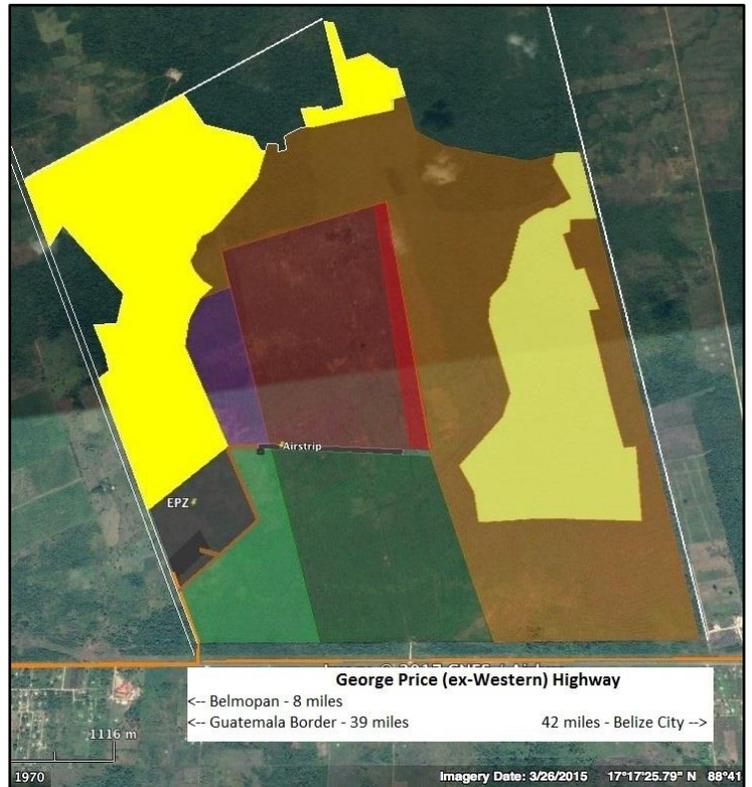


Belize Sustainable Agriculture, Ltd. Farming Report – July 31st, 2017

This is the **Fourth** 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 had a dry spell from July 7th through July 19th, after which a further 70 mm of rain fell, mostly between July 20th and 24th. July’s total rainfall was, for the first time in several years, quite close to its long term average. August historically sees most of its rainfall in the early part of the month, usually followed by a multi-week dry (ish) period. After July’s “normal” rainfall, and given recent weather volatility, the question for this season may now be: Is “Abnormal” the new “Normal”, or will we “Revert to the Mean”? Also, we are now into the Hurricane season...

Cayo One - Belmopan Precipitation Data (mm per month) – 2017 Season YTD Data through July 31 st .													
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
2016/17	295	345	96	55	74	126	10	263	237				
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: ~ 200+ Hectares (100% non-irrigated)

The exact acreage to be planted during the Summer 2017 season is still not been determined; as of July 31st we have planted fields 1 and 2 but have another 3-4 days of work to make Field 1N (at least most of it) ready for planting. However, we will soon reach our “Drop Dead” date for planting Field 1N, so the weather in the coming fortnight will be key to determine what portion Field 1N we are able to plant.

Weather Analysis

Recent rainfall patterns on the Cayo One property between July 17th and the date this report is being (belatedly!) sent (August 5th) have been near ideal (we hope that the Fates are otherwise occupied and won't read this tempting word!) After the very heavy mid-June/early-July rains, there followed the July 7th through July 19th dry spell, which allowed most land preparation to be completed and Fields 1 and 2 to be planted. Then some 70 mm of rain fell, mostly between July 20th and 24th. This was followed by another dry period through August 4th, during the afternoon and night of which a further ~25mm of rain fell.

This weather pattern can be compared to a gardener who begins by deep-soaking his seed beds, then lets the upper portion dry out to prepare them, then plants his seeds. Shortly after planting he gives them a through watering. A dry, sunny period then allows the plants to emerge from their well-watered seed bed and begin vigorous growth. After a week of sunshine, another solid watering sets the plants onto their next stage of growth...

There is considerable residual moisture in Cayo One's fields, so we believe that even with relatively dry weather in August our Summer 2017 corn should not be unduly affected. This season's corn will experience its highest water requirements from mid-September through mid-October, which are historically wet periods in Belize.

New and more up to date aerial photographs below show how those farmers who planted early suffered significant crop damage from the heavy June/July rains. However, we have not yet observed much replanting activity...

Readers not familiar with corn's development cycle and water requirements, and who wish to learn more, will find the document available in the link below to be quite informative.

<https://www.ag.ndsu.edu/pubs/plantsci/crops/a1173.pdf>

We are at almost exactly the one year anniversary on Hurricane Earl. While there has been periodic tropical depression activity in the western Atlantic and Caribbean, no major storms have yet formed this season (Once again, we hope the Fates are otherwise occupied!)

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.

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As of July 31st, 2017 the status of BSA's fields is:

Field 1 (79 Ha): was planted July 17th – 18th

Field 2 (120 Ha): was planted July 15th – 17th

Field 1 N (33 Ha): needs 3-4 more days of work; a decision whether to plant will be made in the next fortnight, subject to weather. We will endeavor to plant at least a section of Field 1N for comparative purposes with Fields 1 and 2.

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 will not be subsoiled whereas Field 1N, if planted, has been subsoiled.

Seed Selection, Planting, and Crop Development

Seed Selection

Acreages planted so far are:

- Syngenta Impacto – 195 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

Both plant varieties have performed very well in terms of germination and early vigor. Beyond these two key points, it is too early in the cycle for additional observations.

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

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.

We have identified certain rows in Field 2 where the liquid fertilizer application nozzles mal-functioned; we are seeing clear evidence of differing plant characteristics where the plants did not receive liquid fertilizer.

We look forward to the opportunity to upgrade our planter to full electronic controls/monitoring, which will allow us to better manage issues with fertilizer application and consider variable density planting.

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

We now in the V3 to V5 stages, which typically begin two weeks after the plant emerges. While the plant is still fragile, some of the main risks encountered in North America (early season light frosts) are not a risk in Belize. The greater risk faced in Belize is corn that is planted in late May/early June, especially in fields with inadequate drainage, suffers from heavy rains and is waterlogged or drowned.

Growth of the seedling root system essentially has ceased. Root hairs are present on nodal roots. The roots of the second whorl are elongating. The nodal roots now form the major part of the root system. Leaf and ear shoots

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are being initiated and this initiation will be complete by V5 (Important Note: potential ear shoot number is determined).

By V5, a microscopically small tassel is initiated at the growing point. The above-ground plant height is about 8 inches when the tassel is initiated, but the growing point is still at or just under the soil surface. Weeds also are competing for water, nutrients and light. (*Note: we are proactively managing weed issues, as discussed below, to limit the competition to the corn crop.*)

Fertilizer Program

BSA has set a business goal of a minimum weighted 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).

The summary table below provides an overview of this 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>	19	51	39
<i>110% Fertilization requirement surplus:</i>	0	44	34

We decided on an early first aerial application of Urea on July 27th as we observed some (very manageable) potential nitrogen deficiencies in our corn. This was not surprising given that we applied our Base Fertilizer (which contained an initial nitrogen application) in late May/early June, after which there were several weeks of extensive rain. Accordingly, much of this applied nitrogen will have been lost, and we are adapting our plans accordingly.

Our total cost of aerial fertilizer application was slightly below \$5.00/acre and our goal is to further refine our processes to reduce the cost to ~\$4.00/acre (Kaizen!) These very attractive costs are due to having a crop-duster based at Cayo One, better loading equipment, and a team that is learning to work well together.

Given the ease and affordability of aerial fertilizer applications we will consider increasing the number of post planting nitrogen applications to four from three, with a slightly higher than planned total Urea application (but with less Urea in each application). We believe that this approach will improve the nitrogen usability in our plants. With just a 1 bushel (25kg) increase in yield per acre, we more than pay for the extra application cost!

A detailed discussion of our fertilizer program is in the June 19th, 2017 Farming Report, which is available upon request.

Insects

We clearly witnessed the increased worm activity this year, which is also present at Cayo One!

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As the photographs below show, where there were a few patches of weeds which had not fully responded to our July 1st glyphosate application, worms simply devoured all of the broadleaf weeds. Thankfully, our corn was well protected by our seed treatment, as the photographs below also show. As a reminder, we are addressing the worm issue in a two-fold manner:

- Seed Treatment using Syngenta's Fortenza[®], which has currently proven to be the most effective seed treatment for worm control used in the region (effectiveness can change over multi-year cycles). It provides 15+ days of post emergence protection to young corn and has proved very effective this year at Cayo One.
- Field Spraying with Coragen[®]. We imported this insecticide from Mexico under a Minor Use Permit on August 3rd and we sprayed our fields on the morning of August 4th, just as our first planted corn was expected to begin losing protection from its Fortenza[®] treatment. We will closely monitor Coragen[®]'s effectiveness, which should provide 45-60 days of protection. We will re-apply if needed between day 60 and 75 of the corn's cycle, which would provide coverage through the end of the plant's vulnerability to worms this season.

Worms are the principal insect risk at this stage of the corn cycle. Other possible insect risks that will emerge later include spider mites, aphids, stink bugs, and beetles. We will be proactively managing these risks, and rigorously inspecting our fields for signs of insect pressure.

Once again, the presence of an on-site crop duster should give us a strong capability to rapidly address any detected insect issues.

Funguses and Bacteria

We have developed a fungus/bacteria management program which uses Syngenta's Amistar[®] in an initial prophylactic application, with a second application based on subsequent climatic conditions and crop development.

Our first Amistar[®] application is a function of weather, local conditions, and plant development. Our current estimate is that it will occur during the first half of September.

Weeds

We sprayed our fields with glyphosate on July 1st, which, along with land cultivation and harrowing, left our fields in a substantially clean condition for planting. Generally speaking we are very pleased with weed management this season. Interestingly, as mentioned above and seen on the photographs below, the few weed patches that were not controlled by land work and spraying provided an edifying example of the intensity of worm pressure this year, and its devastating impact on untreated plants.

We aerially applied Syngenta's Calaris[®] on July 31st when most of our corn was at the V-3 stage (Calaris[®] is indicated for spraying when corn is in the V-2 to V-8 stages) Spraying conditions were near ideal, with warm humid temperatures, some very early weed growth, and no subsequent rains within the next few hours (which might impact its effectiveness – there was no rain until late on August 4th), This is our only scheduled application for this season, and we will report back on its effectiveness in future Farming Reports.

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 District fields North of Cayo One - July 25, 2017
Irregular or failed fields due to heavy June/July rains



North of Cayo One: newly cleared (poor) field – July 25, 2017
Zoom in to see clear evidence of old Mayan field outlines!



Cayo One Field 2 Day 7: Excellent Emergence – July 24, 2017
95%+ uniform emergence and early vigor are encouraging!



Cayo One Field 2 Day 7: Scale Picture – July 24, 2017
Healthy plants at V1-V2 Stage!



Cayo One Field 1 Day 8: Worm Damage to weeds – July 25 '17
VERY IMPORTANT: Note how the corn plant is undamaged!



Cayo Field 1 Day 8: Close up on worms – July 25, 2017
They may be small, but they're hungry and can devour plants!

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Cayo Field 1 Day 8: Weed patch devoured – July 25, 2017
Corn is undamaged thanks to Fortenza® seed treatment



Field 2 Day 17: Aerial Spraying – August 4, 2017
Next step in worm defense: Coragen® is being sprayed on fields



Cayo One Field 1 Day 10: July 31, 2017
Last planted field shows good weed management



Cayo One Field 2 Day 17 – Aug 4, 2017
Calaris® at work on emerging weeds (but very healthy corn!)



Field 1 Day 14: Corn progressing well – Aug 4, 2017
Impacto to left / Pioneer 4225 to right of stick



Field 1 Day 14: Syngenta Impacto© – Aug 4, 2017
Excellent Emergence and Vigor – promising start at V-3

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Cayo Field 2 Day 17: Corn looks very happy – Aug 4, 2017
Excellent Emergence and Vigor, no worm damage or weeds



Field 2 Day 17: Syngenta Impaco® – August 4, 2017
Impacto plants show excellent development as they enter V-5



Cayo One Field 2 Day 17: Aug 4, 2017
GPS minor error places 2 rows very close, but they seem happy!



Cayo One Field 2 Day 17: (same picture) Aug 4, 2017
Note smaller row right of pair: liquid fertilizer nozzle was stuck!



Cayo One Airstrip: Air Tractor 402 takes off – Aug 4, 2017
Wheels up with 1,600 litres of agri-chemical spray



Cayo One: Air Tractor 402 Loading Fertilizer – Jul 27, 2017
Useful payload just over 1mt of fertilizer

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Market Conditions and Conclusion

Corn

Global prices have continued to trade steady to slightly weaker, with Gulf Ports prices averaging ~\$155/mt for US #2 Feed Grade corn. This equates to ~\$195/mt FOB Puerto Quetzal (Guatemala) and \$255/mt CIF Melchor (Belize-Guatemala border crossing). The breakeven duty paid CIF price delivered in Belize would be ~\$375/mt, or BZD 34.00/cwt

Domestic Belize prices continue to remain steady at recently lower levels, with prices trading in the \$265-\$285/mt range (BZD 24-26.00/cwt).

Our recent aerial inspections continue to lead us to expect that the challenging start to the 2017 Summer Season will likely mean that Belize's domestic production is unlikely to achieve its estimated 2015 production level of 50,000 mt (2016 was much lower due to Hurricane Earl). Almost all Belize corn production is expected to be Feed Grade and suitable for use by regional food manufacturing companies.

We will continue to monitor the situation and report. We may have a small amount of excess production (~500 mt) which we could make available to the domestic market, or to other regional prospects.

Edible Beans

Global prices for black beans continue to trade steady to slightly firmer, with black beans trading at ~\$850/mt FOB US and Chinese dealers and Mexican CIF prices considerably higher at ~\$1,150/mt.

Belize's small 2016/17 black bean crop sold out quickly at historically attractive prices of \$1,000+/mt FOB. Belize still has a modest supply of light red kidney beans currently offered at ~\$1,050/mt FOB Belize.

Soybeans

Global prices reversed their previously firmer trends, with Gulf Ports prices falling to ~\$365/mt, which equates to ~\$405/mt FOB Puerto Quetzal and \$465/mt CIF Melchor border crossing. The breakeven duty paid CIF price (Belize delivery) would be ~\$665/mt, or BZD 61.50/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.

We hope that the Fates are not listening, because we are encouraged by the recent weather conditions, as well as our ability to rapidly and effectively address pest and weed issues. It is important to remember that we are only at week 3 of an 18 week crop cycle so there will undoubtedly be more problems to come. However, despite a very inauspicious start to the season, this is the best looking corn crop we have seen since beginning to farm at Cayo One in 2015. We will continue to do everything possible to ensure its success, and 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	79/195	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> 40-0-0-5.5 (S) <u>100lbs/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
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> 40-0-0-5.5 (S) <u>100lbs/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
BSA	Cayo One	1N	34/83	N	Black	Corn (Yellow)	Syngenta Impacto 70,000 28,340	TBD	TBD	Base	Decision to Plant must be made by August 12 th
BSA	Cayo One	2	115/289	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> 40-0-0-5.5 (S) <u>100lbs/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

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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