Belize Sustainable Agriculture, Ltd.
Farming Report – July 27, 2015

General Comments & Weather

This is the fifth of BSA's fortnightly Farming Reports for the 2015 Summer (Wet) Season, whose main objectives are to:

- Inform readers as to BSA's farming activities by season, farm, and crop
- Provide relevant data on climatic conditions and agricultural pests potentially affecting our crops.
- Inform readers on domestic and regional market conditions for BSA's crops.

BSA is only farming in the Summer 2015 season at the Cayo One Estate, situated approximately between miles 40 and 42 of the George Price Highway in Belize, near the village of Cotton Tree in Cayo District. Cayo One is some 41 miles west of Belize City, some 9 miles east of Belmopan and 38 miles east of the Belize-Guatemala border at Melchor.

June's exceptionally heavy rainfall was followed by a drier period during the first week of July, with about 1" of rain. This allowed some drying of the ground to occur, which was clearly important for BSA's corn crop. The second week of July brought a return of abnormally heavy rains, with nearly 8" of rain in the July 8-11 period, making the month to date total over 9" (88% of July average). However, in the fortnight since our July 13th report only about 1" of rain has fallen, which means we should be back to an average rainfall for July. As we discuss below, this is very beneficial for our corn crop.

The table below shows rainfall at Belmopan, which is about 9 miles from Cayo One. Data are shown both for the current year and an average for the past 15 years.

Belmopan Precipitation Data (mm per month) – July Data through July 29, 2015												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	**195**	**0.1**	**56**	**18**	**57**	**491**	**257**					
2000-2014	137	55	49	31	132	245	261	238	216	252	165	129

You can (normally) follow Belize's weather on:

http://www.hydromet.gov.bz/250-km-radar-loop

We continue to use the US NOAA Hurricane Center weather radar network which monitors the Caribbean basin, and would also suggest Weather Underground as an additional resource:

http://www.nhc.noaa.gov/

http://www.wunderground.com/q/zmw:00000.2.WMGMM

Cayo One (Corn) – 358 acres (100% non-irrigated)

BSA planted 358 acres of corn on 3 fields at Cayo One (described in the data table below) between May 28th and 30th. All of Cayo One's fields are virgin ground, with soil tests for the newly created farmland showing a consistently rich black soil with some clay, 3-4% organic matter, pH levels in a range of 6.0 – 6.9.

Pre-planting operations involved a disking, a leveling, and a harrowing of the fields, after which a granular base fertilizer was applied. Our 2015 Summer Crop is relying principally on granular based fertilizers, with a modest amount of supplemental liquid fertilizers. Specifics of the fertilizers and their applications are in the data table and Lot Records below. It is important to note that BSA has budgeted fertilizers for its corn fields based on a 150 bushel / acre (9.4 mt/Ha) yield goal. We do not expect to achieve that yield in this first year of operation, but we are fertilizing to that level in order to begin enhancing our soil quality. Our optimum outcome for this first season would be 110 bushels / acre (6.9 mt/Ha) and our financial budgets assume a yield of 81 bushels / acre (5.1 mt/Ha). We are presently holding off on a downward revision on crop yields as a result of the encouraging first plant count data collected on July 10th and the early stage evolution of the ears.

48 samples, comprised of 16 different samples each covering 1/1000th of an acre were collected in each of the three corn fields, with the following results:

Corn Population Summary - 20150710					
	Plants /acre (Estimate)	Blanks (Number)	Blanks (%)	Doubles (Number)	Doubles (%)
Field 1	26,438	22	5.20%	0	0.00%
Field 2	26,188	18	4.30%	2	0.48%
Field 3	27,188	5	1.15%	5	0.23%

The number of Blanks is higher than we would target in the long term (0.0-2.0%), and is likely to have been a function of the uneven ground. Doubles were (surprisingly) already within range (0.0-2.0%). Germination seems to have been excellent (98%+). Allowing for a typical amount of ear failure, the above data would indicate about 26,000 ears per acre. This would be a very creditable achievement on a seed rate of 27,000 in a first year of planting recently cleared ground.

We expect to be able to provide an initial ear count at our August 10th report with Data collected on August 8th. This will be Day 71 of the crop, the better sections of which should have reached the R-2 stage. At this point the defining characteristics of the ears have been set and we will have a clear sense of how many ears /acre are expected to develop.

We should also have an early indication of what the ears will look like in terms of kernel rows and height. We have left an explanation of yield analysis in the box below:

Yield Analysis

Ear Count is the first key component in determining yield; this depends on the number of plants that successfully develop (a function of seed variety and quality, planting bed preparation, planting equipment quality, and weather conditions) and then the percentage of plants that develop a satisfactory ear (a function of seed variety, quality, nutrition, as well as weather conditions).

Ear Size is the second component (number of kernels/ear), which is derived by the number of rows (typically 14 to 20 depending on variety and growing conditions) and the height of the rows (typically 20 to 45 kernels per row, again depending on variety and growing conditions)

Kernel Weight is the third component (number of kernels per bushel or pound).

Our long term goal would be to deliver 27,000 ears per acre at 650 kernels/ear weighing 92,500 kernels/bushel. This would deliver a yield of ~190 bushels/acre (~12.0 mt/Ha).

Corn reached VT stage on Monday July 20th. This is a little premature for corn under normal conditions with a maturity time of 140 days to harvest. However, this crop has had anything but normal growing conditions. The crop was at 56 days at the last detailed field inspection on July 25th and we had already had close to 28" (700mm) of rain. Any stress encountered by the crop will usually shorten the days to harvest period.

We used mid-July rains to make a final small (aerial) fertilizer application (Urea and Sulfur - details on Lot Records).

Currently the corn is in full pollination. The silk on the cobs is prolific. Many plants are producing two cobs. Although this is usually not a desirable thing it does not seem to be detrimental in this year's crop due to the rather low plant density. We believe that this development is again a result of stress (excessive rain) during the plants' early development. Morphologically the plant is capable of producing as many ears as the plant has leaves. However one large ear is preferred for best yield and kernel size. Early inspection of ears indicates a healthy number of rows and kernels.

Weather during pollination is important with temperature being the most crucial element. Temperatures over 32ºC have a detrimental effect on pollen production. Fortunately this process is very forgiving and may take as long as two weeks to complete with the majority of the pollen being produced in 3 days. Pollen release occurs basically twice daily; once in mid-morning before the heat and again in the afternoon after the greatest heat has subsided. For an excellent treatment on this topic see: https://www.agry.purdue.edu/ext/corn/news/timeless/tassels.html

Pest pressure has been much less during this last reporting period with the last application being 160 mL of Certero (Bayer AG) on July 16th. This is also a chitin inhibitor as all the other insecticides have been. Surveys by chemical company reps have given favorable reviews of the amount of worm damage to the corn and overall plant health. Fortunately this chemical is also effective on corn ear worm and the fields are being monitored with greater vigilance during this next two-three week period. The overall comments from industry representatives are very positive with the greatest emphasis surrounding lack of drainage and ponding issues. This issue was high on our list but, with such a late start to the 2014/2015 clearing season we simply ran out of time to address it. Our efforts will be redoubled to prevent

this happening in our next crop. We remain absolutely impressed by the soils' ability to remain friable and loose under the preceding adverse conditions.

As the aerial photographs below show, where we had good natural drainage the corn crop is looking very healthy; areas where there was ponding indicate a total crop loss, and then there will be areas with partial crops as the plants have struggled to overcome excessive water. Our current thinking is that 50-60% of the crop is very promising, 20-30% is stressed and will suffer reduced yields, and 10-20% will experience a complete crop loss. Depending on our early look at ear quality at the next report (and weather, of course!), we may well be in a position to maintain our original crop forecast come early/mid-August.

Cayo One (Rice) – 125 acres (100% non-irrigated)

BSA planted 125 acres of rice on the field which has been designated as field #4 and runs east to west across the northernmost section of the prepared farmland. Field #4 received one disking, two passes with a harrow and one leveling during preparation. It has essentially the same soil composition and chemistry as the corn fields.

The rice got off to a good start, as rice doesn't mind the heavy rains. Pest pressure has been limited despite lots of overhead duck movement. Ducks can destroy a large portion of a rice crop if they are not closely monitored; fortunately these have not yet been a problem. There is only one reliable solution for these pests: a 12 gauge shotgun loaded with #6 shot!

The rice is developing well despite needing rain, although development will stall if this rain does not arrive shortly. The plants continue to produce tillers in areas where plant density allows. Rice is somewhat unique in that it will determine its own density; in areas where there are ample (12 or so) plants per square foot each plant may produce 2-5 tillers but in areas where density is low (<3 plants per square foot) the plant may produce as many as 40-50 tillers from the same root. (highest John Peters ever saw was 59!) Nutrients (including water) and sunshine play a critical role in this plant's morphology. We have certainly had sufficient heat for good development but rain in the next 48 hours will be critical. Each tiller will typically produce 2/3 the size of panicle that the main stalk does.

Insect pressure has been very low and no further treatments since July 11 have been necessary. Almost unbelievably, grass has not been an issue and no herbicides applications have been made. There are patches of weeds which will need to be dealt with after the next good rainfall while the plant is growing well so as to minimize any negative effect on the rice itself. Weeds and grasses have a better "kill" while growing hardily while the crop is better able to withstand the chemical used.

Further applications of fertilizer are planned as soon as sufficient rainfall will permit. Applications of any nitrogen on the dry soil will simply evaporate and not benefit the plant. As can be understood in this report, soil moisture is absolutely critical and our reliance on Mother Nature this year cannot be understated.

.

Aerial View of 500 acres: July 25, 2015

Note the improved crop quality to the left of road where soil was "ripped"

Aerial view of Filed 2 with worst ponding: July 25, 2015

Field 2 had the heaviest ponding effects, although there is an actual pond in the southern part of Field 3

View of EPZ and Quarry: July 25, 2015

A road base has been laid from the EPZ to the Price Highway – Dry access all the way now!

View of Northwest Cleared area: July 25, 2015

Stagnant water between windrows; this should disappear completely once converted to farmland

Field 3 in well drained ground thriving – Day 56– July 24, 2015

Emerging Silk – Day 57– July 24, '15

Double Ear Silking – Field 3 Day 56– July 24, '15

Pollen Visible Day 57– July 24, '15

Market Conditions and Conclusion

There are few changes to market conditions in the past fortnight, so we have repeated the essential parts of last fortnight's report.

Corn

Corn continues to enjoy a firm local market in Belize, with buyers recently paying BZD 28.00/cwt from the local co-operatives ($7.84/bushel - $309/mt), who are now confirmed as being short. Guatemalan buyers continue to look for corn from Belize sources.

Soybeans

Soybeans remain steady at BZD 57.00-58.00/cwt ($17.25/bushel - $634/mt). Demand is stable and increasing with more mills coming on stream with their own crushing capability. There continues to be talk about increased planting of soybeans this Summer season but we have yet to see evidence of this trend. A closer aerial inspection of the major growing areas should lead to better intelligence in terms of domestic production.

Edible Beans

Edible beans remain a mixed market. Light Red Kidney Beans ("LRK") are moving very slowly at a severely reduced price. (BZD 85.00/cwt compared with BZD 170.00/cwt in 2014!) Small Red beans have fared better (last sales were reportedly at BZD 1.10/cwt). Black eyed beans ("BEBs") also have a solid market (Last prices were reported at BZD 85.00-90.00/cwt).

Rice

Belize's domestic Rice harvest has been coming in below estimates as a number of growers have now finished and, despite early oprtimism, reported only average results. Local wholesale prices for rough rice ("Paddy rice") at the mill contnue to be reported at USD 22.50/cwt or USD 496 /mt. Milled premium rice is expected to wholesale for around USD 45.00/cwt.

We have been encouraged by the respite that Mother Nature has recently granted us. Our corn is looking much better and, if we can get a solid shower or two on our rice, then things will be looking much better.

Early stage crop data remain encouraging, and we look forward to sharing more with you next report.

We have a clear goal which we are working on for Cayo One, namely to ensure that the necessary drainage and levelling work is done in the 2015/16 Dry season so that all of our crop is in optimum shape for even a very wet 2016 Summer season!

Thanks!

Abram Dyck, John Peters, and the Farming Report Editorial Team

Grower	Location	Field #	Acres	Irr ?	Soil Type	Crop	Seed Variety (count/acre)	Plant Date	Stand Date	Fertilizer Program *(For full details of applications, refer to Lot Records)*	Comments
BSA	Cayo One	1A	36	N	Black	**Corn**	DK 7088 27,000/acre	05/28	06/03	<u>Base</u> 330 lbs/acre 13+30+13+Micros <u>Starter 1</u> 1 ltr/acre Algaenzyme <u>Starter 2</u> 3.5 ltr/acre K - Focus <u>Post-Plant</u> 46-0-0 110 lbs (1st) Jun 12 Foliar Jun 18 46-0-0 110 lbs (2nd) Jun 27 Foliar/Micro Jul 8 39-0-0-7S 42 lbs (3rd) Jul 18	Western strip that received a "Deep Soil Rip" Full Base: 13.31-30.3-13.2+1.77S +0.12B+0.04Cu+0.22Mn+1Zn+0.22Fe Planted just in time ☺ 235mm of rain days 4-15 V4+ at Day 17 240m of rain days 15-28! V7 at Day 31 V12 at Day 44 VT at Day 52
BSA	Cayo One	1B	89	N	Black	**Corn**	DK 7088 27,000/acre	05/28	06/03	<u>Base</u> 330 lbs/acre 13+30+13+Micros <u>Starter 1</u> 1 ltr/acre Algaenzyme	Full Base: 13.31-30.3-13.2+1.77S +0.12B+0.04Cu+0.22Mn+1Zn+0.22Fe Planted just in time ☺ 235mm of rain days 4-15

										Starter 2 3.5 ltr/acre K - Focus Post-Plant 46-0-0 110 lbs (1st) Jun 12 Foliar Jun 18 46-0-0 110 lbs (2nd) Jun 27 Foliar/Micro Jul 8 39-0-0-7S 42 lbs (3rd) Jul 18	V4+ at Day 17 240m of rain days 15-28! V7 at Day 31 V12 at Day 44 VT at Day 52
BSA	Cayo One	2	100	N	Black	**Corn**	DK 7088 27,000/acre	05/29	06/03	Base 330 lbs/acre 13+30+13+Micros Starter 1 1 ltr/acre Algaenzyme Starter 2 3.5 ltr/acre K - Focus Post-Plant 46-0-0 110 lbs (1st) Jun 12 Foliar Jun 18 46-0-0 110 lbs (2nd) Jun 27	Full Base: 13.31-30.3-13.2+1.77S +0.12B+0.04Cu+0.22Mn+1Zn+0.22Fe Planted just in time ☺ 235mm of rain days 3-15 V4+ at Day 17 240m of rain days 15-28! V7 at Day 30 V12 at Day 43 VT at Day 52

										Foliar/Micro Jul 8 39-0-0-7S 42 lbs (3rd) Jul 18	
BSA	Cayo One	3	133	N	Black	**Corn**	DK 7088 27,000/acre	05/30	06/03	<u>Base</u> 330 lbs/acre 13+30+13+Micros <u>Starter 1</u> 1 ltr/acre Algaenzyme <u>Starter 2</u> 3.5 ltr/acre K - Focus <u>Post-Plant</u> 46-0-0 110 lbs (1st) Jun 12 Foliar Jun 18 46-0-0 110 lbs (2nd) Jun 27 Foliar/Micro Jul 8 39-0-0-7S 42 lbs (3rd) Jul 18	Full Base: 13.31-30.3-13.2+1.77S +0.12B+0.04Cu+0.22Mn+1Zn+0.22Fe Planted just in time ☺ 235mm of rain days 2-15 V4+ at Day 17 240m of rain days 15-28! V7 at Day 31 V7 at Day 29 V12 at Day 42 VT at Day 52
BSA	Cayo One	4	125	N	Black	**Rice**	Cheniere 110 lbs/acre	6/25	6/29	<u>Base</u> 250 lbs/acre 12+26+23+Micros <u>Starter</u> NPK (pH adjust)	Full Base spread 6/13 50%: 13.31-30.3-13.2+1.77S+0.12B+0.04Cu+0.22Mn+1Zn+0.22Fe 50%: 11-22-13.33+ 5S +0.1B+ 0.04Cu+0.22Mn+1Zn+0.22Fe

										Post-Plant 46-0-0 40 lbs (1st) 39-0-0-7S 42 lbs (2nd) Jul 18	235mm of rain 6/1-14 240m of rain days 15-28!

Lot Records for Fields 1, 2, 3, & 4

GROWER: BSA

Date Planted: May 28, 2015

SECTION #: 1

FARM LOCATION: Cayo One Estates I

BLOCK #:

SOIL TYPE: Black Loam

CROP: Corn

VARIETY: DeKalb 7088

OF ACRES: 125

LAND PREPARATION				
Discing	Harrowing	Leveling or Land Plane	Cultivating	Other
2	2	2		

FERTILIZERS			
PREPLANT		AT PLANTING	
See Below	Liquid		See Below
	Dry		

PLANTING	
Seed-Rate	Condition
Projected 27,000	Soil dry to moist

FERTILIZERS						Rain		PESTICIDES					
Date	Analysis	Rate/Ac	Ground	Air	#	Date	Quantity	Date	Description	Rate/Ac	Ground	Air	#
25-May-15	13.31-30.3-13.2+1.77S	330lb	Preplant		1	5/18-5/31	38 mm	27-May-15	Cruiser	seed	X		1
27-May-15	AlgaEnzims	1 Litre	At planting		2	6/01-6/14	236 mm	29-May-15	Atrazine	1.25lb	X		2
27-May-15	K-Focus	3.5 Litre	At planting		2	6/15-6/26	128 mm	29-May-15	Prowl	1 Litre	X		2
9-Jun-15	Frutal (PH adjust)	13.8CC		X	3	6/27-7/11	224mm	9-Jun-15	Nomax 15 EC	125CC		X	3
12-Jun-15	Frutal (PH adjust)	13.8CC		X	4	7/12-7/26	25mm	12-Jun-15	Cipermethrin	150CC		X	4
12-Jun-15	46-0-0	110lb		X	5			18-Jun-15	Chlorfluba	400CC		X	6
18-Jun-15	NPK (PH adjust)	27.6CC		X	6			29-Jun-15	Tordon	220CC		X	8
18-Jun-15	Sagaquel Combi	500CC		X	6			29-Jun-15	Chlorfluba	400CC		X	8
27-Jun-15	46-0-0	110lb		X	7			16-Jun-15	Certero	161CC		X	9
8-Jul-15	NewFol Mg	150mg		X	9								
8-Jul-15	Nachurs Micro+Folia	1L		X	9								
18-Jul-15	38.7N + 7.2S	42.4lb		X	10								

GROWER: BSA

Date Planted: May 29, 2015

SECTION #: 2

FARM LOCATION: Cayo One Estates I

BLOCK #:

SOIL TYPE: Black Loam

CROP: Corn

VARIETY: DeKalb 7088

OF ACRES: 100

LAND PREPARATION				
Discing	Harrowing	Leveling or Land Plane	Cultivating	Other
2	2	2		

FERTILIZERS			
PREPLANT		AT PLANTING	
See Below	Liquid		See Below
	Dry		

PLANTING	
Seed-Rate	Condition
Projected 27,000	Soil dry to moist

FERTILIZERS						Rain		PESTICIDES					
Date	Analysis	Rate/Ac	Ground	Air	#	Date	Quantity	Date	Description	Rate/Ac	Ground	Air	#
25-May-15	13.31-30.3-13.2+1.77S	330lb	Preplant		1	5/18-5/31	38 mm	28-May-15	Cruiser	seed	X		1
28-May-15	AlgaEnzims	1 Litre	At planting		2	6/01-6/14	236 mm	30-May-15	Atrazine	1.25lb	X		2
28-May-15	K-Focus	3.5 Litre	At planting		2	6/15-6/26	128 mm	30-May-15	Prowl	1 Litre	X		2
9-Jun-15	Frutal (PH adjust)	13.8CC		X	3	6/27-7/11	224mm	9-Jun-15	Nomax 15 EC	125CC		X	3
12-Jun-15	Frutal (PH adjust)	13.8CC		X	4	7/12-7/26	25mm	12-Jun-15	Cipermethrin	150CC		X	4
12-Jun-15	46-0-0	110lb		X	5			18-Jun-15	Chlorfluba	400CC		X	6
18-Jun-15	NPK (PH adjust)	27.6CC		X	6			29-Jun-15	Tordon	220CC		X	8
18-Jun-15	Sagaquel Combi	500CC		X	6			29-Jun-15	Chlorfluba	400CC		X	8
27-Jun-15	46-0-0	110lb		X	7			16-Jun-15	Certero	161CC		X	9
8-Jul-15	NewFol Mg	150mg		X	9								
8-Jul-15	Nachurs Micro+Folia	1L		X	9								
18-Jul-15	38.7N + 7.2S	42.4lb		X	10								

Belize Sustainable Agriculture, Ltd. Farming Report – July 27, 2015

GROWER: BSA

Date Planted: May 30, 2015

SECTION #: 3

FARM LOCATION: Cayo One Estates I

BLOCK #:

SOIL TYPE: Black Loam

CROP: Corn

VARIETY: DeKalb 7088

OF ACRES: 133

LAND PREPARATION				
Discing	Harrowing	Leveling or Land Plane	Cultivating	Other
2	2	2		

FERTILIZERS			
PREPLANT		AT PLANTING	
See Below	Liquid		See Below
	Dry		

PLANTING	
Seed-Rate	Condition
Projected 27,000	Soil dry to moist

FERTILIZERS						Rain		PESTICIDES					
Date	Analysis	Rate/Ac	Ground	Air	#	Date	Quantity	Date	Description	Rate/Ac	Ground	Air	#
27-May-15	13.31-30.3-13.2+1.77S	330lb	Preplant		1	5/18-5/31	38 mm	30-May-15	Cruiser	seed	X		1
30-May-15	AlgaEnzims	1 Litre	At planting		2	6/01-6/14	236 mm	30-May-15	Atrazine	1.25lb	X		2
30-May-15	K-Focus	3.5 Litre	At planting		2	6/15-6/26	128 mm	30-May-15	Prowl	1 Litre	X		2
9-Jun-15	Frutal (PH adjust)	13.8CC		X	3	6/27-7/11	224mm	9-Jun-15	Nomax 15 EC	125cc		X	3
12-Jun-15	Frutal (PH adjust)	13.8CC		X	4	7/12-7/26	25mm	12-Jun-15	Cipermethrin	150cc		X	4
12-Jun-15	46-0-0	110lb		X	5			18-Jun-15	Chlorfluba	400CC		X	6
18-Jun-15	NPK (PH adjust)	27.6CC		X	6			29-Jun-15	Tordon	220CC		X	8
18-Jun-15	Sagaquel Combi	500CC		X	6			29-Jun-15	Chlorfluba	400CC		X	8
27-Jun-15	46-0-0	110lb		X	7			16-Jun-15	Certero	161CC		X	9
8-Jul-15	NewFol Mg	150mg		X	9								
8-Jul-15	Nachurs Micro+Folia	1L		X	9								
18-Jul-15	38.7N + 7.2S	42.4lb		X	10								

GROWER: BSA

Date Planted: June 25, 2015

SECTION #: 4

FARM LOCATION: Cayo One Estates I

BLOCK #:

SOIL TYPE: Black Loam

CROP: Rice

VARIETY: Cheniere

OF ACRES 125

LAND PREPARATION				
Discing	Harrowing	Leveling or Land Plane	Cultivating	Other
1	2	1		

FERTILIZERS			
PREPLANT		AT PLANTING	
See Below	Liquid		
	Dry		

PLANTING	
Seed-Rate	Condition
110lbs	Wet

FERTILIZERS						Rain		PESTICIDES					
Date	Analysis	Rate/Ac	Ground	Air	#	Date	Quantity	Date	Description	Rate/Ac	Ground	Air	#
12-Jun-15	13.31-30.3-13.2+1.77S	124.4lb	Pre-plant	X	1	5/18-5/31	38 mm	18-Jun-15	Touchdown	600CC		X	3
12-Jun-15	11-22-13.33+5S+0.1B-	124.4lb	Pre-plant	X	2	6/01-6/14	236 mm	11-Jul-15	Karate	100CC		X	4
18-Jun-15	NPK (PH adjust)	27.6CC	Pre-plant	X	3	6/15-6/26	128 mm						
11-Jul-15	46-0-0	40lb		X	5	6/27-7/11	224mm						
18-Jul-15	38.7N + 7.2S	42.4lb		X	6	7/12-7/26	25mm						