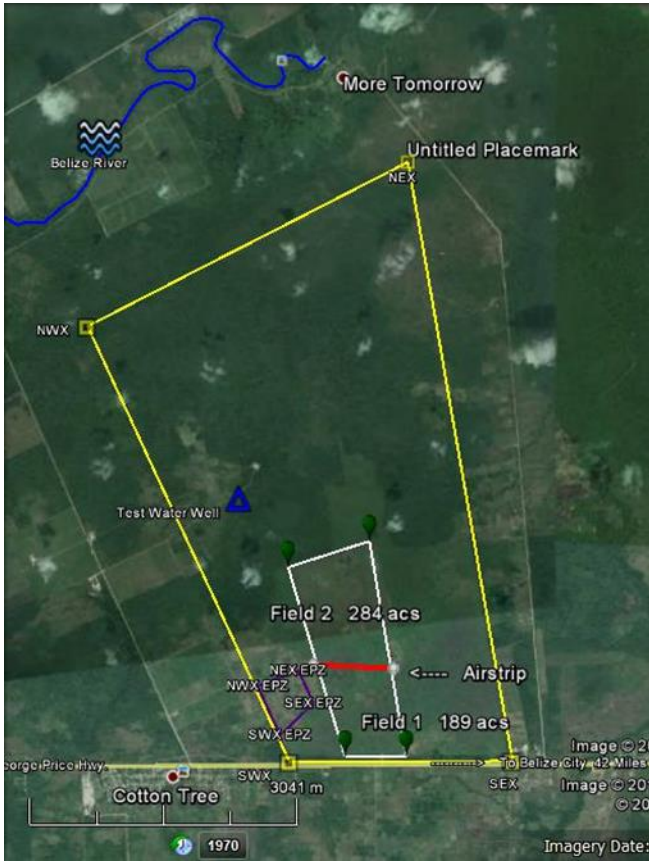


Belize Sustainable Agriculture, Ltd. Farming Report – June 28, 2016

General Comments & Weather



This is the fifth fortnightly Farming Report for BSA’s 2016 Summer (Wet) Season, whose main objectives are:

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

BSA is only farming at the Cayo One Estate in the Summer 2016 season; it is 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 some 38 miles east of the Belize-Guatemala border at Melchor.

June 2016 has seen seasonal rains that are, as in 2015, significantly above average. While the first half of the month provided close to ideal rainfall, the almost daily and substantial rain in the second half of June has left parts of Fields 1 and 2 quite water-logged, with ponding and runoff throughout the farm. The forecast for the current week is for mostly sunny and dry weather, so hopefully this will allow the ground to dry out somewhat. Once again, we are reminded that weather is the element over which we have the least control...

Belmopan Precipitation Data (mm per month) - June Data through June 27 th												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	105	282	30	66	71	414						
2000-2015	141	51	50	30	127	261	261	228	230	269	232	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>

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Cayo One ~ 473 acres (100% non-irrigated)

Farm Operations

Land Preparations

These were timely completed, and a full description is provided in the Lot Records at the end of this document.

Rain Impact

The weather has been less than cooperative for good growing conditions. In particular we have had rain: lots and lots of rain. Our fields are completely waterlogged with ponding and runoff throughout the whole farm. The rains are interspersed with periods of bright intense sunlight and generally windy conditions. This allows the crop to cope somewhat better but a week of dry is needed to bring the crop into a strong growth position. Weather forecasts for the region are erratic and contradictory so we hesitate to make any intermediate forecasts, although the last two days have been warm, breezy, and rain free. June's heavy rains are a reminder of the importance of implanting our drainage program as soon as possible (Dry Season 2016/2017). While this could not fully mitigate heavy rain, drainage tiling would allow 3/8"-1/2" of water to be drained off the land every day which would not only absorb water but it would sharply reduce surface run-off.

Seed Selection & Planting

Planting began on Saturday May 28th and finished on June 1st. Final acreages planted were:

- **DeKalb 7088 - 425 acres (Part of Field 1 and all of Field 2) @ 27,656 seeds/acre**
- **Dow 3383 - 24 acres (Part of Field 1) @ 27,656 seeds/acre**
- **American Seed & Genetics R9000 - 24 acres (Part of Field 1) @ 27,656 seeds/acre**

All varieties displayed a vigorous germination *in vitro*, and mostly strong initial emergence *in terra*. This is when problems first became visible. The Field count table below provides clear evidence of those problems:

Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count	Loc.	Count						
1	23	2	26	3	25	4	17	5	24	6	21	7	20	8	23	9	27	10	24	11	23	12	22	13	25	14	27	15	25	16	17
	26		24		25		23		29		23		18		20	(Dow)	27	(ASG)	28		24		23	(Dow)	29	(ASG)	24		25	22	
	24		21		18		28		26		23		20		27		27		26		24		26		26		23		27	22	
	27		24		22		23		22		24		24		23		28		25		27		22		22		26		28	16	
	26		25		28		8		28		24		17		23		28		28		27		26		24		28		28	23	
	24		23		22		18		25		27		16		24		25		24		27		19		26		26		25	22	
	23		22		22		20		26		22		24		22		28		25		28		21		28		25		28	20	
	24		23		23		11		25		23		18		9		28		26		18		18		26		26		28	18	
	25		14		28		10		23		20		18		18		26		25		24		24		27		27		28	20	
	25		23		21		20		26		21		23		19		27		25		25		24		29		27		28	18	
	23		24		26		20		27		24		16		14		25		26		23		27		28		25		28	24	
	26		27		22		18		26		23		19		14		27		24		19		24		28		28		28	23	
	26		22		26		13		27		24		22		18		28		23		26		24		28		26		28	19	
	24		23		23		16		26		27		22		22		28		28		29		25		28		26		28	19	
	28		23		24		21		27		22		24		23		28		25		19		20		28		27		27	20	
	23		23		25		19		23		20		18		19		26		29		21		24		29		23		28	22	
Avg	24.81		22.94		23.94		17.19		25.75		23.19		20.13		19.44		27.06		25.75		24.13		22.94		26.94		25.88		27.31	20.31	
000s Plants/Acre																															
DeKalb only:		22.67																													
Trials only:		26.41																													
Cayo One Avg:		23.61																													

One of the three lots of DeKalb-7088 seed, representing some 60 bags (120 acres of seed) developed major issues after emergence. We have observed very irregular vigor with erratic plants varying from unusually small to unusually large.

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Representatives from the Distributor (Belagro) and the Manufacturer (Monsanto) were summoned to Cayo One to inspect our fields. Given that some of the DK-7088 showed very good results, and that both of the trials have showed very good results, everyone agreed that there are quality issues with the seed. The Monsanto Tech-Rep agreed to report back to HQ and seek guidance. We have also been able to confirm that these issues were repeated not only among several of the larger farmers in Cayo District, but also among farmers in neighboring Petén province (Guatemala) and Mexico's Yucatan Peninsula.

These seed issues will clearly have a negative impact on yields. However, we began with conservative harvest targets, and we are in no way suggesting that our yield targets need yet be revised downwards (from 107 Bushels/acre, 60 cwt/acre, 6.7mt/Ha). Subject to reasonable weather going forward we remain confident that we will reach our targets. We will also be comparing DK 7088 yields with yields from the Dow and ASG seeds. Where these are materially higher than the DK 7088 we will be seeking compensation from the Agent & Manufacturer. To that end we have withheld payment on the DK 7088 seed, which would cover any lost profit margin on the first 15% of lower DK 7088 yields.

Fertilizer Program

We feel it is worth repeating BSA's fertilizer strategy for Cayo One, which is based on multiple goals:

1. Test the impact of higher fertilization rates on yields
2. Ensure that fertilization is at least 110% of theoretical "maintenance rates"
3. Test one plot for higher Nitrogen Applications
4. Initiate long term trial of organic worm based soil enrichment

For a detailed discussion of BSA's fertilizer strategy, see the May 31st report and the field matrices later in this report. However, based on experience at planting time this year and last, and being mindful of an expected sharp increase in acreage under production going forward, we intend to monitor this crop's performance to possibly re-evaluate our strategy regarding liquid fertilizers.

Early Crop behavior

The corn emerged promptly after the two rains that we had a few days after planting. The vigor looked good; spacing and singulation were very acceptable, subject to the issues described above.

Dow 3383 Trial

This variety certainly shows promise. The seed was very uniform and large flat kernels were used. This seed also had almost 100% germination rates with superior vigor when compared to both other varieties. At 20 days of age it is clearly an additional 4" in height, has slightly wider leaves and also slightly darker green in color. However, it has some unwanted characteristics that will likely disqualify it from our seed selection for next year.

1. Lodges easily: Plants are lodging already; this is partially due to the extreme wet weather but also to brace roots that are completely absent. These brace roots will certainly grow but in the meantime some plants are lying on their side.
2. Tillering: The tendency for the plant to grow another shoot from the base of the plant when subjected to stress, in this case water. This tiller will not produce a harvestable cob and robs the rest of plant of nutrients and possibly water.
3. Our lead customer has already told us that they are not interested in this variety

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ASG RY9000 Trial

This variety looks like a solid performer. The seed selected was large round and kernels were consistent in size. It proved to have a respectable 93% germination and good vigor. The plant seems to be responding in a slightly odd way due to the ample water supply; leaves are curling slightly. In areas of better drainage this is not observed. There is another possible reason for this; application of herbicide. We certainly want to address this concern with the seed supplier and are hoping for favorable results. It is still uncertain whether our snack food customer in Guatemala will be interested in this variety. Presently it looks like it could be a good performer.

DeKalb 7088

This variety clearly takes the ribbon when it comes to root development. This can be seen in some of the pictures attached. Plants at 20 days from germination are sending out brace roots in order to stabilize the plant. This is even during very wet conditions. This is an admirable quality and one which makes DeKalb a preferred variety. Unfortunately, it also seems to be the favorite for worms (a controllable issue but at a cost).

The issues with germination and plant vigor described above have been very disappointing as this is also the preferred variety for our customer. We certainly hope that the seed issue is a “One-Off” occurrence that the manufacturer will forcefully address. Moreover, we will be considering better ways of determining germination moving forward. This will require that we have our seed in stock much sooner to be able to carry out more real-life (*in terra*) testing instead of the lab testing (*in vitro*) which we are currently using.

Weeds and grasses

We were extremely disappointed by the results of our weed and grass control application immediately after planting. Both of the herbicides used are pre-emerge which means grasses and weeds should not even surface as they are killed at germination. We had areas of no control and areas where control was very acceptable but the latter areas were spread over the whole farm. We rapidly took the decision to apply a rescue herbicide to kill the weeds and grasses that had escaped the earlier applied herbicide. It is a little premature to make a definitive statement whether this has wiped out the problem but indications are already that it has done a good job. This is another timely reminder of the need for continuous vigilance and the willingness to take corrective measures rapidly.

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Cayo One Northerly – Starting to dry – June 28, 2016



Cayo One Easterly – Very Wet! – June 23, 2016



Field 1 Dow Trial Looking Good despite rain! 6/24/16



Field 1 Dow Trial Under Water Day 22 – June 23, 2016



Field 2 DK 7088 poorly germinated area Day 22 6/23/16



Field 1 DK 7088 Strong Brace Roots Day 22 – 6/23/16

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Market Conditions and Conclusion

Grain prices remain broadly unchanged in Belize during the past month, notwithstanding the recent improvement in global prices. They continue to remain mostly stable over the six months since the end of the 2015 harvest, once again with the exception of weaker soybean prices which appear to have found a bottom.

Corn

Corn prices remain unchanged from last reporting period (BZD 29.00/cwt; \$8.12/Bu; \$320/mt) and there are indications that prices will remain high. Large areas in the Cayo District have been forced to replant, which can be partially attributed to poor germination of the widely planted DeKalb and Pioneer seed varieties. There are other areas (notably in Orange Walk) which only received sufficient rainfall over the last 2-3 days to allow planting. It is expected that the countrywide rains received over the past few days will further delay planting due to excess moisture.

So domestic corn production, already experiencing some crop transfer into sugarcane, may be challenged to meet domestic needs further supporting domestic prices irrespective of international prices.

Soybeans

Soybeans in Belize remain have stabilized in price, and the new topic of discussion is the difficulty in obtaining good seed. #1 Grade Soybeans continue to sell at 50.00/cwt (USD 550/mt), with lower grade #2 steeply discounted at \$40.00/cwt. (USD 440/mt).

Seed shortage remains a perennial problem which deserves some attention. It is quite conceivable that good production and storage practices could result in a profitable business opportunity for CSA.

Edible Beans

Edible beans, with the exception of black eyes are selling at slightly reduced prices. Available volumes are shrinking with steady, slow sales to the Caribbean. However, Black eyed beans sales are virtually non-existent and the reasons for this are unclear; inventories remain are very high although prices are stable.

We are somewhat disappointed by the return of another very wet June. However, unless extreme weather conditions persist, and despite issues with some of our DK 7088 seeds, we are confident that Cayo One will be able to demonstrate its considerable potential. It is also very comforting to see that regional market conditions remain quite buoyant, despite generally weak agricultural commodity prices on global markets.

We remain more convinced than ever that the key to properly mitigating all but the most extreme weather scenarios is the rapid implementation of our planned drainage and irrigation systems.

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

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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	14	N	Black	Corn (Yellow)	DeKalb 7088 27,656	June 1	June 7	Base 13.3-30.3-13.2-1.8S 330lbs/acre Liquid Aporte-M 2L/Acre TRIAL Vermiplex 4L/Acre 46-0-0 100 lbs/acre	Land Preparation underway May 1, 2016; continues May 17, 2016 under good conditions; finished May 23. Planting June 1. Vigorous emergence June 5-10. Above average June 25 plant count for DK-7088 at 24,000/acre.
BSA	Cayo One	1b	24	N	Black	Corn (Yellow)	Dow 3383 27,656	May 31	June 7	Base 13.3-30.3-13.2-1.8S 330lbs/acre Liquid Aporte-M 2L/Acre 46-0-0 100 lbs/acre	Land Preparation underway May 1, 2016; continues May 17, 2016 under good conditions; finished May 23. Planted May 31. Vigorous emergence June 5-10. June 25 plant count at 27,000/acre
BSA	Cayo One	1c	24	N	Black	Corn (Yellow)	ASG R9000 27,656	May 31	June 7	Base 13.3-30.3-13.2-1.8S 330lbs/acre Liquid Aporte-M 2L/Acre 46-0-0 100 lbs/acre	Land Preparation underway May 4, 2016; continues May 17, 2016 under good conditions; finished May 23. Planted May 31. Vigorous emergence June 5-10. Vigorous emergence June 5-10. June 25 plant count at 26,000/acre

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BSA	Cayo One	2	284	N	Black	Corn (Yellow)	Dekalb 7088 27,656	May 28-31	June 7	Base 13.3-30.3-13.2-1.8S 330lbs/acre Liquid Aporte-M 2L/Acre 46-0-0 100 lbs/acre	Land Preparation underway May 4, 2016; continues May 17, 2016 under good conditions; finished May 27. Planted May 28-31. Vigorous emergence June 5-10 followed by disappointing June 25 plant count at 2X,000/acre
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Lot Records for Fields 1 & 2

GROWER: <u>BSA</u>		Date Planted: <u>5/31/2016 - 6/01/2016</u>	
FARM LOCATION: <u>Cayo One Estates I</u>		SECTION #: <u>1a, 1b, 1c</u>	
CROP: <u>Corn</u>		BLOCK #: <u>DK 7088;</u>	
		SOIL TYPE: <u>Black Loam</u>	
		VARIETY: <u>Dow 3383; ASG R9000</u>	
		# OF ACRES: <u>141+24+24</u>	

LAND PREPARATION					FERTILIZERS			PLANTING			
Discing	Harrowing	Leveling or Land Plane	Raking	Other	PREPLANT	AT PLANTING		Seed-Rate	Condition		
5/1/2016					See Below		Aporte-M	27,656	Dry & Hot		
5/16/2016	23-May-16	5/9/2016	4-May-16				See Below				
5/20/2016											

FERTILIZERS						Rain		PESTICIDES					
Date	Analysis	Rate/Ac	Ground	Air	#	Date	Quantity	Date	Description	Rate/Ac	Ground	Air	#
26-May-16	13.3-30.3-13.2-1.85	330lb	X		1	6/3/2016	0.6	3-Jun-16	Atrazine	1lb	X		3
31-May-16	Aporte-M	2L	X		2	6/5/2016	1.5	3-Jun-16	Prowl	1L	x		3
31-May-16	ermiplex (111 acres)	4L	X		2	6/8/2016	0.5	13-Jun-16	Certero (perimeter only)	161 cc		x	4
22-Jun-16	46-0-0	100lb		x	6	6/9/2016	0.8	13-Jun-16	Aporté Pre-M	250 cc		x	4
						6/12/2016	0.7	13-Jun-16	Damoil	250 cc		x	4
						6/17/2016	1.9	18-Jun-16	Primero	18 cc		x	5
						6/18/2016	1.3	18-Jun-16	Tordon	150 cc		x	5
						6/19/2016	3.8	18-Jun-16	Aporté Pre-M	122 cc		x	5
						6/22/2016	1.0	18-Jun-16	Surf-Ac	3 cc		x	5
						6/23/2016	0.8	26-Jun-16	Certero	161 cc		x	7
						6/24/2016	0.7	26-Jun-16	Surf-Ac	2 cc		x	7
						6/25/2016	0.7	26-Jun-16	Aporté Pre-M	80 cc		x	7
						6/26/2016	0.8						

GROWER: <u>BSA</u>		Date Planted: <u>5/28-31/2016</u>	
FARM LOCATION: <u>Cayo One Estates I</u>		SECTION #: <u>2</u>	
CROP: <u>Corn</u>		BLOCK #: <u></u>	
		SOIL TYPE: <u>Black Loam</u>	
		VARIETY: <u>DeKalb 7088</u>	
		# OF ACRES: <u>284</u>	

LAND PREPARATION					FERTILIZERS			PLANTING			
Discing	Harrowing	Leveling or Land Plane	Raking	Other	PREPLANT	AT PLANTING		Seed-Rate	Condition		
5/5/2016					See Below		Aporte-M	27,656	Dry & Hot		
5/10/2016	23-May-16	5/12/2016	6-May-16				See Below				
5/16/2016		5/17/2016									

FERTILIZERS						Rain		PESTICIDES					
Date	Analysis	Rate/Ac	Ground	Air	#	Date	Quantity	Date	Description	Rate/Ac	Ground	Air	#
20-May-16	13.3-30.3-13.2-1.85	330lb	X		1	6/3/2016	0.6	2-Jun-16	Atrazine	1lb	x		3
28-May-16	Aporte-M	2L	X		2	6/5/2016	1.5	2-Jun-16	Prowl	1Lb	x		3
22-Jun-16	46-0-0	100lb		x	6	6/8/2016	0.5	13-Jun-16	ertero (perimeter only)	161 cc		x	4
						6/9/2016	0.8	13-Jun-16	Aporté Pre-M	250 cc		x	4
						6/12/2016	0.7	13-Jun-16	Damoil	250 cc		x	4
						6/17/2016	1.9	18-Jun-16	Primero	18 cc		x	5
						6/18/2016	1.3	18-Jun-16	Tordon	150 cc		x	5
						6/19/2016	3.8	18-Jun-16	Aporté Pre-M	122 cc		x	5
						6/22/2016	1.0	18-Jun-16	Surf-Ac	3 cc		x	5
						6/23/2016	0.8	26-Jun-16	Certero	161 cc		x	7
						6/24/2016	0.7	26-Jun-16	Surf-Ac	2 cc		x	7
						6/25/2016	0.7	26-Jun-16	Aporté Pre-M	80 cc		x	7
						6/26/2016	0.8						