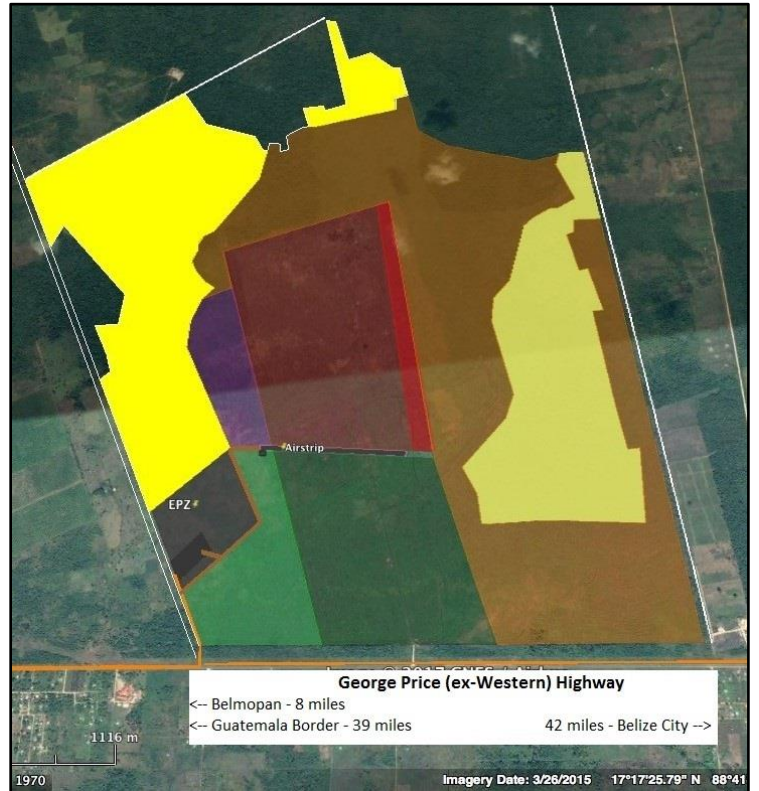


Belize Sustainable Agriculture, Ltd. Farming Report – September 11th, 2017

This is the **Seventh** Farming Report for BSA’s 2017 Summer (Wet) season. Its main objectives are to inform readers about BSA’s farming activities by season and crop; to provide data on climactic conditions, agricultural pests, and market conditions; as well as detailed data on BSA’s farming methodologies.



Field 2: Subsoiled & Leveled	106 Ha	Mix Plow / Subsoil in progress	270 Ha
Field 2: Leveled / No Subsoil	13 Ha	Windrow / Work in Progress	173 Ha
Field 2N: Plowed / Some subsoil	23 Ha	Chained – No further work	109 Ha
Field 1: Leveled / No Subsoil	79 Ha	EPZ – Total Area	24 Ha
Field 1N: Plowed & Subsoiled	36 Ha	EPZ – Finished	2 Ha

BSA is only farming at the Cayo One Estate in the Summer 2017 season; it is situated some 8 miles east of Belmopan near the village of Cotton Tree in the Cayo District, and is ~39 miles east of the Belize-Guatemala border at Melchor de Mencos.

Weather Summary: The first half of September has seen a more typical “Little Dry” period during which, except for one heavy downpour, the weather has followed its historical “mostly hot and rain free” pattern. While this has occurred somewhat later than normal, it is indeed a welcome dry period. Tropical cyclone activity continues to “revert to the mean” with higher activity than in the past few years, and Irma following Harvey with equally devastating effect. We expect continued tropical cyclone activity as we are now in the peak phase of the hurricane season, which will last into November.

Cayo One - Belmopan Precipitation Data (mm per month) – 2017 Season YTD Data through September 11 th													
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
2016/17	295	345	96	55	74	126	10	263	237	210	74		
2000-2016	232	129	139	65	49	32	124	271	256	236	230	260	2039

You can follow Belize’s weather on: <http://www.hydromet.gov.bz/observations/radar/radar-images>

We also use the US NOAA Hurricane Center weather radar network which monitors the Caribbean basin, and recommend: <http://www.nhc.noaa.gov/> <https://www.wunderground.com/q/zmw:00000.1.WMGMM>

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Cayo One: ~ 201 Hectares (100% non-irrigated)

The exact acreage to be planted during the Summer 2017 season has now been determined, which is comprised of Fields 1 and 2. Most of Field 2 has been subsoiled, and, as the discussion and photographs below demonstrate, we continue to be well pleased with the early indications of the benefits of subsoiling.

Weather Analysis

The first part of September has, again, been another remarkably “average” period, with 74mm of rain in the first 11 days, most of which was a single downpour (53mm) on September 3rd. Otherwise the weather has been hot (33C/91F) and very humid (98%). This relatively dry period has certainly been beneficial for crops.

We estimate that there is now sufficient moisture in the ground to carry our crop through the key “R3” stage over the next 20 days, which is the period when drought conditions have the greatest negative impact on yields. We would expect that, barring an extraordinarily dry late-September/October period moisture shortfall should not negatively impact yields this season.

We are in the peak of the Tropical Cyclone season, and we continue to monitor activity closely. The period of peak cyclone risk to our crop will be when the corn crop is nearing completion and the plants are heavy with ears (late October/early November), but have begun to dry out. The plants would be both heavy and unable to resist strong winds, and likely to “lodge” (fall). While some corn would still be harvestable, there would clearly be substantial crop losses under those conditions.

Predicting Tropical Cyclone activity and landfalls is extremely difficult. We continue to rely on long term (100+ year) data that indicate that a tropical cyclone is not likely to impact Cayo One more than once a decade. However, this is ultimately a factor beyond our control, although our plan to shift to an April/August cycle will reduce our statistical exposure to meaningful cyclone risk to once every three decades.

Land Preparation

There are two components to CSA’s Land Preparation activities in 2017: Land Development and Farmland Preparation.

Land Development

A detailed discussion of CSA’s Land Development activities was provided in the June 19th, 2017 Farming Report, which is available upon request.

As of September 11th, 2017 the status of BSA’s fields is:

- Field 1 (79 Ha): was planted July 17th – 18th
- Field 2 (122 Ha): was planted July 15th – 17th

We hope to have an interesting ability to compare the impact of subsoiling, as a small section of Field 2 (13 Ha) was not subsoiled, and Field 1 was not subsoiled.

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Seed Selection, Planting, and Crop Development

Seed Selection

Acreages planted so far are:

- Syngenta Impacto® – 197 Ha / 482 acres (Field 2 and most of Field 1) @ ~70,000 seeds/Ha or ~28,340 seeds/acre
- Pioneer® 4226 – 4 Ha / 10 acres (a small part of Field 1) @ ~70,000 seeds/Ha or ~28,340 seeds/acre

A detailed discussion of these two non-GMO hybrids is in the June 19th, 2017 Farming Report, which is available upon request.

Both plant varieties continue to develop well, but we also continue to notice differences. Comparisons made are from adjoining sections of Field 1 where both varieties are on comparable soils and have received identical fertilizer treatment.

Impacto® continues to show vigorous growth with little evidence of disease or plant issues, especially in Field 2 which was subsoiled. In Field 2 it is running almost 10 days ahead of its biological cycle. A surprising number of corn plants appear to be producing two ears which may be harvestable, although this will need verification later in September when we do a detailed field analysis including viable ear counts.

Pioneer® 4226 continues to show good growth, although it is still not growing quite as quickly or strongly as Impacto®. We still find it to be more disease prone than Impacto®, although this trend has not worsened. 4226 also has still not responded quite as visibly to the substantial amounts of urea applied to all of the fields.

Beyond the above points, it remains still early in the cycle for additional observations, notably on the most important issue of final yield.

Planting Analytics

Planting Analytics were generally very encouraging, and the data obtained from our Seed Sense FieldView™ software has been very edifying. Singulation, spacing, and ride were all at >99%, and compaction very slight, averaging <2%. The information gleaned will help us further improve our planting next season.

A detailed report on Planting Analytics, with excerpts of computer printouts from our Seed Sense planting software, was provided in the July 17th Farming Report which is available upon request.

Crop Development

As of September 11th, the corn crop is at various points in the R1 “Silking” phase. Most of Field 2 appears at the end of this phase and Field 1 is entering it.

R1 typically occurs about 55 to 66 days after emergence (depending on location and hybrid). This stage begins when silks are visible and pollination occurs. Pollination is when pollen grains contact the new, moist silks. A pollen grain grows down the silk and fertilizes the ovule in about 24 hours. Upon this fertilization, the ovule is a kernel. Silks grow about 1 to 1.5 inches per day.

Normally, for all silks on a single ear to emerge and be pollinated takes two to three days. Moisture stress or nutrient deficiency will result in poor pollination and seed set. The largest yield reduction occurs with stress at silking (early R1).

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Potassium uptake is essentially complete and nitrogen and phosphorus uptake is rapid in the plant. Nutrient content by leaf analysis is highly related to the final grain yield at this time. A response to previously applied fertilizer can be seen.

We have had near ideal conditions for pollination during the R1 silking phase, with mostly dry, hot, and humid weather (afternoon heat has been a little higher than ideal). There has been plenty of soil moisture during the key fortnight before silking began, and there is more than adequate soil moisture for the critical fortnight during/after silking. We have adjusted our fertilizer program, discussed below, to optimize available nutrition to our corn plants. We have also insured minimal traffic in our fields to support root growth. We are pleased to see brace root development get under way, and the early signs of ear development on our R1 corn remain quite encouraging.

We have a number of detailed photographs on page 10 showing the silking/pollination phase.

Field Survey Results

On September 6, 2017 an extensive field survey was performed in which sixteen random, geo-mapped sections were surveyed, each section containing 16 segments that each measured approximately 1/1000th of an acre (17'6"). In total, we counted well over 7,000 corn plants!

Given the singulation recorded at planting of ~99%, we conclude the following:

- Impacto®: Germination and plant development results were outstanding, with approximately 98% of seeds delivering a viable plant.
- Pioneer® 4226: Germination and plant development results were good, with approximately 94% of seeds delivering a viable plant.

September 6, 2017 Field Survey	Plant Count (000s)		Skips or Non Germinated	Plant spacing too Close
	per Acre	per Hectare		
Impacto Field 2 Subsoiled	27.91	68.93	3.37%	2.46%
Impacto Field 2 Non-Subsoiled	29.06	71.78	3.76%	4.22%
Impacto Field 2 (Total)	28.20	69.64	3.47%	2.90%
Impacto Field 1 (Total)	28.79	71.12	2.57%	2.48%
Pioneer 4226 Field 1 (Total)	26.69	65.92	3.99%	1.76%

We expect to conduct a follow up field survey in late September to determine the number of viable ears per acre/hectare, and we will attempt to survey ear formation. Later in October we will also attempt, via aerial overview, to determine what percentage of our fields are likely to have low/no yields due to water/low spot issues. This second survey will provide further guidance in terms of crop development.

Fertilizer Program

BSA has set a goal of a minimum average yield of 7 mt/Ha (112 bushels/acre) for its Summer 2017 corn crop.

However, CSA is fertilizing for a 9.4 mt/Ha (150 bushel/acre) yield, assuming a minimum fertilization rate of 110% of maintenance levels (the level at which the crop neither adds nor depletes to the soil's fertility).

We continue to leverage our access to low cost aerial applications to increase the number of aerial fertilizer applications.

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We made a final urea application to Fields 1 and 2 (total of 4 in each) on September 1st, following our corn’s surprisingly rapid biological development. As urea should not be applied once corn tassels emerge, our “nutrition window” was about to close, so we rapidly applied 70lb/acre (81kg/Ha) to ensure we met our overall nutrition goals. While this was only 8 days since our previous urea application, we continue to see evidence that the corn crop responds very well to more regular applications of smaller amounts of fertilizer.

We look forward to seeing evidence that our continued investment in (pre-planting) P and K will demonstrate vigorous ear development during our later field surveys (and especially at harvest!)

The following summary table provides an overview of our initial plant nutrition program.

Fertilizer Application (lbs./acre)	N	P	K
Base	44	110	78
Liquid (fast uptake)	11	7	3
Urea	152	0	0
Foliar	0	0	0
Total	207	117	81
<i>150 Bushels/Acre Maintenance (lbs./acre):</i>	<i>188</i>	<i>66</i>	<i>42</i>
<i>Fertilizer Build / Draw (lbs./acre):</i>	<i>19</i>	<i>51</i>	<i>39</i>
<i>110% Fertilization requirement surplus:</i>	<i>0</i>	<i>44</i>	<i>34</i>

The June 19th, 2017 Farming Report has a detailed discussion of our fertilizer program; it is available upon request.

Insects

Insect pressure continues to be high this year, with ongoing worm activity, and the recent appearance of aphids. Our aggressive insect management program continues to be effective, but also requires proactive management.

Our initial our corn seed treatment (Syngenta’s Fortenza®) and a subsequent post planting insecticide application (DuPont Coragen®) proved effective against major worm pressure; however, we saw a “next generation” of worms appearing, although Coragen®’s systemic impact appeared to be sharply reducing their populations. We followed up with an application of Syngenta’s Karate® on September 1st; this product was just registered in Belize and was considered a suitable alternative to DuPont Coragen®. Post spraying field surveys show that the product was effective, and we continue to see only modest evidence of worm activity.

During the week of September 11th, we detected aphid presence, and triggered a crop spray on September 15th using Syngenta’s Engeo® 247SC along with a phtyonomic oil as an additional suffocation agent.

It is noteworthy that Cayo farmers are reporting significant spider mite activity this season, whereas we have seen little evidence of them in our fields. We believe that this may be due to the combination of our proactive pest management and our generous nutrition program, which has made plants more resistant to this insect.

We are continuing to monitor insect activity very closely, and we will re-apply additional insecticides promptly as required.

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Funguses and Bacteria

We began our fungus/bacteria management program using Syngenta's Amistar® in an initial prophylactic application on September 1st, during a simultaneous application with the insecticide Karate®. A second application based on subsequent climatic conditions and crop development will be scheduled as required.

Weeds

Our weed management program continues to be successful, with no meaningful weed presence aside from a few small parts of our fields where we have some small patches of a weed known locally as "Tripa de Gallo".

This year's weed control program combined proactive spraying of glyphosate during periods when fields were not cultivated, adequate field preparations, and post-planting application of Syngenta's Calaris®.

Harvest

The speed of our crop's development had led us to change our estimated start date for the Harvest. We now estimate that our fields reached "mid-silk" between September 11th and 15th, and allowing 60-65 days between mid-silk and harvest at 20-22% humidity, we are moving our target start date for harvest to start to the week of November 13th. This date is likely to fluctuate modestly depending on weather conditions as our corn begins to dry down in early November.

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Cayo One Field 2 Day 45: Corn already at V-T Sep 01, 2017
Tassles are breaking out over 10 days early!



Cayo One Field 2 Day 45: Corn already at V-T Sep 01, 2017
Tassles emerging throughout Field 2: last chance to apply urea!



Cayo One Field 2 Day 52: Corn R-1 – Sep 08, 2017
Tassling is well developed and pollination is starting



Cayo One Field 2 Day 41: V-12 to V-13 – Aug 28, 2017



Cayo One Field 1 Day 50: entering R-1 – Sep 08, 2017
Tassling has also begun in Field 1



Cayo One Field 1 Day 39: Corn at V-11 to V-12 – Aug 28, 2017

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Cayo One Field 2 Day 52: Southerly view – Sep 08, 2017
Most of the field is well into tassling



Cayo One Field 2 Day 52: Closeup look – Sep 08, 2017
Well developed corn that is tassling



Cayo One Field 1 Day 50: Northerly – Sep 08, 2017
Some low spots that will need more levelling next winter



Cayo One Field 1 Day 50: Easterly – Sep 08, 2017
Tassling has started!



Cayo One Field 1 Day 56: Eastern edge – Sep 14, 2017
Note the lighter color Pioneer® 4226 tassles on left of field



Cayo One Field 1+2 Day 56+58: Northerly - Sep 14, 2017
Early to mid Silking: fields are in good condition!

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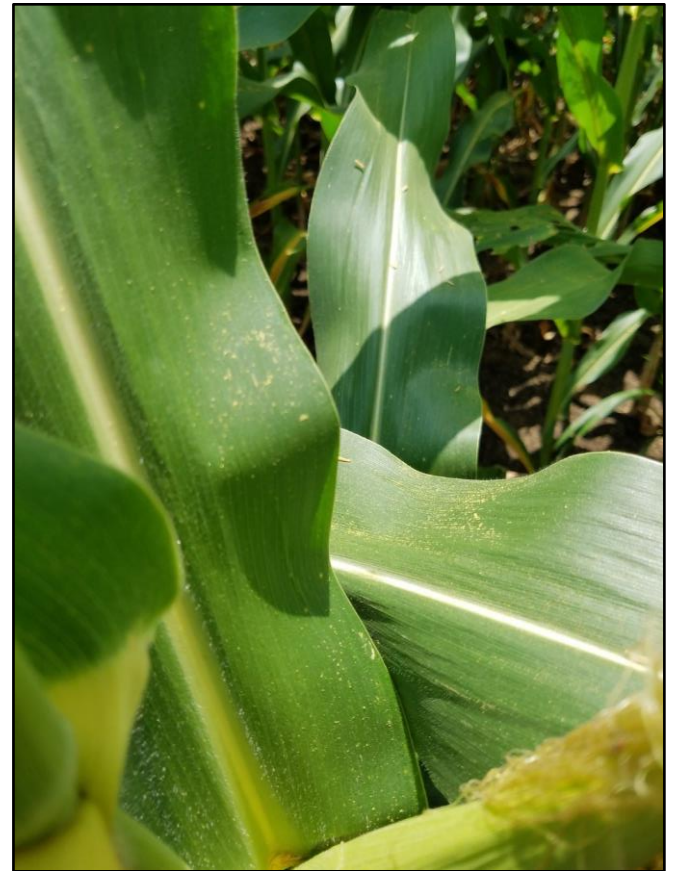
Cayo One Field 2 Day 58: Northerly view – Sep 14, 2017
Well developed field that is passing "Mid-Silk"



Cayo One Field 1 Day 56: Southeasterly view – Sep 14, 2017
Field is well into silking



Cayo One Field 2 Day 58: Silking – Sep 14, 2017
Zoom in to see pollen on silks: Mother Nature at work reproducing



Cayo One Field 2 Day 58: Pollination – Sep 14, 2017
Pollen visible on corn leaves

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Cayo One Field 2 Day 58: Corn Tassles – Sep 14, 2017
Tassles are fully developed and pollinating



Cayo One Field 2 Day 58: Worm – Sep 14, 2017
Zoom in to see worm – dark head indicates it's dying



Cayo One Field 2 Day 58: Worm Presence – Sep 14, 2017
Worms like to hide under silk – but this one is also dying!



Cayo One Field 2 Day 58: Aphids – Sep 14, 2017
Young aphids beginning to appear



Cayo One Field 2 Day 58: Aphids – Sep 14, 2017
Adult Aphid – most should be dead after Sep 15 spraying

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Market Conditions and Conclusion

Corn

Global corn prices are steady at 12 month lows, with Gulf Ports prices averaging ~\$146/mt for US #2 Feed Grade corn. This equates to ~\$182/mt FOB Puerto Quetzal (Guatemala) and \$245/mt CIF Melchor (Belize-Guatemala border crossing). The breakeven duty paid CIF price delivered in Belize would be ~\$351/mt, or BZD 31.85/cwt

Domestic Belize prices continue to be weak as the 2017 harvest season approaches and local mills and dealers talk the price down. Prices have fallen to the \$230-\$250/mt range (BZD 21.00-23.00/cwt).

We continue to see (from the air) a wide dispersion of field quality throughout the country, and it will be interesting to see if recent acreage increases keep total Belize production rising. Once again, many local farmers will find 2017 to be another difficult year owing to the combination of disappointing yields and low prices...

Edible Beans

Global prices for beans continue to trade at slightly firmer prices in most markets, with black beans trading at \$850/mt FOB China, and Mexican CIF prices considerably higher at ~\$1,150-\$1,200/mt. US Dealer prices, with the 2017 harvest coming in, have slipped to ~\$800/mt FOB.

There remains a modest supply in Belize of light red kidney beans currently offered at ~\$1,050/mt FOB Belize.

Soybeans

Global prices firmed slightly, with Gulf Ports traded around ~\$368/mt, which equates to ~\$408/mt FOB Puerto Quetzal and \$472/mt CIF Melchor border crossing. The breakeven duty paid CIF price (Belize delivery) would be ~\$665/mt, or BZD 60.00/cwt

Domestic Belize prices once again remain steady, as they have for an extended period of time, with Grade #1 soy bean prices being quoted in the \$560-\$580/mt range (BZD 50-52.00/cwt), although there is little activity.

The Fates continue to rattle Belize's farmers with considerable cyclone activity. Harvey spared Belize, as did Irma and José, but potential cyclone formation remains active and 2017 will be a busy year!

We continue to be greatly encouraged by the appearance of our crop, as well as how well it seems to be pollinating. We remain extremely vigilant regarding to any pest and disease issues, which we will rapidly address.

We are now at week 9 of an 18 week crop cycle and are in the final fortnight of the key phase of crop development. The key yield determinants are mostly fixed as there is sufficient field moisture to see us through this phase.

Local markets are somewhat rattled by continued weakness in North American markets, while the historic trends of weaker prices approaching harvest continues...

We continue to hope that Lady Luck will maintain her so far benevolent attitude towards our weather this year...

Thanks! - Abram Dyck, John Peters, and the Farming Report Editorial Team

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Grower	Location	Field #	Ha/ Acres	Irr ?	Soil Type	Crop	Seed Variety (count/Ha) (count/acre)	Plant Date	Stand Date	Fertilizer Program <i>(For full details of applications, refer to Lot Records)</i>	Comments
BSA	Cayo One	1	75/185	N	Black	Corn (Yellow)	Syngenta Impacto 70,000 28,340	July 17-18	July 20	Base 12-24-12 <u>330lbs/acre</u> 0-46-0 <u>85lbs/acre</u> 0-0-60 <u>68lbs/acre</u> 40-0-0-5.6 (S) <u>100lbs/acre</u> 40-0-0-5.6 (S) <u>70lbs/acre</u> 40-0-0-5.6 (S) <u>68lbs/acre</u> 40-0-0-5.6 (S) <u>70lbs/acre</u>	Near ideal seedbed and planting conditions. Stand emerged and established by July 20. Stand is Uniform and Vigorous at Day 11 – July 31 V-6 to V-7 and healthy although slight signs of water stress – Aug 14 Solid growth thanks to less rain and generous fertilizer: V-11 to V-12 at Aug 28. Continued solid growth and early R-1 at Sep 11.
BSA	Cayo One	1a	4/10	N	Black	Corn (Yellow)	Pioneer 4226 70,000 28,340	July 18	July 20	Base 11.1-28.6-20.2 <u>385lbs/acre</u> 40-0-0-5.6 (S) <u>100lbs/acre</u> 40-0-0-5.6 (S) <u>70lbs/acre</u> 40-0-0-5.6 (S) <u>68lbs/acre</u> 40-0-0-5.6 (S) <u>70lbs/acre</u>	Western side of Field 1. Near ideal seedbed and planting conditions. Stand emerged and established by July 20. Stand is Uniform and Vigorous at Day 11 – July 31 V6 to V7 and healthy although slight signs of water stress – Aug 14 Solid growth thanks to less rain and generous fertilizer, but higher evidence of illnesses: V-11 to V-12 at Aug

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											28. Continued solid growth and early R-1, with no worsening of illness patterns at Sep 11.
BSA	Cayo One	1N	34/83	N	Black	Corn (Yellow)	Syngenta Impacto 70,000 28,340	TBD	TBD	Base	Decision made not to plant on August 15 th . Insufficient time to complete landworks.
BSA	Cayo One	2	122/301	N	Black	Corn (Yellow)	Syngenta Impacto 70,000 28,340	July 15-17	July 18	Base 11.1-28.6-20.2 <u>385lbs/acre</u> 40-0-0-5.6 (S) <u>100lbs/acre</u> 40-0-0-5.6 (S) <u>70lbs/acre</u> 40-0-0-5.6 (S) <u>68lbs/acre</u> 40-0-0-5.6 (S) <u>70lbs/acre</u>	Near ideal seedbed and planting conditions. Uniform emergence within 60-72 hours of planting Stand emerged and established by July 18. Stand is Uniform and Vigorous at Day 13 – July 31 V8 and healthy across the field with little to no signs of water stress – Aug 14 Impressive growth with healthy plants at V12 to V-14: August 28. Continued vigorous growth and mid R-1 at Sep 11.

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[Lot Records for Fields 1 and 2 \(Zoom in to see details\)](#)

A new Lot Record is (still!) in development and will be provided in following reports

