasora, Province Camaguey
Research organization: Ministry of Agriculture, Rice Agroindustrial Production Group, Havana, Cuba
Variety: unknown *Soil type*: unknown *Planting date*: spring, 2004
Experimental design: A large rise field was divided into two parts, one treated with Vitazyme and the other left untreated, in an effort to evaluate the product's effectiveness in large-scale trials.

1. Control **2. Vitazyme**

Fertilizer: standard protocol
Vitazyme application: 1.5 liters/ha, most likely at planting
Weather: There was a very limited supply of water at the final stages of rice development.
Yield results:

Treatment	Area	Yield	Increase
	ha	tons/ha	tons/ha
Control	103	2.13	—
Vitazyme	64	2.50	0.37 (+17%)

Increase in rice yield: +17%



Conclusions: This large-scale field trial in Cuba proved that Vitazyme, applied only once at 1.5 liters/ha, greatly increase grain yield (+17%), despite a serious water shortage late in the growing season.

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2004 Crop Results

Vitazyme on Rice

Rice Trial of the Cuban Ministry of Sugar

Researcher: unknown *Farm*: Aracelio Iglesias Diaz Agricultural Enterprise
Location: Majajigua, Sancti Spiritus, Cuba *Variety*: unknown *Soil type*: "gleyish" Vertisol
Planting date: unknown *Seeding rate*: unknown
Experimental design: A field of rice was divided in a Vitazyme treated area (25 ha, or 62.5 acres), and a control area (2 ha, or 5 acres), to evaluate effects on crop yield.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: 1 liter/ha during active tillering
Yield results: Due to a lack of irrigation water the crop did not attain maturity.
Conclusions: Despite the fact that the crop was not harvested, **the Vitazyme treated crop was darker green** 10 to 12 days after application, showing the product's effect to stimulate chlorophyll development. It was also noted that **Vitazyme reduced plant stress during drought conditions.**

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2004 Crop Results

Vitazyme on Rice

Institute for Rice Research, Republic of Cuba

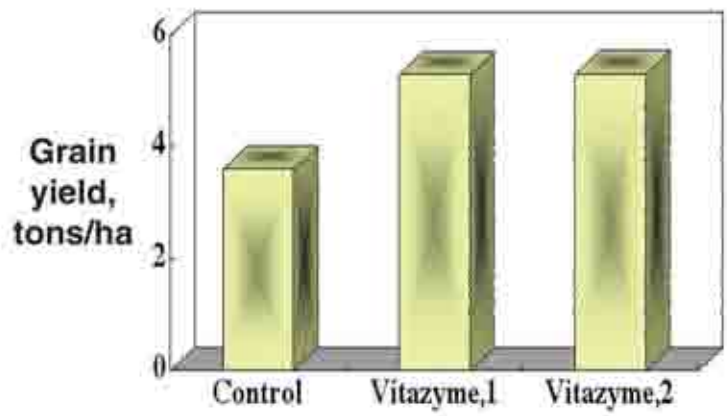
Researcher: unknown *Research entity:* Institute for Rice Research *Location*: Institute for Rice Research, Estacion de Jucarito, Granma, Cuba *Variety*: unknown *Soil type*: unknown
Planting date: unknown, in 2003 *Harvest date*: unknown
Experimental design: A randomized complete block design was set up to determine the effects of Vitazyme on rice yield and profitability. Only three of the several treatments established were reported, and are as follows:

1. **Control**: 75% normal N (58.5 Kg/ha N, or 127 kg/ha urea)
2. **Treatment 2**: 75% normal N + Vitazyme twice
3. **Treatment 3**: 75% normal N + Vitazyme once

Fertilization: 58.5 kg/ha N (127 kg/ha urea) for all three treatments
Vitazyme application: 1 liter/ha at tillering for Treatment 3, and 1 liter/ha at both tillering and flower initiation for Treatment 2
Yield and income results:

Treatment	Yield of grain	Yield change
	t/ha	t/a
1. Control	3.61	—
2. Vitazyme twice	5.30	1.69 (+47%)
3. Vitazyme once	5.29	1.68 (+47%)

Grain increase: + 47%



Treatment	Cost of production	Net income	Income increase
	$/ha	$/ha	$/ha
1. Control	70.79	327.01	—
2. Vitazyme twice	132.76	452.04	125.03
3. Vitazyme once	109.78	476.02	149.01

Conclusions: Vitazyme greatly increased rice yield in this Cuban study, by 47% over the control for both the single and double 1 liter/ha treatments. Crop returns were also substantially increased, by $125.03 to $149.01 per hectare for the two treatments

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2004 Crop Results

Vitazyme on Rice – Seedling Growth In Vitro

Institute for Rice Research, Republic of Cuba

Researchers: unknown *Research entity*: Institute for Rice Research
Location: Institute for Rice Research, Province of Havana, Cuba
Variety: Reforma *Testing date*: 2003

Experimental design: In the laboratory, Petri dishes (9 cm x 1.5 cm) with filter paper were wetted with Vitazyme solutions of 0, 2, 4, 6, 8, and 10%. Each treatment was replicated four times in a completely randomized design, with 100 rice seeds in each Petri dish. The moisture level of the dishes was maintained by adding distilled water to the dishes as required. Coleoptile and root growth were measured at 5 and 10 days after germination. This experiment was repeated three times.

Results: An average of the three Petri dish experiments is given in the following table

	Roots*		Coleoptiles*	
Vitazyme	5 days	10 days	5 days	10 days
%	---------- cm ----------		---------- cm ----------	
0	4.12 a	5.49 a	1.75 a	4.88 a
2	4.37 a (+6%)	5.46 a (-1%)	1.62 a (-7%)	5.00 a (+2%)
4	4.57 a (+11%)	6.17 a (+12%)	1.81 a (+3%)	5.07 a (+4%)
6	4.71 a (+14%)	5.87 a (+7%)	1.83 a (+5%)	5.19 a (+6%)
8	4.75 a (+15%)	5.74 a (+5%)	1.92 a (+10%)	5.26 a (+8%)
10	4.75 a (+15%)	5.75 a (+5%)	1.73 a (-1%)	4.91 a (+1%)

*Means followed by the same letter are not significantly different at P=0.05.

Increase in rice root extension at 5 days: up to 15%
Increase in rice root extension at 10 days: up to 12%

Increase in rice coleoptile extension at 5 days: up to 10%
Increase in rice coleoptile extension at 10 days: up to 8%

While none of the treatments were significantly greater than the 0% control, Vitazyme consistently increased root growth in Petri dishes at both 5 and 10 days after test initiation. Increases of 5 to 15% were recorded. Coleoptile extension stimulation was less impressive, but still produced increases of from 1 to 10% at 5 to 10 days after test initiation two negative results at 5 days were reversed by 10 days after initiation.

Conclusions: In these Petri dish studies using Vitazyme at different concentrations to stimulate root and coleoptile extension, the product consistently produced increases of up to 15% in root growth and of up to 10% in coleoptile growth above the control. These increases in seedling growth reveal how Vitazyme can produce faster and more aggressive germination of rice seedlings.

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2004 Crop Results

Vitazyme on Rice

Institute for Rice Research, Republic of Cuba

Researchers: unknown *Research entity*: Institute for Rice Research
Location: (1) Institute for Rice Research, Province of Havana; (2) Experiment Station, south of Jibaro, Province of Sancti Spiritus
Varieties: Perla de Cuba ["Cuban Pearl"], a short cycle type, at Havana Province, and 4499, a medium cycle type, at Sancti Spiritus
Planting date: unknown, in 2003 *Soil types*: unknown *Planting rate*: unknown
Experimental design: A randomized complete block design with four reps was set up at Sancti Spiritus, the plots 3x4 meters with four reps. At Havana Province, there were two reps with plots that were 2x10 meters. Eight treatments were utilized at both sites.

		Vitazyme application		
Treatment	**NPK fertilizer**	**Active tillering**	**Flowering initiation**	**Primordial change**
1	0	0	0	0
2	100%	0	0	0
3	75%	0	0	0
4	100%	x	x	0
5	75%	x	x	0
6	75%	x	0	0
7	75%	0	0	x
8	75%	0	x	0

Fertilization: At Sancti Spiritus, all treatments received 68 kg/ha of triple superphosphate (0-46-0% N-P_2O_5-K_2O), 90 kg/ha of KCl (0-0-60% N-P_2O_5-K_2O), and 170 kg/ha urea (46-0-0% N-P_2O_5-K_2O). At Havana Province, the rate of application was 34 kg/ha 0-46-0, 48 kg/ha 0-60-0, and 127 kg/ha of urea.
Vitazyme application: All treatments receiving Vitazyme were sprayed using a manual sprayer at 1.4 atmospheres of pressure, with a delivery rate of 100 ml/m^2. One liter/ha was applied at the growth stages indicated above.
Results: Besides rice yield and economic analyses, the plant height, number of stems per m^2, leaf area per m^2, and thickness and length of the first basal internode were evaluated for each trial.

Havana Province, cv. Perla de Cuba

Treatment	Height*	Leaves*	Stems*	Internode thickness*	Internode length*	Leaf area*
	cm	number/m^2	stems/m^2	mm	cm	cm^2
1 (no fert.)	92	1,888	688	0.53	3.8	22.2
2 (100% fert.)	96	3,024	864	0.43	4.9	23.3
3 (75% fert)	102	3,024	864	0.49	3.9	28.5
4 (100% + 2x Vit.)	100 (+4%)	3,440 (+14%)	560 (-35%)	0.50 (+16%)	5.9 (+20%)	26.7 (+15%)
5 (75% + 2x Vit.)	100 (-2%)	3,152 (+4%)	832 (-4%)	0.44 (-10%)	3.7 (-5%)	33.3 (+17%)
6 (75% + Vit. early)	104 (+2%)	2,480 (-18%)	672 (-22%)	0.49 (0)	3.8 (-3%)	30.3 (+6%)
7 (75% + Vit. late)	92 (-10%)	2,784 (-8%)	704 (-19%)	0.37 (-24%)	7.2 (+85%)	24.0 (-16%)
8 (75% + Vit. flow.)	74 (-27%)	3,648 (+21%)	992 (+15%)	0.36 (-27%)	5.0 (+28%)	16.0 (-44%)

*All comparisons for percentage changes are made using the same fertilization levels. Thus, Treatment 4 is compared with Treatment 2, and Treatments 5,6,7, and 8 are compared with Treatment 3.

Vitazyme application to rice in this trial at 100% fertilizer increased leaf number (+14%), leaf area (+15%), and height (+4%), though stem number was reduced; internode length and thickness were reduced. With 75% fertilizer, Vitazyme applications caused considerable variation in growth parameters depending upon application times. Early applications increased leaf area, up to 17%, but had variable effects on height and leaf number. Stem density per unit area was decreased, and internode thickness was decreased while, for a late application, internode length was greatly increased (+85%). Vitazyme applied at flowering increased stems per unit area (+15%) while increasing internode length and reducing leaf area and height; leaf and stem number were concurrently increased.

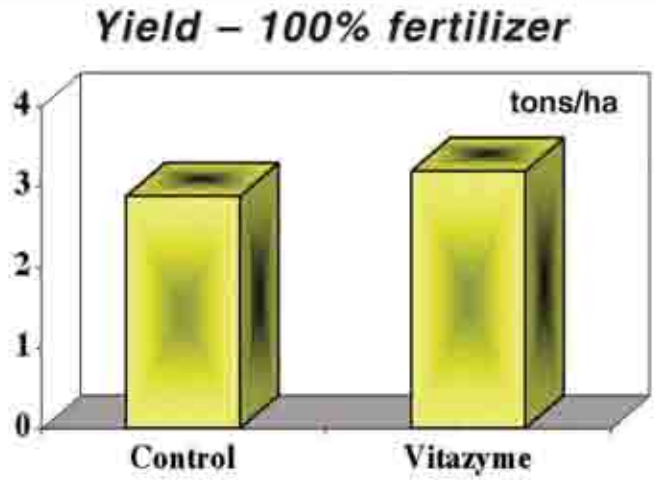
Treatment	Grain yield*	Panicles*	Kernels*	Kernel wt.*	Panicle length*
	tons/ha	per m^2	per panicle	g/1000	cm
1 (no fert.)	2.41 b	230 b	64 a	24.86 c	22 b
2 (100% fert.)	2.88 ab	344 a	72 a	26.58 ab	22 b
3 (75% fert)	2.96 ab	343 a	61 a	26.00 bc	23 ab
4 (100% + 2x Vit.)	3.19 a (+11%)	301 a (-13%)	75 a (+4%)	26.14 abc (-2%)	23 ab (+5%)
5 (75% + 2x Vit.)	3.10 a (+5%)	330 a (-4%)	81 a (+33%)	26.64 ab (+2%)	23 ab (0)
6 (75% + Vit. early)	3.18 a (+7%)	332 a (-3%)	67 a (+10%)	27.50 a (+6%)	23 ab (0)
7 (75% + Vit. late)	3.08 a (+4%)	315 a (-8%)	61 a (0)	27.25 a (+5%)	22 b (-4%)
8 (75% + Vit. flow.)	2.65 bc (-10%)	347 a (+1%)	72 a (+18%)	26.67 ab (+3%)	24 a (+4%)

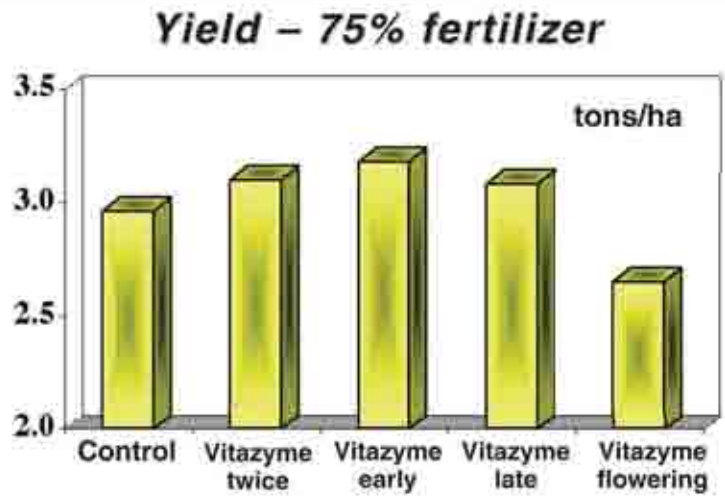
*All comparisons for percentage changes are made using the same fertilization levels. Thus, Treatment 4 is compared with Treatment 2, and Treatments 5,6,7, and 8 are compared with Treatment 3. Means followed by the same letter are not significantly different at

Yield increase, 100% fertilizer: 11%

Yield increase, 75% fertilizer + Vitazyme at active tillering: 7%

Vitazyme increased the yield of rice at 100% fertilizer by up to 11% (two applications early), although a single application at the beginning of flowering actually reduced yield from the control. These yield increases were due primarily to increases in the number and weight of kernels per panicle, since the panicle number per unit area actually decreased — though not significantly — for all but the single early flowering application. Of interest is the fact that 75% fertilizer (Treatment 3) outyielded — though not significantly — the 100% fertilizer treatment (Treatment 2). Also, all of the Vitazyme applications but Treatment 8 (Vitazyme applied at flower initiation) increased rice yield above the 100% fertilizer treatment.





One weakness of this experiment was a failure to isolate the treatments from one another in the paddy. Thus, treatment effects migrated to some extent from one plot to another, obscuring some of the effects by tending to equalize fertility and Vitazyme responses.

Sancti Spiritus, cv. 4499

	Plant height at days after planting*			
Treatment	**26**	**37**	**53**	**76**
	cm			
1 (no fert.)	19	32	38	39
2 (100% fert.)	30	51	44	78
3 (75% fert)	28	43	47	71
4 (100% + 2x Vit.)	30 (0)	48 (-6%)	61 (+39%)	88 (+13%)
5 (75% + 2x Vit.)	28 (0)	47 (+9%)	52 (+11%)	76 (+7%)
6 (75% + Vit. early)	29 (+4%)	40 (-7%)	51 (+9%)	81 (+14%)
7 (75% + Vit. late)	27 (-4%)	44 (+2%)	53 (+13%)	80 (+13%)
8 (75% + Vit. flow.)	28 (0)	45 (+5%)	37 (-21%)	81 (+14%)

*All comparisons for percentage changes are made using the same fertilization levels. Thus, Treatment 4 is compared with Treatment 2, and Treatments 5,6,7, and 8 are compared with Treatment 3.

By 76 days after planting Vitazyme had enhanced the height of all of the rice treatments in this study, the increase being from 7 to 14% above the appropriate controls. No individual plot data is available to compare the treatments on a statistical basis.

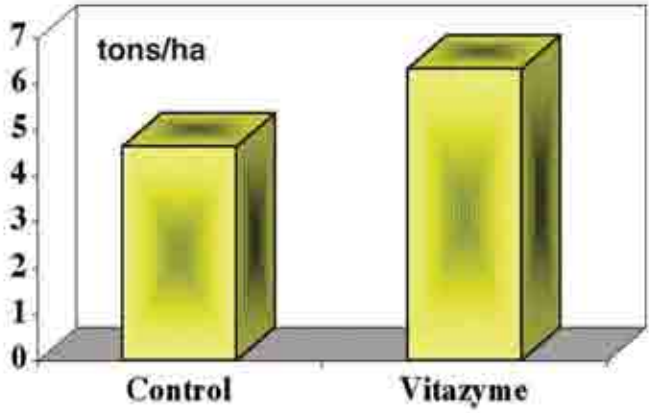
Treatment	**Grain yield***	**Panicles***	**Kernels***	**Unproductive kernels***	**Panicle length***
	tons/ha	per m^2	per panicle	grains/panicle	cm
1 (no fert.)	3.17 e	182 f	62 c	25 a	18.4 c
2 (100% fert.)	4.65 c	267 d	79 b	17 ab	21.3 b
3 (75% fert)	3.83 d	215 e	77 b	16 ab	20.7 b
4 (100% + 2x Vit.)	6.34 a (+36%)	365 a (+37%)	92 a (+16%)	18 ab (+6%)	23.3 a (+9%)
5 (75% + 2x Vit.)	5.81 b (+52%)	336 ab (+56%)	81 b (+5%)	13 b (-19%)	21.3 b (+3%)
6 (75% + Vit. early)	5.17 c (+35%)	327 b (+52%)	82 b (+6%)	18 ab (+13%)	21.3 b (+3%)
7 (75% + Vit. late)	4.74 c (+24%)	310 bc (+44%)	78 b (+1%)	17 ab (+6%)	20.7 b (0)
8 (75% + Vit. flow.)	5.12 c (34%)	288 cd (+34%)	83 b (+8%)	20 ab (+25%)	18.4 c (-11%)

*All comparisons for percentage changes are made using the same fertilization levels. Thus, Treatment 4 is compared with Treatment 2, and Treatments 5,6,7, and 8 are compared with Treatment 3. Means followed by the same letter are not significantly different at P=0.05.

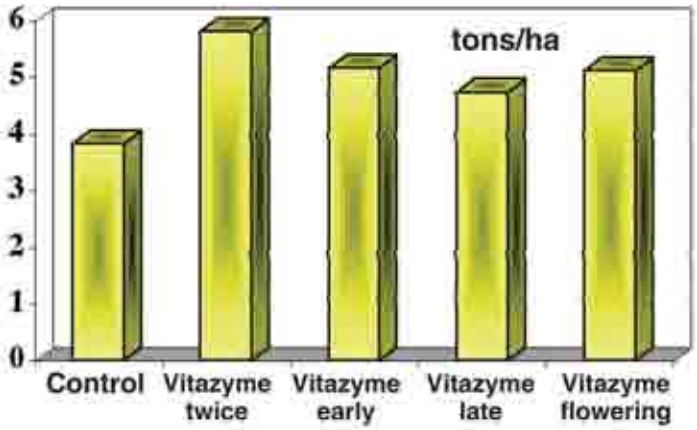
All Vitazyme treatments in this rice trial exceeded the respective controls highly significantly, at the 100% fertilizer level by 36% and at the 75% fertilizer level by 24 to 52%. Moreover, all of the 75% fertilizer + Vitazyme treatment yields exceeded the 100% fertilizer treatment (Treatment 2) yield; while the single appli-

cation (Treatments 6, 7, and 8) increases were not significantly greater, the double application (Treatment 5) was, by a full 1.16 tons/acre, or 25%. These results dramatically show the effect of Vitazyme's active agents to stimulate improved nitrogen and mineral utilization and natural soil nitrogen fixation, thus reducing the farmer's reliance on expensive fertilizer inputs. These yield improvements were influenced primarily by a great increase (34 to 56%) in panicle density per unit area, a reflection of the number of tillers (stems) produced per plant. Kernels per panicle were also increased, from 1 to 16%, whereas effects on unproductive tillers and panicle length were somewhat variable.

Yield – 100% fertilizer



Yield – 75% fertilizer



Income results: The economic effects from this study are shown using the calculations of the Cuban researchers. Calculations were made only on the Sancti Spiritus site, so only those figures are shown below.

Treatment	Grain yield (with hull)	Yield (white)	Price	Market value	Cost of increased yield	Cost of fert. + other	Total cost	Profit	Economic effect
	tons/ha	tons/ha	US$	US$/ha	US$/ha	US$/ha	US$/ha	US$/ha	US$/ha
Control (100% fert.)	4.65	3.02	170	513.40	—	101.70	101.70	411.70	—
100% fert. + 2x Vit.	6.34	4.12	170	700.40	27.50	132.58	160.08	540.32	128.62
75% fert. + 2x Vit.	5.81	3.78	170	642.60	19.00	117.57	136.50	506.10	94.38
75% fert. + Vita. early	5.17	3.36	170	571.20	8.50	110.73	110.73	460.47	48.77

Income increase with Vitazyme vs. 100% fertilizer: $48.77 to $128.62/ha

Conclusions: Vitazyme in these Cuban rice studies proved to be an excellent booster of rice growth and yield at two locations: Havana Province and Sancti Spiritus. Economic profits were also markedly improved. Effects include the following:

	Havana Province	Sancti Spiritus Province
Growth effects		
Leaf area	+6 to 17% with early applications	
Plant height		+7 to 14% with all applications
Yield effects		
Grain yield		
100% fertilizer	+11%	+36%
75% fertilizer	+4 to 7% (except late appl.)	+24 to 52%
Panicles		
100% fertilizer	-13%	+37%
75% fertilizer	-8 to +1%	+34 to 56%

Kernels per panicle		
100% fertilizer	+4%	+16%
75% fertilizer	0 to 33%	+1 to 8%
Kernel weight		
100% fertilizer	-2%	Not determined
75% fertilizer	+2 to 6%	
Panicle length		
100% fertilizer	+5%	+9%
75% fertilizer	-4 to +4%	-11 to +3%
Fertilizer enhancement effects	Excellent	Excellent
Income effects		
100% fertilizer	Not determined	$128.62/ha
75% fertilizer	Not determined	$48.77 to $94.38/ha

Conclusions of the Cuban research team are as follows:

1. **The biostimulant Vitazyme increased the agricultural yield of rice cultivation.**
2. **The 100% and 75% nitrogen variants, plus the application of Vitazyme during active tillering or the beginning of the panicle stages, were the most effective to increase the agricultural yield, with economic effects of $128.62 and $94.38 per hectare respectively.**

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1998 Crop Results

Vitazyme on Rice

Researcher: Barry Aycock, Ph.D., Aycock Agricultural Services
Location: Parma, Missouri *Variety*: Cypress *Previous crop*: rice
Row spacing: 7 inches (drilled) *Planting rate*: 110 lb/acre *Planting date*: April 30, 1998
Experimental design: Two side-by-side paddies of equal cropping history and soil type were selected. The treatments were as follows:

1. **Control**
2. **Vitazyme**

At harvest, four rounds were harvested from each field and the grain was weighed separately for each round, to provide four replicates for each treatment.

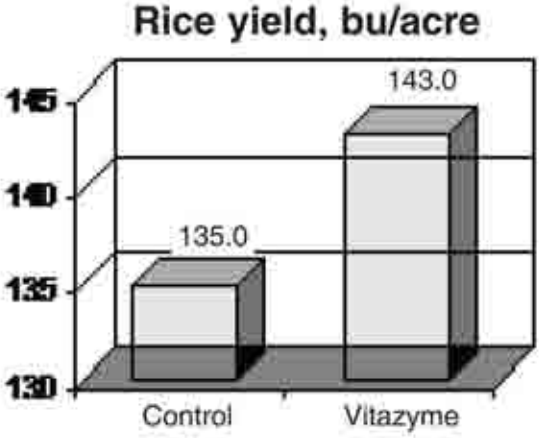
Fertility treatments: Total nitrogen applications were 180 lb/acre of actual N. No phosphorus or potassium were applied.

Vitazyme applications: (1) 13 oz/acre on the seed at planting; (2) 13 oz/acre at the fifth leaf stage along with the herbicidel application.

Harvest date: September 21, 1998

Yield results: At harvest, the grain contained 15.4% moisture.

	Control	Vitazyme	Increase
Grain yield, bu/acre	135.0	143.0	8.0 (+6%)



Grain Increase: 6%

Income results: The price of rice is estimated at $4.00/bu.

	Control	Vitazyme	Increase
Grain value	$540.00/acre	$572.00/acre	$32.00/acre

Income increase: $32.00/acre