Belize Sustainable Agriculture, Ltd.
Farming Report – July 13, 2015

General Comments & Weather

This is the fourth 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 only about an inch 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 has 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). After the more propitious start to the month, it now appears as if July is on its way to above average rain.

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 14, 2015												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	**195**	**0.1**	**56**	**18**	**57**	**491**	**229**					
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 are pleased to report that the Belize Meteorology Department weather radar is once again operational! 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 have been planted 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 discussed below:

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.

Ear count is the first key component in determining yield. The second component is ear size (number of kernels/ear) and the third component is kernel weight (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 90,000 kernels/bushel. This would deliver a yield of 185 bushels/acre

(11.6 mt/Ha). But in this first year of farming we would be thrilled to harvest, before making allowances for the very wet start to the season, 26,000 ears at 500 kernels/ear weighing 100,000 kernels/bushel (130 bushels/acre – 8.1mt/Ha.) How much of an allowance will then need to be made for crop losses due to inadequate drainage or ponding in low lying areas is still uncertain. The number is likely to be at least 15-20% and could rise as high as 30-35%. We will have a better understanding of this in the coming weeks (assuming weather normalizes!) as the crop progresses.

Our field observations indicate that the corn continues to recover remarkably well despite some 9 inches of rain during this reporting period. It is becoming obvious which plants will develop and which will become "weeds". Those that are thriving on well drained soils are in excess of six feet tall with a very healthy appearance. Most of these plants are at V12 stage and Brace Roots are developing from the fifth node and the first above-ground node.

Moisture or nutrient deficiencies at this stage may seriously reduce the potential number of kernels, as well as the ear size. 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 considerably.

Leaf tissue and soil analysis was performed during this reporting period. Results for N-P-K were well within range, which was quite satisfactory given the heavy rains. However, micronutrients were almost all deficient (again, heavy rains at work), so a remedial plan was implemented via a foliar application in order to reduce the plant's requirements. There was an almost immediate visual difference in the plants due to their response to the foliar program. An additional 110 pounds/acre of urea was also applied and should round out the plants' nitrogen needs. There may still be a small amount of additional urea required due to the amount of rain received and we will continue to monitor this closely. The Lot Records at the end of this report reflect these applications.

Pest and disease control continue to be satisfactory. A second dose of Chlorfluba was also applied when worms again presented themselves; this application seems to have been very effective with total control over all the acreage. Earwigs, a beneficial insect, are also present in abundant numbers and are showing evidence they are controlling any minor pests which may present themselves.

In summary, we are pleased with the progress of the corn crop, especially in light of the very challenging weather conditions. The key to further progress will be a return to more normal weather patterns.

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 is off to a good start, as rice doesn't mind the heavy rains. Although in retrospect planting one day earlier would have proven beneficial as two days after planting rain stopped for three days and the soil developed a very thin dry layer on top which stalled germination. Any kernels that had not yet put down a root dried out and failed to establish. Fortunately this is a rather small percentage and is only evident on the knolls as anywhere there is a little shelter or dip in the soil there are plenty of plants standing. But a good farmer never fails to point out why conditions were not "just right". Going forward, we may need to consider planting unirrigated rice via a different method to achieve more even plant stand. Unirrigated rice ground is clearly different than leveled irrigated fields where you can maintain a thin layer of water over the entire acreage and population of plants. Field #4 remains rather "uncivilized", with windrows still

present from raking. So, all things considered, the stand is very acceptable. Interestingly, even though Field #4 is located on the lowest portion of the 480 acres there is little ponding despite the last fortnight's ample 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!

Otherwise, we had a few isolated cases of worm infestations, mostly around the edges of field #4. The presence of worms is generally first noticed by egrets and their presence is an almost definitive sign of an infestation. These were absent in our field so careful inspection of the plants was necessary. The worms typically chew off the plant and move on to the next one. The worms we had were consuming the majority of the leaf. This does not usually kill the plant but rather delays it a few days until it is able to regrow and, if treated, yield is unaffected at this stage. The worms were treated with Karate, a broad spectrum cyhalothrin providing excellent control in a large variety of crops. Results were almost immediate, with this successful application being described by our watchman as "roasting the worms".

Example of a "Blank" – Field 3: July 10, 2015

Example of a "Double" – Field 3: July 10, 2015

Example of a "Brace Root" – Field 3: July 10, 2015

Very limited dorm damage – Field 3 July 10, 2015

Well drained ground thriving – Field 3 Day 41– July 10, 2015

Temporary drainage and Erosion – Field 3 Day 41– July 10, '15

Ideal Rice Plant Population – Field 4 Day 15– July 10, '15

Worm Damage to Rice Plants – Field 4 Day 15 – July 10, '15

Dense Rice Plant Population – Field 4 Day 15– July 10, '15

Deere Tractor Stuck in the Mud – July 4, 2015

Market Conditions and Conclusion

Corn

Corn continues to enjoy a firm local market in Belize. Buyers have recently been paying BZD 28.00/cwt from the local co-operatives ($7.84/bushel - $309/mt) who are rumored to be running short as the new season crop is not expected until October. There are continuing reports of large volume demand from Guatemala, although prices offered are somewhat lower than local Belize prices.

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. This is reducing demand for imported soymeal as mills and farmers realize the better feed value of locally crushed domestic soybean meal. There is much talk about increased planting of soybeans this 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 are a mixed market. Light Red Kidney Beans ("LRK"), which were in strong demand in 2014, are moving very slowly at a severely reduced price. Recent reports indicate that LRK's were selling at BZD 85.00/cwt (compared with BZD 170.00/cwt in 2014!) and that sales volumes were depressed and carried unfavorable payment terms. Small Red beans have fared better and domestic stocks appear to be sold out; the last sales were reportedly at BZD 1.10/cwt and were said to be destined to a Guatemalan based buyer. Black eyed beans ("BEBs") also had a solid market, especially compared with 2014. Last prices were reported at BZD 85.00-90.00/cwt, with continuing demand at that price. BEB supply was particularly short as recent low prices had discouraged plantings…

Rice

Belize's domestic Rice supply should benefit from a solid harvest brought in by Blue Creek, although we expect local prices to remain in their recent range. Local wholesale prices for rough rice ("Paddy rice") at the mill were reported to equal or exceed USD 22.50/cwt or USD 496 /mt. Milled premium rice is expected to wholesale for around USD 45.00/cwt. We continue to hear rumors of potential rice importers from Guatemala, with prospective prices expected to be close to those prevailing in Belize (we are sceptical but will investigate further as our rice crop progresses).

We continue to be reminded this season that Mother Nature has a determining impact on our success. After a very encouraging start, the heavy rains in June and July are indeed challenging. But once again there is a forecast for reasonable sunshine in the days ahead, which will be necessary for nutrient uptake, so essential to plant, kernel, and cob development. Our early data on the corn crop stand count is most encouraging, and is further evidence that materially higher yields can be achieved in Belize with the right land preparation, equipment, and farming techniques. With just a touch of kindness from Mother Nature, our goals should be within reach!

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	06/02	<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) Foliar Jun 18 46-0-0- 110 lbs (2nd) Foliar/Micro Jul 8	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
BSA	Cayo One	1B	89	N	Black	**Corn**	DK 7088 27,000/acre	05/28	06/02	<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	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

										110 lbs (1st) Foliar Jun 18 46-0-0- 110 lbs (2nd) Foliar/Micro Jul 8	V12 at Day 44
BSA	Cayo One	2	100	N	Black	**Corn**	DK 7088 27,000/acre	05/29	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) Foliar Jun 18 46-0-0- 110 lbs (2nd) Foliar/Micro Jul 8	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
BSA	Cayo One	3	133	N	Black	**Corn**	DK 7088 27,000/acre	05/30	06/04	<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	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!

										Post-Plant 46-0-0 110 lbs (1st) Foliar Jun 18 46-0-0- 110 lbs (2nd) Foliar/Micro Jul 8	V7 at Day 31 V7 at Day 29 V12 at Day 42
BSA	Cayo One	4	125	N	Black	**Rice**	Cheniere 110 lbs/acre	By 6/26	TBA	Base 250 lbs/acre 12+26+23+Micros Starter NPK (pH adjust) Post-Plant 46-0-0 40 lbs (1st)	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 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 / Dry		See Below

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	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			12-Jun-15	Cipermethrin	150CC		X	4
12-Jun-15	46-0-0	110lb		X	5			6/18/2015	Chlorfluba	400CC		X	6
18-Jun-15	NPK (PH adjust)	27.6CC		X	6			6/29/2015	Tordon	220CC		X	8
18-Jun-15	Sagaquel Combi	500CC		X	6			6/29/2015	Chlorfluba	400CC		X	8
27-Jun-15	46-0-0	110lb		X	7								
8-Jul-15	NewFol Mg	150mg		X	9								
8-Jul-15	Nachurs Micro+Folia	1L		X	9								

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 / Dry		See Below

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	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			12-Jun-15	Cipermethrin	150CC		X	4
12-Jun-15	46-0-0	110lb		X	5			6/18/2015	Chlorfluba	400CC		X	6
18-Jun-15	NPK (PH adjust)	27.6CC		X	6			6/29/2015	Tordon	220CC		X	8
18-Jun-15	Sagaquel Combi	500CC		X	6			6/29/2015	Chlorfluba	400CC		X	8
27-Jun-15	46-0-0	110lb		X	7								
8-Jul-15	NewFol Mg	150mg		X	9								
8-Jul-15	Nachurs Micro+Folia	1L		X	9								

Belize Sustainable Agriculture, Ltd. Farming Report – July 13, 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 / Dry		See Below

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	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			12-Jun-15	Cipermethrin	150cc		X	4
12-Jun-15	46-0-0	110lb		X	5			6/18/2015	Chlorfluba	400CC		X	6
18-Jun-15	NPK (PH adjust)	27.6CC		X	6			6/29/2015	Tordon	220CC		X	8
18-Jun-15	Sagaquel Combi	500CC		X	6			6/29/2015	Chlorfluba	400CC		X	8
27-Jun-15	46-0-0	110lb		X	7								
8-Jul-15	NewFol Mg	150mg		X	9								
8-Jul-15	Nachurs Micro+Folia	1L		X	9								

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: 122

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						