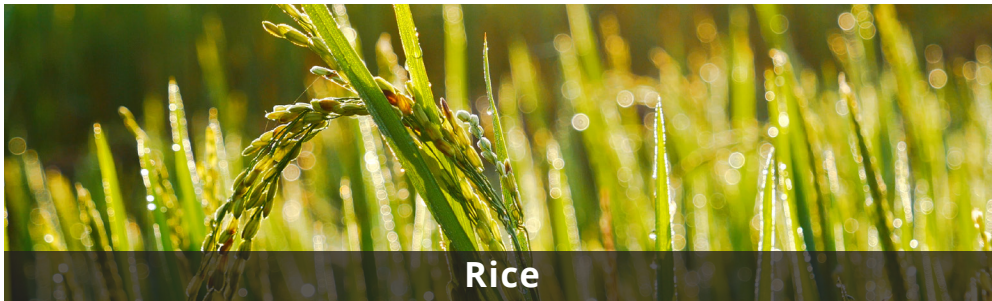


BiOWiSH® Crop Liquid

Evaluation of BiOWiSH® Crop Liquid Increases Rice Yield in Two Vietnamese Soil Types



Rice

Executive Summary

BiOWiSH Technologies partnered with the Vietnam National Field Fertilizer Testing Department to conduct a study to test the effect of BiOWiSH® Crop Liquid coated onto urea to create an Enhanced Efficiency Fertilizer (EEF) for rice production in Vietnam.

The study compared three treatments:

- Control, Standard Urea Fertility Program
- Control + BiOWiSH® Crop Liquid
- N Optimized Fertility Program + BiOWiSH® Crop Liquid

The results indicate that the addition of BiOWiSH® Crop Liquid optimized yield potential by improved nutrient uptake for both BiOWiSH® treatments compared to the Control, which resulted in higher profit.

Background

About BiOWiSH Technologies

Headquartered in Cincinnati, Ohio, BiOWiSH Technologies, Inc. is a global provider of biotechnology solutions. As a leader in the agricultural market, we help farmers increase crop production sustainably, safely, and cost effectively. Our revolutionary BiOWiSH® Crop Liquid is a blend of proprietary microbial cultures that can be coated onto dry fertilizer or mixed with liquid fertilizers to create an enhanced efficiency fertilizer. BiOWiSH® endophytic *Bacillus* deliver soil nutrients to crops through the rhizophagy cycle creating a symbiotic relationship between the plant and soil microbes. This helps farmers achieve consistent results across a broad range of operating conditions, climates, and environments. By unifying nature and science, BiOWiSH reinvents the way food is grown. For more information, visit biowishtech.com.

BiOWiSH® Crop Liquid



- Optimizes yield potential by improved nutrient uptake
- Increases nutrient use efficiency and supports nutrient uptake
- Optimizes soil conditions for greater root mass
- Improves soil conditions for increased plant vigor
- Enhances beneficial microbes in the rhizosphere

Available Size

- 264 gal/1000 L

About Vietnam National Field Fertilizer Testing Department

Founded in 1980 as a state scientific and technological organization under the Soils and Fertilizers Research Institute, the center has had many achievements, research results, and production methods that have been applied to agricultural production in Vietnam. It is also the organization accredited to be eligible for fertilizer testing, producing, and trading fertilizer along with other agro-chemical substances with the best reputation and quality.

Objectives

The purpose of this trial was to evaluate the performance of BiOWiSH® Crop Liquid coated onto urea to create an Enhanced Efficiency Fertilizer (EEF) for rice, as part of a standard fertility program and an optimized fertility program, compared to the Control. The study was conducted in the Hau Giang and An Giang Provinces of Vietnam.

Implementation Program

The studies were conducted in two locations with different soil types. Hau Giang Province has acid sulphate soil and An Giang Province has a neutral pH, alluvial soil. Both studies were conducted in typical fields. The studies compared the farmer's standard urea fertility program against urea coated with BiOWiSH®, and an N Optimized Fertility Program + BiOWiSH® with a 10% reduction in total urea use. Costs and yields were evaluated to determine how the addition of BiOWiSH® to the fertility programs increased the farmer's yield and revenue. Trials were laid out in a randomized complete block design (RCBD) with four replicates.

Table 1. Fertilizer, Treatments, and Application Timing

Treatment	Fertilizer Application Timing	Urea kg/ha [lbs/acre]	DAP kg/ha [lbs/acre]	KCI kg/ha [lbs/acre]
Control, Standard Urea Fertility Program	1 DAT	50 [44.6]	50 [44.6]	-
	10 DAT	50 [44.6]	40 [35.7]	-
	30 DAT	50 [44.6]	40 [35.7]	-
	45 DAT	50 [44.6]	-	40 [35.7]
	Flower Development	30 [26.8]	-	30 [26.8]
Control + BiOWiSH® Crop Liquid	1 DAT	50 [44.6]	50 [44.6]	-
	10 DAT	50 [44.6]	40 [35.7]	-
	30 DAT	50 [44.6]	40 [35.7]	-
	45 DAT	50 [44.6]	-	-
	Flower Development	30 [26.8]	-	-

*DAT: Days After Transplanting.

Treatment	Fertilizer Application Timing	Urea kg/ha [lbs/acre]	DAP kg/ha [lbs/acre]	KCI kg/ha [lbs/acre]
N Optimized Fertility Program + BiOWiSH® Crop Liquid	1 DAT	50 [44.6]	45 [40.2]	-
	10 DAT	50 [44.6]	40 [35.7]	-
	30 DAT	50 [44.6]	40 [35.7]	-
	45 DAT	50 [44.6]	-	40 [35.7]
	Flower Development	30 [26.8]	-	30 [26.8]

*BiOWiSH® Crop Liquid used at manufacturer's recommended rate.

**Calculations for conversions between imperial and metric units are based on the original source data; slight rounding differences may occur within reported publication values.

Results

BiOWiSH® Crop Liquid, when coated onto fertilizer, optimized yield potential by improved nutrient uptake for both treatments and locations in this rice study.

Figure 1: Rice Yield – Hau Giang

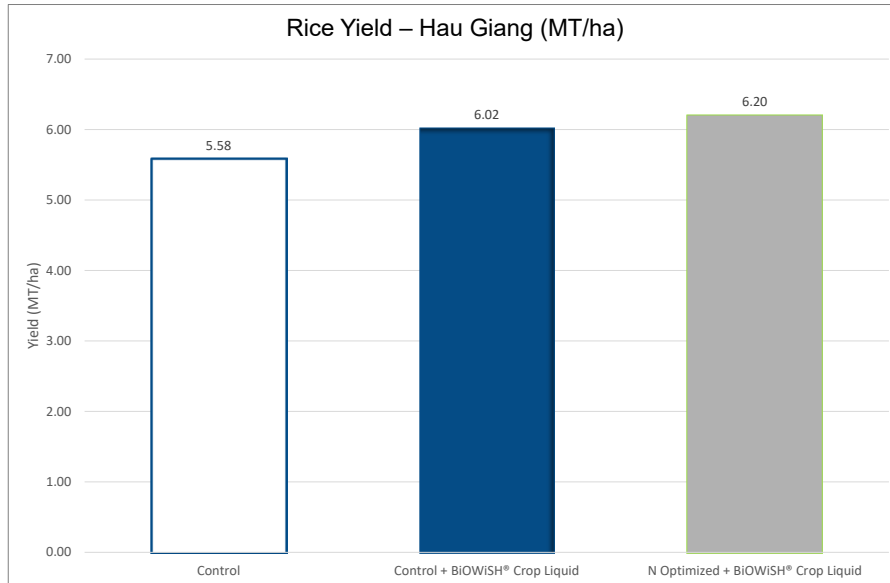


Figure 2: Rice Yield – An Giang

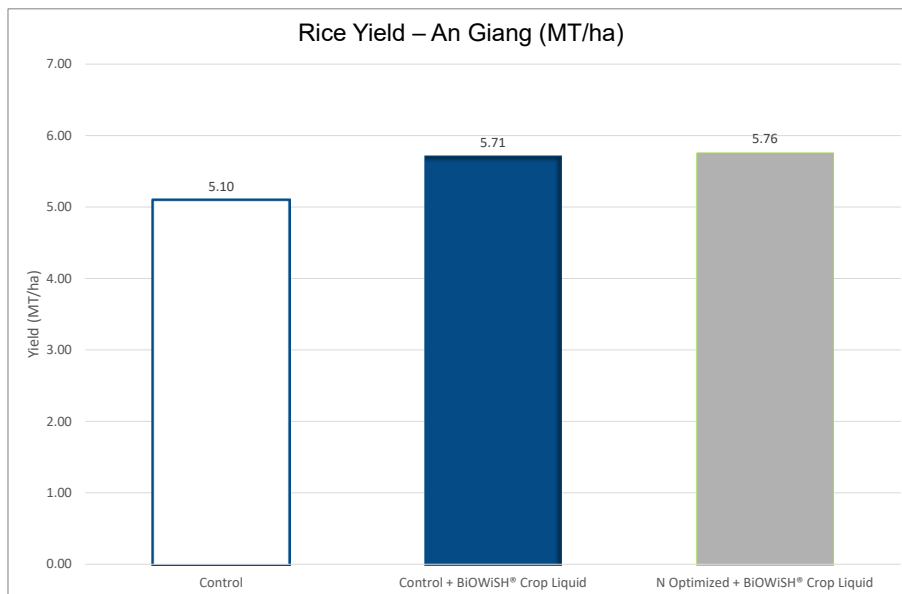


Table 2: Yield and Net Income – Hau Giang

Hau Giang Treatments	Yield MT/ha [tons/acre]	Yield Increase MT/ha [tons/acre]	Yield Increase %	Net Income USD/ha [USD/acre]	Profit Change USD/ha [USD/acre]
Control, Standard Urea Fertility Program	5.58 [2.49]	-	-	2143 [956]	-
Control + BiOWiSH® Crop Liquid	6.02 [2.69]	0.44 [0.20]	7.89	2314 [1032]	171 [76]
N Optimized + BiOWiSH® Crop Liquid	6.20 [2.77]	0.62 [0.28]	11.11	2391 [1067]	248 [111]

Table 3: Yield and Net Income – An Giang

An Giang Treatments	Yield MT/ha [tons/acre]	Yield Increase MT/ha [tons/acre]	Yield Increase %	Net Income USD/ha [USD/acre]	Profit Change USD/ha [USD/acre]
Control, Standard Urea Fertility Program	5.10 [2.28]	-	-	1954 [872]	-
Control + BiOWiSH® Crop Liquid	5.71 [2.55]	0.61 [0.27]	11.96	2190 [977]	236 [105]
N Optimized + BiOWiSH® Crop Liquid	5.76 [2.57]	0.66 [0.29]	12.94	2218 [989]	264 [118]

*Calculations for conversions between imperial and metric units are based on the original source data; slight rounding differences may occur within reported publication values.

**Net income is the crop value minus the fertility program cost. It does not account for the non-fertility expenses.

***Profit change is the difference between net income of the respective program and the Control.

Conclusion

BiOWiSH® endophytic *Bacillus* deliver soil nutrients to crops through the rhizophagy cycle creating a symbiotic relationship between the plant and soil microbes. This enabled optimized yield potential by improved nutrient uptake, which led to profit changes of between \$171 USD/ha [\$76 USD/acre] and \$264 USD/ha [\$118 USD/acre]. This demonstrates that despite a reduction of fertilizer rates, fertilizer coated with BiOWiSH® Crop Liquid can achieve higher yield potential across different soils in Vietnam.



Contact us:
 agronomy@biowishtech.com
 +1 312 572 6700
 biowishtech.com

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