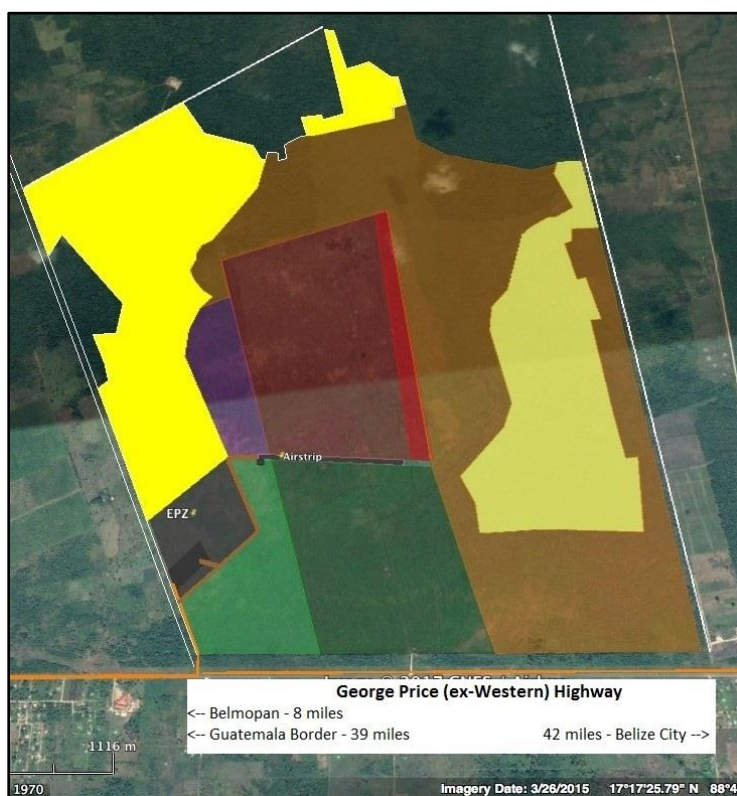
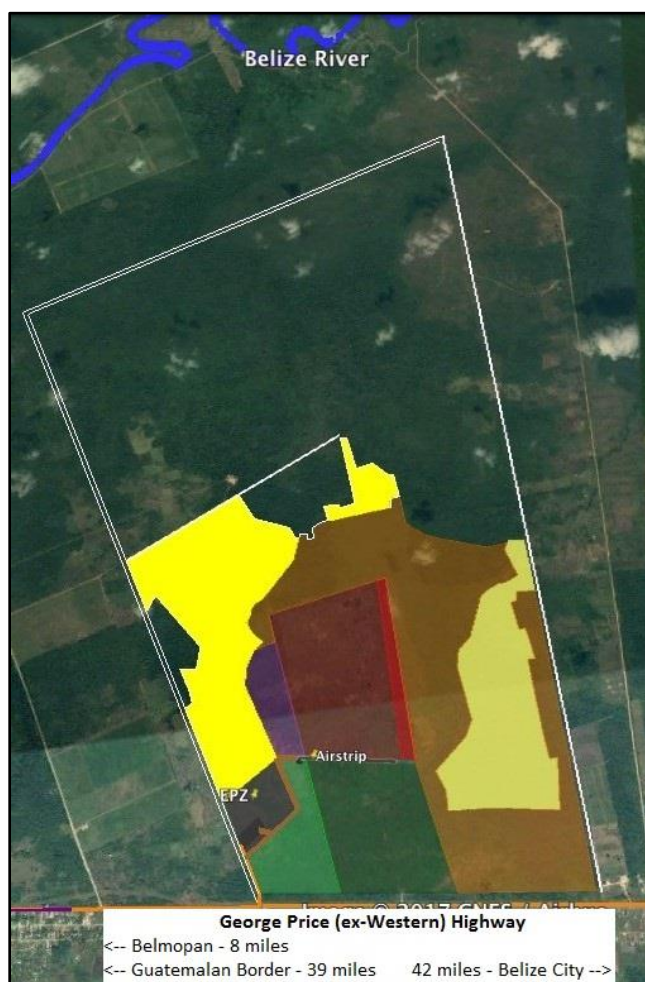


Belize Sustainable Agriculture, Ltd. Farming Report – August 28^h, 2017

This is the **Sixth** 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: Belize's Cayo District has again experienced "normal" rainfall during the second half of August, and is again continuing to track quite close to its long-term average. Hurricane Harvey thankfully broke up in the western Caribbean before making landfall on the Yucatan about 100 miles north of the Belize Mexico Border. We expect continued tropical cyclone activity as we are now entering the peak phase of the hurricane season.

Cayo One - Belmopan Precipitation Data (mm per month) – 2017 Season YTD Data through August 28 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			
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 are well pleased with the early indications of the benefits of subsoiling.

Weather Analysis

August has proved to be another “average” month, marking an unexpected “three in a row” pattern of near average rainfall. It is important to note that this “normal” 90 day rainfall of some 720mm (28”) is still high by most standards. Moreover, the concentration of heavy rains in the mid-June to early July period made planting difficult for many Belize farmers. As we discuss below, these levels of rainfall should be quite manageable on land that has been subsoiled and properly leveled, and where a drainage pipe network has been installed. Historically we should be in a period where we should see a few weeks of drier weather, which would be ideal for our crops...

Hurricane Harvey formed as a Tropical Storm in mid-August in the western Atlantic. It made a steady path heading westward over the eastern Antilles, with NOAA’s long-range model indicating possible landfall in Belize. Other models, notably out of Europe, indicated a likelihood that Harvey would break up in the western Caribbean and cross the Yucatan as a tropical depression. All models indicated a possible acceleration into a Hurricane in the Gulf of Campeche as the system moved towards Mexico. It turns out that the European models were the most accurate, with Harvey breaking up 200 miles east of Belize and heading WNW to cross the Yucatan 100 miles north of Belize. We measured only about 20mm of rainfall at Cayo One as the outer fringes of Harvey’s remnants reached the Yucatan.

However, as Harvey’s remnants entered the Bay of Campeche and began to cross the Gulf Mexico, events took an unexpected turn (no pun intended) as the system rapidly reformed into a Tropical Storm which veered NW across the Gulf of Mexico and accelerated up to Category 4 intensity (sustained winds >130 mph). We have all watched with great sadness the devastating impact of Harvey’s biblical rainfall on Texas, notably on Houston.

Tropical cyclones are a fact of life in the Caribbean / Central American area. Being prepared for them and having a business plan that seeks to mitigate their impact are key factors of success in the region.

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 is available in the June 19th, 2017 Farming Report, which is available upon request.

As of August 28th, 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.

We continue to see both plant varieties, having performed very well in terms of germination and early vigor, continue to develop well, but we are seeing some emerging differences. Comparisons made are from adjoining sections of Field 1 where both varieties are on comparable soils and have received identical fertilizer treatment.

Impacto® is showing continuing vigorous growth with little evidence of disease or plant issues, especially in Field 2 which was subsoiled. It has responded very well to the regular applications of Urea and additional nutrients described below, as also seen in the pictures below. The only areas where Impacto® has been less than vibrant are those, relatively few, where ponding had occurred (notably in Field 1).

4226 has showed good growth, but has not developed quite as quickly or strongly as Impacto®. Notably, it seems to be more disease prone, as seen by some of the pictures below. It also has not responded as visibly to the substantial amounts of Urea applied to all of the fields. It lacks the powerfully vibrant green color of Impacto®.

Beyond the above points, it is 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 August 28th, the corn crop is mostly in the V12 to V-13 stages, with some of Field 1 still at V11 and a few parts of Field 2 reaching V-14. The V10 to V17 phases are key periods for yield determination.

Five weeks after the plant emerges, it enters V10. The corn plant begins a steady and rapid increase in nutrient and dry-matter accumulation. The time between the appearance of new leaves is shortened, with a new leaf appearing every two to three days. Demand for soil nutrients and water are relatively high to meet the needs of the increased growth rate. Moisture and nutrient deficiencies at this stage will influence the growth and development of the ears markedly. Fertilizer, especially phosphorus and potassium, is needed near the roots, which do not move appreciable distances in most soils. Dry soils also may make needed nutrients less available.

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Six weeks after the plant emerges, V12 begins. Moisture or nutrient deficiencies may reduce the potential number of seeds, as well as the ear size, seriously. These two components of yield have key development during the period from V10 to V17. The length of time for the plant to develop through these stages affects harvestable yield. Cultivation of plants at this time will destroy some of the plant roots. Brace roots are developing from the fifth node and the first above-ground node.

Seven weeks after the plant emerges, V14 begins. The corn plant at V15 is only 12 to 15 days (around one to five V stages) away from R1 (silking).

Lack of moisture has not been an issue, quite the contrary, for our crop. 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 V14 corn are also encouraging.

The late publication of this fortnight's Farming Report has allowed us to introduce six pictures, found on page 9 below, of one of the most advanced corn plants from field 2. On this dissected plant, the progression of ear formation from the 2nd to the 9th nodes can be seen. It is interesting to note that there are two early stages ears that could mature into fully harvestable ears. We believe that this is evidence of both good genetics and a generous nutrition program which is allowing the plant to produce to the higher range of its genetic potential. We should stress, however, that is preferable to harvest eventually one large and well-formed ear per plant than two less well-developed ears.

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. On August 24th we made a third post planting application of ~ 76 kg / Ha (~68lb / acre) of Urea (40-0-0-5.6S), to which our corn reacted very favorably.

We expect to make one final application of Urea to Field 2 (total of 4), but we may make two further applications to Field 1 (total of 5), with moderately higher total N amounts spread over these two applications. Field 1 has been more affected by the seasonal rains as it does not benefit from the enhanced drainage through subsoiling.

We continue to firmly believe that more frequent post planting fertilizer applications (mostly N) which can be flexibly programed to allow for weather conditions will benefit our crops (see pictures on page 6 below)

We also believe that our continued investment in P and K, which takes place pre-planting, should bode well for plant and ear development (see pictures at page 9 below).

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

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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

We continue to see clear evidence of significant worm activity this year and the reports we had received from other farmers who had planted much earlier, have been unquestionably confirmed.

We also continue to see evidence that our insect management program has been effective. The combination of treating our corn seed with Syngenta's Fortenza® and a subsequent post planting insecticide application in early August of DuPont Coragen® has proved effective. We are seeing some evidence of a "next generation" of worms appearing, but Coragen®'s systemic impact appears to be sharply reducing their populations before they can do material damage (see pictures on pages 6, 7, and 8 below).

We will continue to monitor this situation closely, and if necessary we will re-apply Coragen® in mid-September if we see evidence of worm damage.

Funguses and Bacteria

We expect to begin our fungus/bacteria management program, which will use Syngenta's Amistar® in an initial prophylactic application, with a second application based on subsequent climatic conditions and crop development. An initial application should take place during the week of September 4th, which is slightly on the early side of our schedule.

Weeds

Our weed management program has been successful to date, with only minor weed growth in a few parts of our fields, notably some small patches of a weed known locally as "Tripa de Gallo". We are otherwise very pleased with the effectiveness of this year's weed control program, which combined proactive spraying of glyphosate during periods when fields were not cultivated, adequate field preparations, and post-planting application of Syngenta's Calaris®.

Harvest

We continue to tentatively schedule our harvest to begin during the week of November 27th, although this target date is likely to change during the course of the crop cycle as we see how our corn matures.

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Cayo One Field 2 Day 41: Corn at V-13 to V-14 – Aug 28, 2017
Corn continues to grow vigorously on subsoiled ground



Cayo One Field 2 Day 29: Vigorous Growth – Aug 16, 2017
Field 2 at V-7 to V-8



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



Cayo One Field 1 Day 27: Making progress too – Aug 16, 2017
Field 1 at V-4 to V-5



Cayo One Field 2 Day 31: Aerial southerly – Aug 18, 2017
Subsoil drainage pipes needed to further mitigate excess rain



Cayo One Field 1 Day 29: Aerial Northerly – Aug 18, 2017
Field needs subsoiling & drainage pipes, but still looks OK

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Cayo One Field 2 Day 37: Fertilizer Spreading – Aug 24, 2017
Frequent applications at smaller doses = good looking corn!



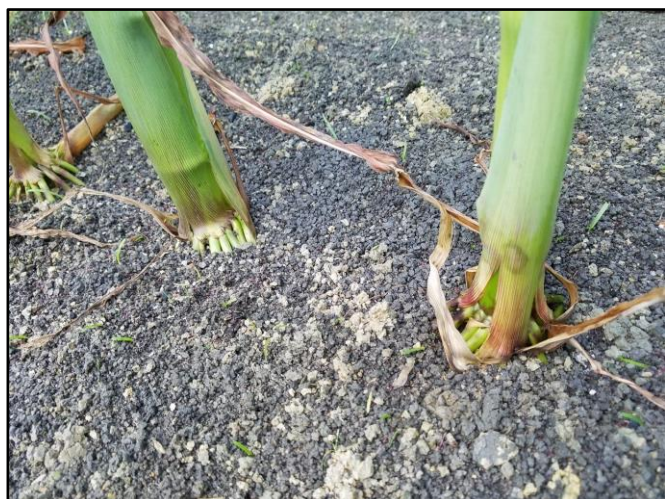
Cayo One Field 2 Day 37: Fertilizer Granules – Aug 24, 2017
Zoom in to see well spread urea granules & good weed control!



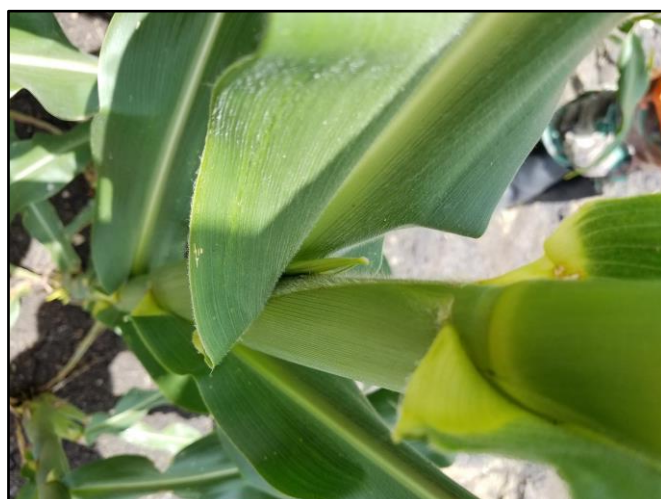
Cayo One Field 1 Day 39: Northerly – Aug 28, 2017
Wet spots visible but field is responding to nutrition/some sun!



Cayo One Field 1 Day 35: Wet spot – Aug 24, 2017
Manageable with subsoiling/drainage pipes & laser levelling



Cayo One Field 2 Day 37: Brace Roots – Aug 24, 2017
Impacto® Brace Roots slower to appear



Cayo One Field 2 Day 42: Ear Peeking out – Aug 29, 2017
Small green sprout rising between leaves and stalk

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Cayo One Field 1 Day 41: Pioneer® 4226 – Aug 30, 2017
Zoom in to leaf to see disease proneness



Cayo One Field 1 Day 41: Pioneer® 4226 – Aug 30, 2017
More evidence 4226 doesn't like wet conditions



Cayo One Field 1 Day 41: Pioneer 4226 – Aug 30, 2017
Grows well in drier ground – not as dark green as Impacto®



Cayo One Field 1 Day 39: Pioneer 4226 – Aug 28, 2017
Insecticide at work – black head means dead worm!



Cayo One Field 1 Day 39: Beneficial Insect – Aug 28, 2017
It's nice to get some help from Nature



Cayo One Field 2 Day 42: Beneficial Insect – Aug 29, 2017
Again: it's nice to get some help from Nature

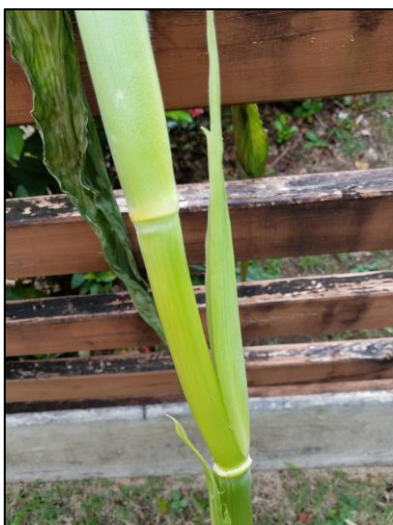
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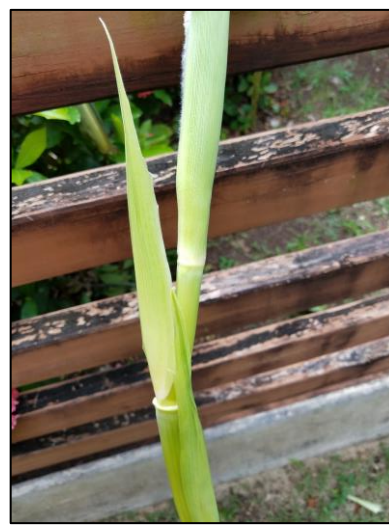
Cayo One Field 2 Day 42: Plant Dissection – Aug 29, 2017
Node 2 - Note small white growth on node: embryonic ear



Cayo One Field 2 Day 42: Plant Dissection – Aug 29, 2017
Node 5 - Embryonic ear is distinctly visible rising from node



Cayo One Field 2 Day 42: Plant Dissection – Aug 29, 2017
Node 8 – Ear is formed and may be harvestable if Node 9 fails



Cayo One Field 2 Day 42: Plant Dissection – Aug 29, 2017
Node 9 – Ear is formed and should be harvestable



Cayo One Field 2 Day 42: Plant Dissection – Aug 29, 2017
Relative Ear sizes from Nodes 1 to 9



Cayo One Field 2 Day 42: Plant Dissection – Aug 29, 2017
Largest ear dissected: Too early to evaluate size without scope

**Belize Sustainable Agriculture, Ltd.
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Market Conditions and Conclusion

Corn

Global prices fell back towards 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 have begun to fall 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, with a significant percentage of fields having failed completely, and another portion of poor quality. Recent acreage increases should keep total production up, but many local farmers will find 2017 to be another difficult year...

Edible Beans

Global prices for black beans are trading at slightly firmer prices, with black beans trading at ~\$900/mt FOB US dealers and Mexican CIF prices remain considerably higher at ~\$1,150-\$1,200/mt.

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

Soybeans

Global prices reversed lower, with Gulf Ports dropping to ~\$352/mt, which equates to ~\$392/mt FOB Puerto Quetzal and \$452/mt CIF Melchor border crossing. The breakeven duty paid CIF price (Belize delivery) would be ~\$645/mt, or BZD 58.50/cwt

Domestic Belize prices continue to 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 no activity.

Once again the Fates thought they would rattle Belize's farmers with cyclone activity. Harvey looked like it might come ashore in northern Belize as a tropical storm. Thankfully it broke up in the western Caribbean, then reforming as a storm that has devastated Texas.

We continue to be greatly encouraged by the appearance of our crop, notably in Field 2, which we subsoiled. We remain extremely vigilant to rapidly and effectively address any pest and weed issues.

We are now at week 7 of an 18 week crop cycle and are in a key phase of crop development as many of the yield determinants are fixed.

Local markets are somewhat rattled by continued weakness in North American markets, while the historic trends of weaker prices approaching harvest continues. This is where long term supply relationships are so important...

And of course, we continue to hope that Lady Luck will still occasionally smile at us...

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>	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
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>	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 28

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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>	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

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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