# Confidential Client and OceanGrown 2009 Field Trials

Facts, Findings and The Future of Sustainable Agriculture

# 3 Key Questions

1. Why did Confidential Client choose to study the **OceanGrown fertility management solution in comparison to its conventional NPK applications**?
2. What are the **critically important Take-Aways** from the study?
3. Will these results create **a revolutionary new approach that can help Client and growers to sustain profitability**, **nourish** the expected 9 billion people by 2050, and **care for the planet** by reducing water pollution, water scarcity and global warming?

# Why did Client choose to study the OceanGrown fertility management solution in comparison to its standard NPK applications?

- Client is committed to sustainable agriculture and so is OceanGrown!
  - Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs.
  - Client has made sustainability a corporate goal that is measurable as described in the following slides.

- By choosing to study OceanGrown, Client wanted to verify its claims that OceanGrown fertility management solution would use:
  - Less Land
  - Less Water
  - Less Pesticides

**Client**
**wants to continue**
**to have their contract growers grow**
**foods using**
**Less Land, Less Water, Less Pesticides**
**&**
**OceanGrown**
**wants to continue**
**to have growers grow**
**food, feed, fuel, and fiber using**
**Less Land, Less Water, Less Pesticides**

**Therefore, Client chose to undertake the field trials.**

# Sustainability Challenges met by OceanGrown

- Less Land by enhanced yields
- Less Water by optimizing the health of the plants which results in reduced stress (introduced by standard NPK applications) that otherwise would then require additional irrigation
- Less Pesticides by optimizing the health of the plants so that they are not suspectible to pests or fungus diseases

# Facts about the Field Trials and Subsequent Nutrient Quality Lab Analyses

- During the 2009 growing season, Client undertook field research to compare yield performance of yellow sweet corn using OceanGrown fertility management products and program as compared to standard NPK fertilizer placement
- Client ’s senior research agronomist conducted the trials and compiled results
- OceanGrown, Inc. was provided both canned and frozen ears from the field trials for plant nutrient utilization and crop nutrient full spectrum elemental nutrient quality lab analyses
- Selected data sheets of the results are included in this presentation

# Findings from the Field Trials

Field trial and lab results indicate that the OceanGrown products and the respective integrated fertility/nutrient management program delivers significantly enhanced market-favorable, nutrient quality, and sustainability features that include:

- Overall better yields compared to NPK fertilizer placement
- Reduced Nitrogen fertilizer by 30%
- Cost effective fertilizer replacement
- Better plant utilization of nutrients
- Enhanced flavor of canned corn
- Enhanced nutrient quality of sweet corn from kernels and canned corn

# OceanGrown delivered better yields compared to standard fertilizer placement for Hybrid1

OceanGrown Fertilizer Replacement comparison trial 2009

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | | Hybrid 1 | Hybrid 1 | Hybrid 1 | Hybrid 1 | Hybrid 1 | Hybrid 1 |
| Part Rated | | | | | | | | Green | Tip | Ear | Ear | Husked | Green |
| Rating Data Type | | | | | | | | Yield | Fill | Length | Width | Yield | Yield |
| Rating Unit | | | | | | | | Lbs | Inches | Inches | Inches | Lbs | T/A |
| Rating Date | | | | | | | | 9/8/09 | 9/8/09 | 9/8/09 | 9/8/09 | 9/8/09 | 9/8/09 |
| Crop Stage | | | | | | | | Mature | | | | Mature | Mature |
| Crop Stage Scale | | | | | | | | 20 ears | | | | 20 ears | 20 ears |
| ARM Action Codes | | | | | | | | | | | | | TY1 |
| # Subsamples, Dec. | | | | | | | | | | | | | 1 |
| Trt No. | Treatment Name | Form Conc | Form Type | Rate | Rate Unit | Grow Stg | Appl Code | | | | | | |
| 1 | No Starter | | | | | | | 12.9 b | 1.38 a | 7.13 a | 1.89 a | 9.5 b | 6.4 b |
| | No Side Dress | | | | | | | | | | | | |
| 2 | 10-34-0 | | | 5 | GAL/A | InFurrow | A | 13.6 ab | 1.38 a | 7.56 a | 1.93 a | 10.4 a | 6.8 ab |
| | 28%N | | | 35 | GAL/A | 8" | B | | | | | | |
| 3.00 | OG Humic Acid 12 | | | 2.00 | GAL/A | InFurrow | A | 14.20 a | 1.06 a | 7.44 a | 1.94 a | 10.65 a | 7.10 a |
| | OG PGS | | | 3 | OZ/A | InFurrow | A | | | | | | |
| | OceanSolution | | | 64 | OZ/A | InFurrow | A | | | | | | |
| | OG Liquid Calcium | | | 3 | GAL/A | 8" | B | | | | | | |
| | 28%N | | | 22.00 | GAL/A | 8" | B | | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | 12" | C | | | | | | |
| | OceanSolution | | | 32 | OZ/A | 12" | C | | | | | | |
| | OG Humic Acid | | | 1 | GAL/A | 3 | D | | | | | | |
| | OceanSolution | | | 64 | OZ/A | 3 | D | | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | Tassel | E | | | | | | |
| LSD (P=.05) | | | | | | | | 0.958 | 0.375 | 0.36 | 0.094 | 0.624 | 0.48 |
| Standard Deviation | | | | | | | | 0.554 | 0.217 | 0.208 | 0.054 | 0.361 | 0.28 |
| CV | | | | | | | | 4.08 | 17.04 | 2.82 | 2.83 | 3.54 | 4.08 |
| Bartletts X2 | | | | | | | | 2.682 | 1.429 | 1.753 | 7.649 | 2.499 | 2.681 |
| P(Bartletts X2) | | | | | | | | 0.262 | 0.49 | 0.416 | 0.022* | 0.287 | 0.262 |
| Replicate F | | | | | | | | 1.435 | 1 | 3.04 | 1.143 | 1.462 | 1.435 |
| Replicate Prob(F) | | | | | | | | 0.3225 | 0.4547 | 0.1144 | 0.405 | 0.3161 | 0.3226 |
| Treatment F | | | | | | | | 5.524 | 2.778 | 4.68 | 0.879 | 11.257 | 5.521 |
| Treatment Prob(F) | | | | | | | | 0.0436 | 0.14 | 0.0596 | 0.4625 | 0.0093 | 0.0436 |

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

**OceanGrown = 7.10 Tons/Acre**
**outyields**
**NPK = 6.8 Tons/Acre**

# OceanGrown delivered better yields compared to standard fertilizer placement for Hybrid2

OceanGrown Fertilizer Replacement comparison trial 2009

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | | Hybrid 2 | Hybrid 2 | Hybrid 2 | Hybrid 2 | Hybrid 2 | Hybrid 2 |
| Part Rated | | | | | | | | Green | Tip | Ear | Ear | Husked | Green |
| Rating Data Type | | | | | | | | Yield | Fill | Length | Width | Yield | Yield |
| Rating Unit | | | | | | | | Lbs | Inches | Inches | Inches | Lbs | T/A |
| Rating Date | | | | | | | | 9/8/09 | 9/8/09 | 9/8/09 | 9/8/09 | 9/8/09 | 9/8/09 |
| Crop Stage | | | | | | | | Mature | | | | Mature | Mature |
| Crop Stage Scale | | | | | | | | 20 ears | | | | 20 ears | 20 ears |
| ARM Action Codes | | | | | | | | | | | | | TY2 |
| # Subsamples, Dec. | | | | | | | | | | | | | 1 |
| Trt No. | Treatment Name | Form Conc | Form Type | Rate | Rate Unit | Grow Stg | Appl Code | | | | | | |
| 1 | No Starter | | | | | | | 16.95 b | 1 a | 7.81 b | 2.11 a | 13.1 b | 8.4 b |
| | No Side Dress | | | | | | | | | | | | |
| 2 | 10-34-0 | | | 5 | GAL/A | InFurrow | A | 18.7 a | 0.5 b | 8.25 a | 2.17 a | 14.25 a | 9.3 a |
| | 28%N | | | 35 | GAL/A | 8" | B | | | | | | |
| 3.00 | OG Humic Acid 12 | | | 2.00 | GAL/A | InFurrow | A | 18.95 a | 0.50 b | 8.13 a | 2.16 a | 14.45 a | 9.40 a |
| | OG PGS | | | 3 | OZ/A | InFurrow | A | | | | | | |
| | OceanSolution | | | 64 | OZ/A | InFurrow | A | | | | | | |
| | OG Liquid Calcium | | | 3 | GAL/A | 8" | B | | | | | | |
| | 28%N | | | 22.00 | GAL/A | 8" | B | | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | 12" | C | | | | | | |
| | OceanSolution | | | 32 | OZ/A | 12" | C | | | | | | |
| | OG Humic Acid | | | 1 | GAL/A | 3 | D | | | | | | |
| | OceanSolution | | | 64 | OZ/A | 3 | D | | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | Tassel | E | | | | | | |
| LSD (P=.05) | | | | | | | | 0.745 | 0.204 | 0.161 | 0.07 | 0.853 | 0.37 |
| Standard Deviation | | | | | | | | 0.431 | 0.118 | 0.093 | 0.041 | 0.493 | 0.21 |
| CV | | | | | | | | 2.37 | 17.68 | 1.16 | 1.89 | 3.54 | 2.37 |
| Bartletts X2 | | | | | | | | 0.67 | 0 | 0.059 | 0.045 | 1.999 | 0.669 |
| P(Bartletts X2) | | | | | | | | 0.715 | 0.00* | 0.809 | 0.978 | 0.368 | 0.716 |
| Replicate F | | | | | | | | 3.212 | 1 | 2.2 | 0.858 | 0.658 | 3.208 |
| Replicate Prob(F) | | | | | | | | 0.1042 | 0.4547 | 0.1889 | 0.5119 | 0.6072 | 0.1044 |
| Treatment F | | | | | | | | 25.616 | 24 | 23.4 | 3.051 | 8.727 | 25.589 |
| Treatment Prob(F) | | | | | | | | 0.0012 | 0.0014 | 0.0015 | 0.1219 | 0.0167 | 0.0012 |

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

**OceanGrown = 9.40 Tons/Acre**
**outyields**
**NPK = 9.3 Tons/Acre**

# NPK delivered better yields compared to OceanGrown fertilizer replacement for Hybrid3

OceanGrown Fertilizer Replacement comparison trial 2009

| Trt No. | Treatment Name | Form Conc | Form Type | Rate | Rate Unit | Grow Stg | Appl Code | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | | Hybrid 3 | Hybrid 3 | Hybrid 3 | Hybrid 3 | Hybrid 3 |
| Part Rated | | | | | | | | Green | Ear | Ear | Husked | Green |
| Rating Data Type | | | | | | | | Yield | Length | Width | Yield | Yield |
| Rating Unit | | | | | | | | Lbs | Inches | Inches | Lbs | T/A |
| Rating Date | | | | | | | | 9/1/09 | 9/1/09 | 9/1/09 | 9/1/09 | 9/1/09 |
| Crop Stage | | | | | | | | Mature | | | Mature | Mature |
| Crop Stage Scale | | | | | | | | 20 ears | | | 20 ears | 20 ears |
| ARM Action Codes | | | | | | | | | | | | TY3 |
| # Subsamples, Dec. | | | | | | | | | | | | 1 |
| 1 | No Starter | | | | | | | | | | | |
| | No Side Dress | | | | | | | | | | | |
| 2 | 10-34-0 | | | 5 | GAL/A | InFurrow | A | 14.25 a | 7.97 a | 1.8 a | 9.23 a | 7.3 a |
| | 28%N | | | 35 | GAL/A | 8" | B | | | | | |
| 3.00 | OG Humic Acid 12 | | | 2.00 | GAL/A | InFurrow | A | 13.65 a | 7.92 a | 1.83 a | 9.18 a | 7.00 a |
| | OG PGS | | | 3 | OZ/A | InFurrow | A | | | | | |
| | OceanSolution | | | 64 | OZ/A | InFurrow | A | | | | | |
| | OG Liquid Calcium | | | 3 | GAL/A | 8" | B | | | | | |
| | 28%N | | | ##### | GAL/A | 8" | B | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | 12" | C | | | | | |
| | OceanSolution | | | 32 | OZ/A | 12" | C | | | | | |
| | OG Humic Acid | | | 1 | GAL/A | 3 | D | | | | | |
| | OceanSolution | | | 64 | OZ/A | 3 | D | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | Tassel | E | | | | | |
| LSD (P=.05) | | | | | | | | 1.299 | 0.206 | 0.08 | 0.421 | 0.67 |
| Standard Deviation | | | | | | | | 0.577 | 0.091 | 0.035 | 0.187 | 0.3 |
| CV | | | | | | | | 4.14 | 1.15 | 1.95 | 2.03 | 4.14 |
| Bartletts X2 | | | | | | | | 0.514 | 1.123 | 0 | 0.261 | 0.514 |
| P(Bartletts X2) | | | | | | | | 0.473 | 0.289 | 0.00* | 0.609 | 0.473 |
| Replicate F | | | | | | | | 0.18 | 0.397 | 0.999 | 0.285 | 0.18 |
| Replicate Prob(F) | | | | | | | | 0.9035 | 0.766 | 0.5002 | 0.8353 | 0.9037 |
| Treatment F | | | | | | | | 2.161 | 0.591 | 1 | 0.141 | 2.16 |
| Treatment Prob(F) | | | | | | | | 0.2379 | 0.498 | 0.391 | 0.7325 | 0.238 |

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

**NPK = 7.30 Tons/Acre**
**outyields**
**OceanGrown= 7.00 Tons/Acre**

# OceanGrown delivered better yields compared to standard fertilizer placement for Hybrid4

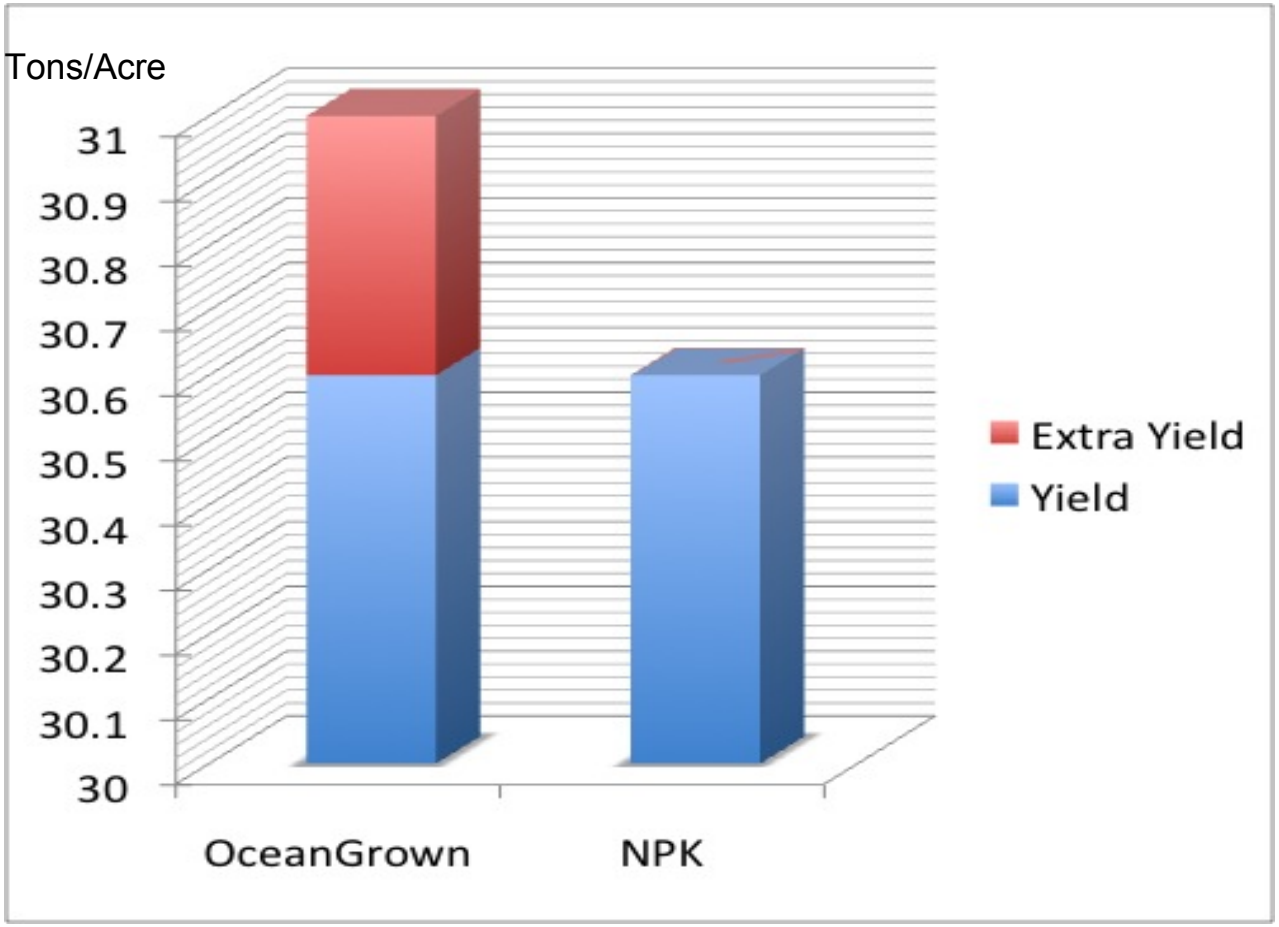
OceanGrown Fertilizer Replacement comparison trial 2009

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | | Hybrid 4 | Hybrid 4 | Hybrid 4 | Hybrid 4 | Hybrid 4 |
| Part Rated | | | | | | | | Green | Ear | Ear | Husked | Green |
| Rating Data Type | | | | | | | | Yield | Length | Width | Yield | Yield |
| Rating Unit | | | | | | | | Lbs | Inches | Inches | Lbs | T/A |
| Rating Date | | | | | | | | 9/4/09 | 9/4/09 | 9/4/09 | 9/4/09 | 9/4/09 |
| Crop Stage | | | | | | | | Mature | | | | Mature |
| Crop Stage Scale | | | | | | | | 20 ears | | | | 20 ears |
| ARM Action Codes | | | | | | | | | | | | TY4 |
| # Subsamples, Dec. | | | | | | | | | | | | 1 |
| Trt No. | Treatment Name | Form Conc | Form Type | Rate | Rate Unit | Grow Stg | Appl Code | | | | | |
| 1 | No Starter | | | | | | | | | | | |
| | No Side Dress | | | | | | | | | | | |
| 2 | 10-34-0 | | | 5 | GAL/A | InFurrow | A | 14.05 a | 7.13 a | 1.9 a | 9.75 a | 7.2 a |
| | 28%N | | | 35 | GAL/A | 8" | B | | | | | |
| 3.00 | OG Humic Acid 12 | | | 2.00 | GAL/A | InFurrow | A | 14.60 a | 7.38 a | 1.93 a | 9.75 a | 7.50 a |
| | OG PGS | | | 3 | OZ/A | InFurrow | A | | | | | |
| | OceanSolution | | | 64 | OZ/A | InFurrow | A | | | | | |
| | OG Liquid Calcium | | | 3 | GAL/A | 8" | B | | | | | |
| | 28%N | | | ### | GAL/A | 8" | B | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | 12" | C | | | | | |
| | OceanSolution | | | 32 | OZ/A | 12" | C | | | | | |
| | OG Humic Acid | | | 1 | GAL/A | 3 | D | | | | | |
| | OceanSolution | | | 64 | OZ/A | 3 | D | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | Tassel | E | | | | | |
| LSD (P=.05) | | | | | | | | 1.229 | 0.459 | 0.08 | 0.687 | 0.63 |
| Standard Deviation | | | | | | | | 0.546 | 0.204 | 0.035 | 0.306 | 0.28 |
| CV | | | | | | | | 3.81 | 2.82 | 1.85 | 3.13 | 3.81 |
| Bartletts X2 | | | | | | | | 3.448 | 0 | 0 | 3.081 | 3.447 |
| P(Bartletts X2) | | | | | | | | 0.063 | 0.001* | 0.00* | 0.079 | 0.063 |
| Replicate F | | | | | | | | 1.625 | 2 | 1.002 | 3.214 | 1.626 |
| Replicate Prob(F) | | | | | | | | 0.3498 | 0.2918 | 0.4994 | 0.1816 | 0.3497 |
| Treatment F | | | | | | | | 2.027 | 3 | 1.004 | 0 | 2.027 |
| Treatment Prob(F) | | | | | | | | 0.2497 | 0.1817 | 0.3902 | 1 | 0.2497 |

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

**OceanGrown = 7.50 Tons/Acre**
**outyields**
**NPK = 7.2 Tons/Acre**

# OceanGrown delivered **<u>0.4 more tons per acre</u>** in overall combined yields



# OceanGrown Reduced Nitrogen Fertilizer By Over 37% and still out-yielded standard NPK placement

OceanGrown Fertilizer Replacement comparison trial 2009

**Standard NPK = 35 gal/acre**

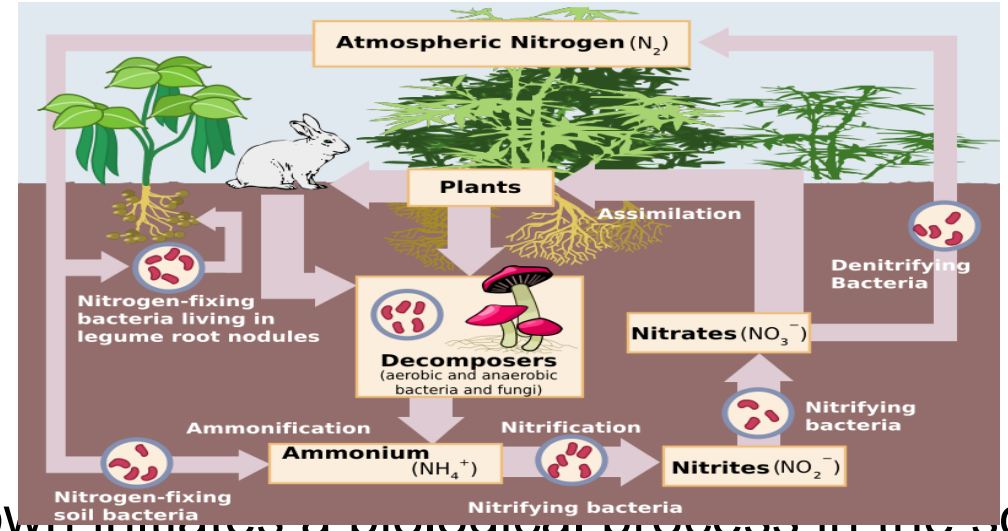
**OceanGrown = 22 gal/acre**

| Trt No. | Treatment Name | Form Conc | Form Type | Rate | Rate Unit | Grow Stg | Appl Code | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Crop Code | | | | | | | | | | | | d 1 |
| | Part Rated | | | | | | | | | | | | en |
| | Rating Data Type | | | | | | | | | | | | eld |
| | Rating Unit | | | | | | | | | | | | T/A |
| | Rating Date | | | | | | | | | | | | 09 |
| | Crop Stage | | | | | | | | | | | | ature |
| | Crop Stage Scale | | | | | | | | 20 ears | | | 20 ears | 20 ears |
| | ARM Action Codes | | | | | | | | | | | | Y1 |
| | # Subsamples, Dec. | | | | | | | | | | | | 1 |
| 1 | No Starter | | | | | | | | | | | | b |
| | No Side Dress | | | | | | | | | | | | |
| 2 | 10-34-0 | | | 5 | GAL/A | InFurrow | A | | | | | | ab |
| | 28%N | | | 35 | GAL/A | 8" | B | | | | | | |
| 3 | OG Humic Acid 12 | | | 2.00 | GAL/A | InFurrow | A | 14.20 | a | 1.06 | a | 7.44 | a | 1.94 | a | 10.65 | a | 7.10 | a |
| | OG PGS | | | 3 | OZ/A | InFurrow | A | | | | | | | | | | | | |
| | OceanSolution | | | 64 | OZ/A | InFurrow | A | | | | | | | | | | | | |
| | OG Liquid Calcium | | | 3 | GAL/A | 8" | B | | | | | | | | | | | | |
| | 28%N | | | 22.00 | GAL/A | 8" | B | | | | | | | | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | 12" | C | | | | | | | | | | | | |
| | OceanSolution | | | 32 | OZ/A | 12" | C | | | | | | | | | | | | |
| | OG Humic Acid | | | 1 | GAL/A | 3 | D | | | | | | | | | | | | |
| | OceanSolution | | | 64 | OZ/A | 3 | D | | | | | | | | | | | | |
| | OG Carbon 4 | | | 16 | OZ/A | Tassel | E | | | | | | | | | | | | |
| | LSD (P=.05) | | | | | | | 0.958 | | 0.375 | | 0.36 | | 0.094 | | 0.624 | | 0.48 | |
| | Standard Deviation | | | | | | | 0.554 | | 0.217 | | 0.208 | | 0.054 | | 0.361 | | 0.28 | |
| | CV | | | | | | | 4.08 | | 17.04 | | 2.82 | | 2.83 | | 3.54 | | 4.08 | |
| | Bartletts X2 | | | | | | | 2.682 | | 1.429 | | 1.753 | | 7.649 | | 2.499 | | 2.681 | |
| | P(Bartletts X2) | | | | | | | 0.262 | | 0.49 | | 0.416 | | 0.022* | | 0.287 | | 0.262 | |
| | Replicate F | | | | | | | 1.435 | | 1 | | 3.04 | | 1.143 | | 1.462 | | 1.435 | |
| | Replicate Prob(F) | | | | | | | 0.3225 | | 0.4547 | | 0.1144 | | 0.405 | | 0.3161 | | 0.3226 | |
| | Treatment F | | | | | | | 5.524 | | 2.778 | | 4.68 | | 0.879 | | 11.257 | | 5.521 | |
| | Treatment Prob(F) | | | | | | | 0.0436 | | 0.14 | | 0.0596 | | 0.4625 | | 0.0093 | | 0.0436 | |

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

# Why can OceanGrown Reduce Nitrogen and Still Get Enhanced Yields?
# The answer, in part, is that it contains Nitrogen Fixing Bacteria from the Ocean!

- **Nitrogen fixation** refers to the biological process by which nitrogen ($N_2$) in the atmosphere is converted into ammonia.[1]



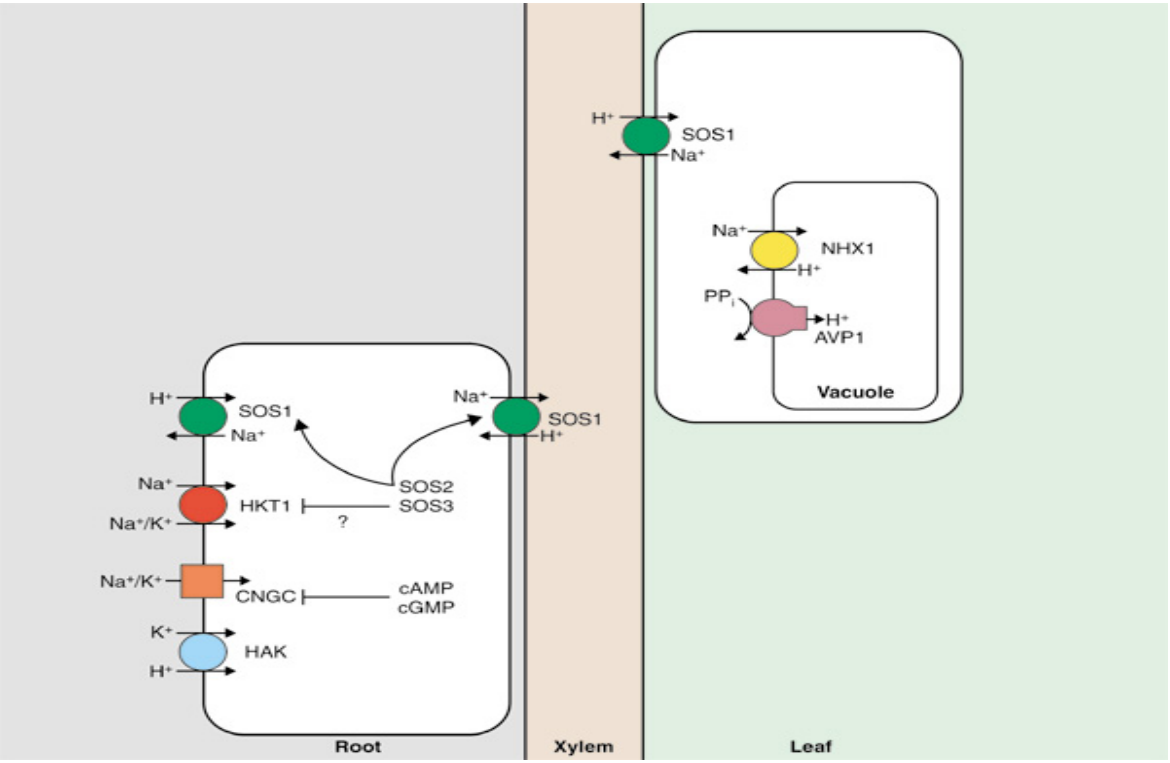

- OceanGrown initiates a biological process in the soil through two key bacteria
  - Azobacter
  - Nitrobacter

# OceanGrown delivers cost effective fertilizer replacement

- Using 2009 fertilizer costing (Citing January 2010, Crop Life magazine)
  - 2009 cost per bushel of corn for fertilizer = $1.36
  - Using OceanGrown and based on 2009 prices, growers could have reduced prices by up to 30% resulting in
    - Cost per bushel of corn for fertilizer = $0.95
    - 2009 Savings = $0.41 per bushel
- Using estimated 2010 fertilizer costing (Citing January 2010, Crop Life magazine)(as based on growers' 100% adoption of Best Management Practices for fertilizer efficiencies)
    - Estimated 2010 Cost per bushel of corn for fertilizer = $0.53
  - Using OceanGrown and adjusting for up to 30% reduction
    - Cost per bushel of corn for fertilizer = $0.37
    - 2010 Estimated Savings = $0.16 per bushel

# OceanGrown delivers ***better plant utilization of nutrients because of Sodium***

- Plants grown with OceanGrown had a 33% difference in higher concentrations of Sodium compared to NPK grown plants
- Measured in the plant's earleaf, sodium has the advantage of creating a pathway for other nutrients that typically is only made possible by a complex process that is dependent on potassium bioavailability
- Thus, OceanGrown provides overall better plant utilization of nutrients




**Model of $Na^+$ fluxes in plant cells.** Sodium ions enter root cells through HKT proteins and non-selective voltage-independent cation channels, [which likely facilitate]...long-distance $Na^+$ transport from roots to shoots [11,21]. ...Cytoplasmic $Na^+$ is compartmentalized into vacuoles within cells by the tonoplast (vacuolar membrane) $Na^+/H^+$ antiporter NHX1,...

Pardo and Quintero *Genome Biology* 2002 **3**:reviews1017.1 doi:10.1186/gb-2002-3-6-reviews1017

# OceanGrown delivers better plant utilization of nutrients because it delivers more than 22% difference in Iron to the plant than NPK and Iron is Good!

**Iron Specifically Protects Corn Protoplasts from T-Toxin of *Cochliobolus heterostrophus* ***

W. Donald MacRae and O. C. Yoder
Department of Plant Pathology, Cornell University, Ithaca, New York 14853-5908

- Ferric ion reduced the damaging effects of T-toxin, a seriesof linear -polyketols produced by the pathogenic fungus Cochliobolus heterostrophus, on leaf mesophyll protoplasts from susceptibleT-cytoplasm corn.
- Of nine metals tested, only ferric and ferrous ions had this effect.
- The mechanism by which iron specifically protects protoplastsfrom T-toxin is not understood, but time lapse experiments suggest that iron acts on some intracellular site to modify T-toxin sensitivity and not on a transport system at the cell surface.

*http://www.plantphysiol.org/cgi/content/abstract/84/4/1257

# NPK produces greater amounts of Aluminum and Manganese which stress the plants

**University of Minnesota Soil Testing - Nutrient and Micronutrient Analysis Results of Pre-harvest Earleaf, Compiled October 1, 2009**

Tests Performed: Nutrient and Micronutrient Series (http://soiltest.cfans.umn.edu/methods.htm)
Lab Manager: Roger Eliason, 612-625-7701, fax 612-624-3420, elias004@tc.umn.edu
Units = ppm

OceanGrown and NPK are highlighted where the percent difference is greater than 20%

Higher concentrations of Aluminum (Al) and Manganese (Mn) found in plants grown using NPK are toxicity concerns. The following is cited from University of Kentucky Agronomy Research (http://www.ca.uky.edu/agc/pubs/agr/agr105/agr105.htm) "... at very low pH, corn suffers from both manganese and aluminum toxicity. Manganese toxicity causes striped leaves and stunted growth whereas aluminum toxicity results in poor root growth with consequent drought injury. Both symptoms are common in soils with pH values of 4 to 5. Above pH 5, no symptoms are likely although improvement in growth may continue to pH 5.5. Above pH 5.5, no yield response of any kind is to be expected. Furthermore, at pH values of 6.5 or higher, corn is very susceptive to zinc deficiency. Therefore, a pH near 6.0 is safest.... adding N fertilizer to corn greatly accelerates the acidification of soils."

| Name | Al | B | Ba | Be | Ca | Cd | Co | Cr | Cu |
|---|---|---|---|---|---|---|---|---|---|
| OceanGrown | 7.540 | 8.256 | 7.301 | <0.02 | 8724.900 | <0.22 | <0.78 | 0.513 | 4.810 |
| OceanGrown Dup | 7.294 | 8.246 | 7.413 | <0.02 | 8747.800 | <0.22 | <0.78 | 0.579 | 5.320 |
| NPK | 9.242 | 9.384 | 8.813 | <0.02 | 9446.500 | <0.22 | <0.78 | 0.572 | 5.402 |
| None | 7.001 | 7.266 | 7.052 | <0.02 | 8262.400 | <0.22 | <0.78 | 0.580 | 3.737 |
| %diff | 20.2836 | 12.7891 | 17.256 | | 7.68043 | | | 1.21633 | 1.52957 |

| Name | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P |
|---|---|---|---|---|---|---|---|---|---|
| OceanGrown | 54.328 | 8455.600 | <0.1 | 7913.700 | 34.053 | <0.54 | 30.244 | <0.64 | 3854.300 |
| OceanGrown Dup | 54.161 | 8527.900 | <0.1 | 7936.800 | 34.043 | <0.54 | 32.956 | <0.64 | 3827.800 |
| NPK | 53.914 | 7404.100 | <0.1 | 7670.300 | 50.474 | <0.54 | 22.122 | <0.64 | 3455.400 |
| None | 43.358 | 7816.200 | <0.1 | 7653.100 | 24.800 | <0.54 | 23.471 | <0.64 | 3468.200 |
| %diff | 22.156 | 8.70895 | | 3.12372 | 38.854 | | 33.619 | | 10.5456 |

| Name | Pb | Rb | Si | Sr | Ti | V | Zn | | Total Nitrogen (%) |
|---|---|---|---|---|---|---|---|---|---|
| OceanGrown | <3.52 | <8.86 | 756.990 | 21.444 | <0.1 | <0.32 | 11.860 | | 2.46 |
| OceanGrown Dup | <3.52 | <8.86 | 717.890 | 21.572 | <0.1 | <0.32 | 11.992 | | 2.45 |
| NPK | <3.52 | <8.86 | 692.860 | 25.581 | <0.1 | <0.32 | 10.899 | | 2.55 |
| None | <3.52 | <8.86 | 788.980 | 20.640 | <0.1 | <0.32 | 9.162 | | 1.92 |
| %diff | | | 8.84643 | 17.004 | | | 9.5496 | | 3.59281 |

Compared to OceanGrown, corn grown with NPK results in 20% more difference in Aluminum and 39% more difference in Manganese toxicities* that stress the plant resulting in poor root and leaf performance.

*University of Kentucky Agronomy Research (http://www.ca.uky.edu/agc/pubs/agr/agr105/agr105.htm)

# OceanGrown delivers enhanced flavor of canned corn

| | Taste Panel Member | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample | A | B | C** | D* | E | F | G | Avg | Overall Avg | Comments |
| OceanGrown-A | 1 | 3 | 2 | 1 | 2 | 3 | 3 | 2.1 | 2.1 | Primary SuperTaster selected OceanGrown each time |
| OceanGrown-B | 1 | 3 | 2 | 1 | 2 | 3 | 3 | 2.1 | | |
| No Fertilizer-A | 1 | 3 | 1 | 2 | 2 | 3 | 4 | 2.3 | 2.1 | Secondary SuperTaster selected No Fertilizer each time |
| No Fertilizer-B | 1 | 3 | 1 | 2 | 2 | 3 | 2 | 2.0 | | |
| NPK-A | 1 | 3 | 2 | 2 | 1 | 3 | 3 | 2.1 | 2.2 | Neither SuperTasters selected the NPK grown corn |
| NPK-B | 1 | 3 | 2 | 2 | 3 | 3 | 2 | 2.3 | | |

*Primary SuperTaster
**Secondary SuperTaster

1 = best taste, 5 = not acceptable taste

The taste panel consisted of seven members of the Confidential Client's research staff with two individuals cited as "super testers"

- The primary SuperTaster selected OceanGrown each time!
- The secondary SuperTaster selected the corn grown without any fertilizer
- Neither SuperTaster selected the NPK grown corn!

# OceanGrown delivers enhanced nutrient quality of kernels

## Kernel Analysis

http://www.nutritiondata.com/facts/vegetables-and-vegetable-products/2982/2

### Corn, sweet, white, frozen, kernels cut off cob, unprepared, 284g

| | USDA Typical | USDA Typical | Daily Value | OG (dry) | OG (dry) | OG Daily Value | NPK (dry) | NPK (dry) | NPK Daily Value |
|---|---|---|---|---|---|---|---|---|---|
| | mg | % | % DV | ppb | % | % DV | ppb | % | % DV |
| Calcium | 11.4 | 0.004014085 | 1.00% | 1094 | 0.0001094 | 2.73% | 1283 | 0.0001283 | 3.20% |
| Copper | 0.1 | 0.000035211 | 5.00% | 16.93 | 0.0000017 | 24.04% | 20.92 | 0.0000021 | 29.71% |
| Iron | 1.2 | 0.000422535 | 7.00% | 100.6 | 0.0000101 | 16.67% | 114.6 | 0.0000115 | 18.99% |
| Magnesium | 51.1 | 0.017992958 | 13.00% | 8965 | 0.0008965 | 64.77% | 8735 | 0.0008735 | 63.11% |
| Manganese | 0.4 | 0.000140845 | 18.00% | 54.48 | 0.0000054 | 69.63% | 61.76 | 0.0000062 | 78.93% |
| Phosphorus | 196 | 0.069014085 | 20.00% | 11990 | 0.0011990 | 34.75% | 10720 | 0.0010720 | 31.07% |
| Potassium | 596 | 0.209859155 | 17.00% | 53350 | 0.0053350 | 43.22% | 51820 | 0.0051820 | 41.98% |
| Selenium | 2 | 0.000704225 | 3.00% | 1.143 | 0.0000001 | 0.05% | 0.56 | 0.0000001 | 0.02% |
| Sodium | 8.5 | 0.002992958 | 0.35% | 115.4 | 0.0000115 | 0.13% | 49 | 0.0000049 | 0.06% |
| Zinc | 1.1 | 0.000387324 | 7.00% | 90.26 | 0.0000090 | 16.31% | 70.09 | 0.0000070 | 12.67% |

- These macro and micro nutrients indicated above were selected on the basis of publicly available USDA database for Daily Value percentages

# OceanGrown delivers enhanced nutrient quality of kernels

| Element | OceanGrown (ppb) | OG Tally | NPK (ppb) | NPK Tally | % Diff |
|---|---|---|---|---|---|
| 9Be | 0.009 | 1 | 0 | | 200.000 |
| 93Nb | 0.001 | 1 | 0 | | 200.000 |
| 89Y | 0 | | 0.003 | 1 | 200.000 |
| 72Ge | 0.089 | 1 | 0 | | 200.000 |
| 157Gd | 0 | | 0.001 | 1 | 200.000 |
| 153Eu | 0.001 | 1 | 0 | | 200.000 |
| 141Pr | 0 | | 0.001 | 1 | 200.000 |
| 103Rh | 0 | | 0.053 | 1 | 200.000 |
| 101Ru | 0 | | 0.003 | 1 | 200.000 |
| 195Pt | 0.004 | | 0.296 | 1 | 194.667 |
| 105Pd | 0.038 | | 0.628 | 1 | 177.177 |
| 182W | 0.035 | 1 | 0.008 | | 125.581 |
| 27Al | 75.33 | | 215.4 | 1 | 96.357 |
| 71Ga | 0.007 | | 0.02 | 1 | 96.296 |
| 121Sb | 0.03 | 1 | 0.011 | | 92.683 |
| 118Sn | 0.102 | 1 | 0.038 | | 91.429 |
| 23Na | 115.4 | 1 | 49 | | 80.779 |
| 78Se | 1.143 | 1 | 0.56 | | 68.467 |
| 208Pb | 0.137 | | 0.277 | 1 | 67.633 |
| 205Tl | 0.002 | 1 | 0.001 | | 66.667 |
| 193Ir | 0.002 | 1 | 0.001 | | 66.667 |
| 189Os | 0.012 | 1 | 0.006 | | 66.667 |
| 147Sm | 0.002 | 1 | 0.001 | | 66.667 |
| 146Nd | 0.002 | 1 | 0.001 | | 66.667 |
| 140Ce | 0.008 | 1 | 0.004 | | 66.667 |
| 197Au | 0.009 | | 0.015 | 1 | 50.000 |
| 139La | 0.005 | 1 | 0.003 | | 50.000 |
| 90Zr | 0.164 | 1 | 0.1 | | 48.485 |
| 107Ag | 0.019 | | 0.03 | 1 | 44.898 |
| 138Ba | 2.476 | | 3.418 | 1 | 31.965 |
| 178Hf | 0.004 | 1 | 0.003 | | 28.571 |
| 45Sc | 0.053 | 1 | 0.041 | | 25.532 |
| 66Zn | 90.26 | 1 | 70.09 | | 25.157 |
| 88Sr | 2.526 | | 3.229 | 1 | 24.431 |
| 35Cl | 5170 | | 6544 | 1 | 23.459 |
| 52Cr | 0.506 | 1 | 0.4 | | 23.400 |
| Subtotal | 5458.376 | 21 | 6887.642 | 15 | |

| | | | | | |
|---|---|---|---|---|---|
| 47Ti | 0.676 | | 0.847 | 1 | 22.456 |
| 65Cu | 16.93 | | 20.92 | 1 | 21.083 |
| 133Cs | 0.296 | 1 | 0.245 | | 18.854 |
| 43Ca | 1094 | | 1283 | 1 | 15.902 |
| 59Co | 0.023 | 1 | 0.02 | | 13.953 |
| 56Fe | 100.6 | | 114.6 | 1 | 13.011 |
| 55Mn | 54.48 | | 61.76 | 1 | 12.526 |
| 79Br | 20.47 | 1 | 18.25 | | 11.467 |
| 31P | 11990 | 1 | 10720 | | 11.185 |
| 51V | 0.139 | | 0.155 | 1 | 10.884 |
| 28Si | 232.5 | 1 | 209.5 | | 10.407 |
| 85Rb | 125.2 | 1 | 114.2 | | 9.190 |
| 60Ni | 2.507 | 1 | 2.288 | | 9.135 |
| 11B | 12.92 | 1 | 11.93 | | 7.968 |
| 111Cd | 0.123 | | 0.132 | 1 | 7.059 |
| 34S | 6442 | 1 | 6008 | | 6.972 |
| 75As | 0.06 | | 0.063 | 1 | 4.878 |
| 39K | 53350 | 1 | 51820 | | 2.910 |
| 25Mg | 8965 | 1 | 8735 | | 2.599 |
| 95Mo | 1.317 | 1 | 1.297 | | 1.530 |
| 181Ta | 0.001 | 1 | 0.001 | 1 | 0.000 |
| 7Li | 0 | 1 | 0 | 1 | |
| 238U | 0 | 1 | 0 | 1 | |
| 232Th | 0 | 1 | 0 | 1 | |
| 209Bi | 0 | 1 | 0 | 1 | |
| 202Hg | 0 | 1 | 0 | 1 | |
| 187Re | 0 | 1 | 0 | 1 | |
| 175Lu | 0 | 1 | 0 | 1 | |
| 172Yb | 0 | 1 | 0 | 1 | |
| 169Tm | 0 | 1 | 0 | 1 | |
| 166Er | 0 | 1 | 0 | 1 | |
| 165Ho | 0 | 1 | 0 | 1 | |
| 163Dy | 0 | 1 | 0 | 1 | |
| 159Tb | 0 | 1 | 0 | 1 | |
| 127I | 0 | 1 | 0 | 1 | |
| 115In | 0 | 1 | 0 | 1 | |
| Subtotal | 82409.242 | 28 | 79122.208 | 24 | |
| Total | 87867.618 | 49 | 86009.85 | 39 | |

| % Diff of Concentrations in ppb | % Diff of Comparatively Higher Concentrations |
|---|---|
| 2.137 | 22.727 |

- The full spectrum analysis of 72 elements found in the samples indicate that OceanGrown has significantly more macro and micro nutrients by 22.7% difference

- OceanGrown has a comparative 96.357% lower amount of Trace Aluminum and has a comparative 67.633% lower amount of Trace Lead

# OceanGrown delivers enhanced nutrient quality of canned corn

http://www.nutritiondata.com/facts/vegetables-and-vegetable-products/2418/2

**Minerals,** Amounts (in mg) Per 1 cup (164 g = 164000 mg) of Corn, sweet, yellow, canned, whole kernel, drained solids [Includes USDA commodity food A119]

| | USDA Typical | USDA Typical | Daily Value | OG (dry) | OG (dry) | Daily Value | NPK (dry) | NPK (dry) | Daily Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | mg | % | % DV | ppb | % | % DV | ppb | % | % DV | %DV Conversion Factor |
| Sodium | 489 | 0.298170732 | 20.0 | **58140** | 0.0058140 | 39.00 | **60280** | 0.0060280 | 40.43 | 67.1 |
| Potassium | 221 | 0.134756098 | 6.0 | **45980** | 0.0045980 | 20.47 | **48440** | 0.0048440 | 21.57 | 44.5 |
| Phosphorus | 78.7 | 0.047987805 | 8.0 | **9438** | 0.0009438 | 15.73 | **9595** | 0.0009595 | 16.00 | 166.7 |
| Magnesium | 24.6 | 0.015000000 | 6.0 | **4754** | 0.0004754 | 19.02 | **5241** | 0.0005241 | 20.96 | 400.0 |
| Calcium | 8.2 | 0.005000000 | 1.0 | **1056** | 0.0001056 | 2.11 | **1134** | 0.0001134 | 2.27 | 200.0 |
| Iron | 1.2 | 0.000731707 | 7.0 | **61.99** | 0.0000062 | 5.93 | **65.43** | 0.0000065 | 6.26 | 9566.7 |
| Zinc | 0.6 | 0.000365854 | 4.0 | **51.21** | 0.0000051 | 5.60 | **50.74** | 0.0000051 | 5.55 | 10933.3 |
| Manganese | 0.2 | 0.000121951 | 12.0 | **17.91** | 0.0000018 | 17.62 | **18.94** | 0.0000019 | 18.64 | 98400.0 |
| Copper | 0.1 | 0.000060976 | 4.0 | **7.161** | 0.0000007 | 4.70 | **6.725** | 0.0000007 | 4.41 | 65600.0 |
| Selenium | 0.0011 | 0.000000671 | 2.0 | **0.507** | 0.0000001 | 15.12 | **0.318** | 0.0000000 | 9.48 | 2981818.2 |

| | OG vs NPK % DV | OG vs USDA Typical % DV | NPK vs USDA Typical% DV |
|---|---|---|---|
| | Statistical Significance | Statistical Significance | Statistical Significance |
| Sodium | equal | Double | Double |
| Potassium | equal | Triple | Triple |
| Phosphorus | equal | Double | Double |
| Magnesium | equal | Triple | Triple |
| Calcium | equal | Double | Double |
| Iron | equal | Slightly less | Slightly less |
| Zinc | equal | Slightly more | Slightly more |
| Manganese | equal | 1/3 more | 1/3 more |
| Copper | equal | Slightly more | Slightly more |
| Selenium | OG is almost double | 7 times more | 3.5 times more |

- OceanGrown has almost twice as much Selenium than corn grown using NPK
- And, OceanGrown has **7 times more** Selenium of the Daily Value than typical canned yellow sweetcorn

# Will these results create a revolutionary new approach to sustainable agriculture?

**YES!**

- These results indicate a revolutionary new approach that can help our Confidential Client and all growers to sustain:

- profitability

- nourishing the expected 9 billion people by 2050

- caring for the planet by reducing water pollution, water scarcity, and global warming

# Profitability

**YES!**

- Typical reductions of NPK average over 30%, this can mean upwards of 30% NPK input cost reductions for the first year

- Application rate (crop specific) of OceanGrown averages at 16% to 20% or more less than typical overall NPK input costs year after year

# Nourishing 9 Billion by 2050

## YES!

- Under performing farmlands in Eastern Europe and the former Soviet Union require improved farm management and fertilizers to produce the calories needed to feed the additional 3 billion people by 2050*

- OceanGrown can meet this challenge and mitigate water issues and climate change and deliver nutrient rich foods!

*http://www.scribd.com/doc/25966374/Adapting-to-Climate-Change-in-Eastern-Europe-and-the-Former-Soviet-Union

# Caring for the Planet

## YES!

- reducing water pollution
  - by reducing NPK
- reducing water scarcity
  - by optimizing plant physiology for drought resistant growing
- reducing global warming
  - by improving root mass to fix carbon through improved sequestration

Side by side Wheat Root Mass - South Dakota Field Trials 2005
(OceanGrown on right)

# Proactively Caring for the Planet

## YES!

- Reducing water pollution by reducing NPK and its resultant runoff
  - OceanGrown is pro-active since the Clean Water Act has now been re-authorized to legislate measurement and reporting of agricultural non-point sources from NPK applications*
- Reducing water scarcity by optimizing plant physiology for drought resistance
  - The standard NPK placement can induce stressors to plants requiring increased irrigation
  - OceanGrown is pro-active by reducing plant stress and subsequently mitigates need for additional water
- Reducing Greenhouse Gases (from Nitrous Oxide)
  - U.S. standard agricultural NPK placement is annually responsible for 209 TgCO2 equivalents estimated Nitrous Oxide emissions**
  - OceanGrown is pro-active by reducing this by at least 30%

*http://www.epa.gov/agriculture/lcwa.html

**(averaged from 2005-2007)-Source: http://www.epa.gov/nitrousoxi/sources.html#anthropogenic

For more information olutionary solution for sustainable agriculture please visit www.oceangrowncanada.com

- Be sure to look for reports from the upcoming University of North Dakota's study of 5 crops' performance using OceanGrown's fertility management solution

- Please contact info@oceangrowncanada.com for any question comments regarding this information