

Belize Sustainable Agriculture, Ltd.
Joint Venture Farming Report – June 16, 2014

General Overview

Weather conditions improved over this reporting period. We enjoyed a real variety of weather with no long periods of continuous rain or sunshine. Temperatures were very favorable for all crops. A fair amount of farm activity had to be done between rains, which were generally light and short. Forecasts show generally fair weather with potential for light thunderstorms over most of region for next week or so. This will coincide with the beginning of rice harvest. There is a fair amount of air movement between rains which should help to dry the foliage and allow us to be able to resume harvesting quickly. Daytime highs have been in the high 20°C with cool nights. As a reminder, for those so inclined, you can follow Belize's weather on:

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

Thiessen Family Farms – 512 acres (283 Irrigated / 229 Dry – 100% Corn)

The Thiessens were able to complete the planting of their entire 512 acre parcel during this reporting period. The entire crop looks good despite there being quite a difference from the start of planting to the final planting. Emergence was somewhat staggered due to insufficient land prep being done to refine the soil for optimum germination, although progress versus last summer was still considerable. The much anticipated land plane did not arrive in time for the Thiessens to make best use of it, yet they went ahead and started planting. In contrast, the neighbor who was patient enough to wait and plane his land is enjoying a more even stand despite being almost two weeks behind the Thiessens earliest planted fields.

There is a noticeable difference in appearance in the trial area due to planting density: the areas planted with 35,000 kernels/acre appear visibly more dense than the area planted at 30,000 kernels/acre. Otherwise not much is evident yet. The next JV Report will contain actual germination results from the trial areas as well as the larger variety plots. Also, leaf tissue analysis can be made anytime after the plant is 21 days old. These tests will be promptly undertaken and will provide an excellent basis for determining further foliar and granular fertilizer applications. We are especially anxious to discover the differences in plant characteristics between the areas which received only granular fertilizers and those that also received liquid fertilizers.

The earliest planted corn emerged with no insect pressures for the first two week period. This was attributed to an insecticide being applied to the seed before planting. When used properly these insecticides typically provide 30 days of protection, yet when not used properly (notably, an insufficient application) the length of time the insecticide is effective quickly reduces. A further benefit of this seed treatment is the deterrence of birds eating seedlings. One of the challenges with emerging corn is that birds will pull out the young seedling and consume what is left of the seed. That activity is non-existent with this treatment. However, there is obviously a cost attached to this treatment and the Thiessens decided to reduce the volume of treatment per seed to reduce their cost; they are now dealing with worms much too soon in their earliest planted corn. This issue will be addressed with the Thiessens in the next couple of days, and we will reinforce with them the need to see these treatments as a key investment in the crop. We were somewhat disappointed in their approach as this issue was addressed with them prior to planting; we must view this as evidence of the need for continued educational efforts. We will monitor results to see if this deviation from the plan will negatively impact Cost of Production due to additional insecticide applications being required. One additional long term issue with these treatments, as with many pesticides, is tolerance build up and the subsequent impact on insect control; this will be part of our longer term crop management effort. We should also probably bear in mind that the Thiessens have

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nonetheless made considerable progress in the three crops we have worked with them, and these issues can and will be addressed.

Now that all the corn has been planted, we have been fortunate that the rains have been sufficient to avoid the need for irrigation. This is good in a number of ways; not only in reduced pumping costs and more equal growing conditions for the irrigated vs non irrigated portions of the field, steady rains also help the already applied nutrients become more soluble and therefore available to the plant. Continued rains at the present consistency would therefore be extremely valuable (although for those who have not yet finished planting these rains are of course a major distraction).

We continue to be excited about the trials for which Marlon is responsible. These cover a dedicated portion of a partially irrigated field covering a total of 131 acres, of which 71 are irrigated and 60 are non-irrigated, and an additional 8 acre non-irrigated field specifically focused on the application of worm castings as a fertilizer alternative. The trials will be particularly benchmarked against two adjacent Thiessen fields totalling 103 acres of which 71 are irrigated and 32 are non-irrigated. There are many important data points that we expect to collect which should help us move forward with improving future corn crops. Indeed, the news of these trials has caught the attention of many other local farmers as well and both our processes and personnel are under scrutiny. We welcome this local scrutiny as it gives us a chance to hopefully help educate and possibly modernize the Indian Creek community's thinking from many of the old, traditional methods which have kept them in the 70-100 bushel/acre yield rut. Key Information we expect to obtain from these trial plots are:

- What are the measurable benefits, if any, of using liquid versus (more traditional) granular fertilizers?
- Up to what density do higher plant populations result in higher yields, and can we begin to “fine tune” optimum plant density in Belize?
- What are the cost/benefit ratios for higher investment in seed density and fertilizer type and application levels?

We are also doing a small 8 acre trial with worm castings as a fertilizer substitute (on a no cost to us basis!). The trial consists of 8 acres of castings incorporated directly under the seed at a rate of 500lbs per acre. Local trials have shown a very favorable cost/benefit for these castings in vegetable crops and the supplier is anxious to try this in corn. If the trial performs as he expects it to, it will be interesting to see how traditional fertilizer suppliers respond, as this product has primarily been in the organic growers' tool chest. We see this trial, if it is successful, as a potential first step towards crop nutrition techniques that are more soil friendly than traditional chemical fertilizers, and therefore inherently more sustainable in the long term. While our goal is to maximize yields, we will always prefer to do so in a way that is demonstrably more sustainable over the long term.

Finally, we are excited to report that the earliest planted corn will soon need its first application of nitrogen: a clear sign that the 2014 Summer Corn Crop is truly under way! This product is in storage locally and our crop-dusters are on standby for aerial application when the proper conditions arrive.

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Thiessen Field TB-2 (Planted May 28) – June 14, 2014



Thiessen Field T2 (Planted June 6-7) – June 14, 2014

Neufeld Family Farms – 336 acres total (100 acres black eyed beans - 0 % Irrigated / 236 acres Rice – 100 % irrigated)

Rice

Jacob's rice is continuing to mature rapidly. At this moment it appears that his field 113 will be first to harvest, although surprisingly this was not the first field planted, and by a five day margin. We are not sure why this is happening but have a few suggestions;

- early grass control causing rice to suffer less
- only single application of grass herbicide reducing plant stress
- small field allowed very quick drainage of original irrigation water giving seeds a good chance to germinate

We will continue to monitor these fields for yield and compare Lot Records for more clues. Harvest is scheduled to begin on Monday June 23, 2014. So by the next JV Report we should be reporting the first harvest results! Jacob's yields are projected to be in the range of 7000lb+/acre. As this is not an exact science (it is not like counting ears of corn per acre and kernel count per ear) we express these predictions with a fair bit of caution; indeed we suggest that even veterans of rice farming have been known to be off by a meaningful margin. However, the fields do look very good and it is exciting to be so close to the finish.

Jacob has his equipment ready. Due to recent rains it is now obvious that we will be harvesting his fields on tracks and Jacob has these installed on his combine. These recent rains are somewhat unfortunate as he was planning on "ratooning"⁽¹⁾ his fields. This becomes much more difficult as much of the rice plants get mashed into the muddy soil and die instead of sending new shoots which contain a fresh panicle. Ratooning is practiced throughout the world and is quite successful wherever the senesced plant can either be cut off just above the ground or rolled down with a smooth drum roller of sufficient weight to cause stalk to become kinked at ground level. Yields resulting from a ratoon crop are typically 30-60% of original yield but with almost no input costs. Furthermore, time to harvest is around 60 days vs 105-120 depending on variety. For our purposes, this would in effect be a second rice crop in the same season.

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The remainder of Jacob's rice (field 221) is in full head; these are the 27 acres that were seeded with seed lacking vigor and subsequently reseeded after a burn down was applied. This field does not look as promising as the remainder of his fields. This field is in clear need of leveling so that water levels can be maintained and proper pre-planting land work can be done prior. Assuming we have enough dry time in the forthcoming off-season, and that we continue to farm this land, we will ensure this leveling is done.

(1) *Ratooning, the ability of rice plants to regenerate new tillers after harvest, may be one practical way to increase rice production per unit area and per unit time. Because ratooned rice has shorter duration than a new crop, it may increase productivity in areas where cropping intensity is limited by inadequate irrigation facilities or by a second crop where the rice season is less than 180 days. Besides short duration, it costs less to grow a ratoon crop than a new crop.*



JSN Field 121: ~10 days before harvest (June 16, 2014)

(Note the heavy rice heads full of grain)



JSN Field 113: ~10 days before harvest (June 16, 2014)

Marlon Dyck – 420 acres (Rice 100 % irrigated)

Marlon's earliest planted rice (March 12-14) in fields 211-213 is now fully headed and in early stages of senescing. The fields are lodging in a few areas where the aircraft has overlapped and over-fertilized small sections of ground (n.b. "Lodging" is the collapse of the cereal stem when it can no longer support its own weight). But this can actually be a good sign when it occurs late in the crop! It means that there is more than the maximum weight in the panicle which the plant can bear. Much of this rice can still be harvested notwithstanding the amount of rain received. However, too much rain will cause the kernel to sprout on the panicle rendering it un-millable. These fields have been drained of water but with the persistence of small showers on an almost daily basis it is hard to believe this rice will not germinate. It is generally accepted that maximum yield can be achieved when 10% of the field is lodged due to heavy grains. Marlon's rice is not at that lodging level but is still at least three weeks from harvest.

Fields 221-226 are somewhat of a phenomenon to us; these are the fields that were reseeded due to poor vigor in the first planted seeds. These fields are currently at 79 days and should be fully headed. However they are not, and the

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reasons why are somewhat of a puzzle. There are individual heads popping up but not what you would expect to see at this day count. Upon closer examination, the girth of the plants is materially above average while the panicle is moving through the sheath as expected; it just seems to take longer than it should. Indeed, it appears as though the yield potential is extremely good due to an earlier application of glyphosate to kill the rice with poor vigor. This also killed much of the unwanted “red” or “wild” rice, significantly reducing competition for nutrients. We continue to monitor these fields without being alarmed; indeed, it should be extremely interesting to see what their yields will be.

Fields 231-237 were planted two days later (March 31, 2014) and their maturity has surpassed the earlier planted 220 series. These fields are approximately 50% headed and just slightly (by a few days) late in their expected cycle. We have been draining large amounts of water from these fields due to a combination of rainfall and general topography (which drains much of the area’s water into these fields). Continuous water management is critical as the plant cannot be “drowned” and will thus continue to grow its stalk in order to keep the head above water. This in turn causes a weak stalk and subsequent lodging.

Marlon continues to prepare his machinery for harvest, which is still at least two weeks away, and he expects to have his equipment ready by end of this week. The combine Marlon will use is a John Deere 9500 CTS Rice Special, which is built specifically for rice, with numerous components specific to rice harvesting. These machines are capable of harvesting vast volumes of rice and cleaning it sufficiently so that it is ready for drying. While this particular harvester is a long way from new, many upgrades have been made in the past to keep this machine going and we expect good results!

Other JV Farming Prospects

As reported in the last JV Report we are excited about some other good pieces of land becoming available for BSA to rent. These will not be farmed on a JV program but rather will be managed by BSA personnel. Negotiations with HAC are complete and we are waiting final confirmation from their lien holder prior to proceeding. The lands are:

- **HAC** – rent ~650 acres of non-irrigated red soil in the San Carlos/Hillbank area. Land preparation has begun but has been delayed due to too much rainfall. The crop allotments are as follows; 120 acres corn and 530 acres soybeans. Varieties have been determined with 100 acres of soybeans being planted with a known local variety 3296. The remainder will be planted with Huasteca 400-a Mexican non GMO variety that a long proven track record. The corn ground will be planted with Syngenta Impacto variety, another proven top performer.
- **HAC** – rent ~280 acres of non-irrigated sandy black soil in the Blue Creek area, almost adjacent to our current rice crops. The crop being planted here has not been determined. Much of this is dependent on when we will be able to work the soil. The later in the crop season we get, the less our options. Possibilities are that this will be left for a July planting of soybeans or a fall planting of milo. Demand seems to remain high for milo and usually a window of opportunity opens in September/November to adequately prepare the solid for good germination. Work will begin on this ground as soon as weather permits.

Summary and Conclusion

We continue our search for large volume buyers in Guatemala, El Salvador, Mexico and the rest of the Caribbean region. We have one much anticipated meeting this week with a large buyer representing a major Guatemalan consumer. We are interested in negotiating with him as he has indicated he would be interested in purchasing the entire output of BSA’s owned farmland and its JV farmland (including when production areas reach 30-40,000 acres!) He claims to really like the quality and proximity of Belizean corn. Of course there would be many issues that would need negotiation and

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agreement, from price, to delivery and payment terms, and indeed to varieties. This prospective purchaser is very specific about which variety he needs (Dekalb 7088) for his purposes and will apparently pay a premium for that variety. He has in the past established “gray routes” through the border and is well familiar with the logistics of moving large volumes of grain. Our challenge is to establish reliable transportation mechanisms through official channels, for which we hope to use a first 500 mt sale as a learning exercise. So we await this prospective partner’s arrival, recognizing that our neighbors are not always as punctual or rigorous as one would like...

Another contact has also been made with a large Guatemalan corn consumer from the feed industry: Comayma. This lead was received through Beltraide, the government entity responsible for promoting both Foreign Direct Investment and for assisting Belizean industry with exports. Early contacts are slow and irregular, but we have been assured of their interest and will pursue this lead.

We have also introduced ourselves to several other high volume users in Guatemala and El Salvador namely Frito-Lay and Diana. They too are interested in specific varieties, and will apparently pay significant premiums for those varieties. They also have indicated that they would like us to come see them for further discussions instead of email or phone conversations. This is definitely part of the plan moving forward!

Local corn sales have slowed down somewhat with reduced exports to Guyana being the main reason, and it now appears there will be a local surplus before the new crop arrives in November. We understand that the local co-ops in Blue Creek and Indian Creek have so far only sold about two-thirds and one half respectively of their stored corn. Thus there may well be some consolation in the fact that a significant quantity of early planted corn has been wiped out due to excessive rains, especially when planted in heavier “black” soils. Fortunately our crops have not been affected in this way and we are pleased we chose to avoid farming heavy black soils in the Blue Creek area.

We believe we have secured enough temporary storage for the Summer 2014 corn crop. However, with the strong projected growth in our farmed acreage, it has always been part of our business plan that we have our own drying, storage and handling facility (indeed, we plan to have one in both the Cayo and Orange Walk districts). Recent progress on funding for CSA has provided resources for planning work (albeit not purchasing) in this key area, and several contacts have been made in the USA with leading equipment suppliers, notably Brock, GSI, Sukup and Superior. A “grain facility tour” is being planned for key BSA personnel as well as preliminary design and planning meetings with suppliers, who seem generally ready to provide up front design and planning services at little or no cost. This tour should help us better determine our needs, narrow our choice of manufacturer and generally help us in planning to move forward. So far we have been particularly impressed by Superior, the smallest of the suppliers, who seem particularly eager to accommodate our requests for information and details. We will share progress on this important project as it develops.

Thanks!

John Peters

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Grower	Location	Field #	Acres	Irr?	Soil Type	Crop	Seed Variety (count/acre)	Plant Date	Stand Date	Fertilizer Program	Comments
BSA / Marlon & Team	Hillbank	?	120	N	Red	Corn	Syngenta Impacto			TBA	Waiting finalization of HAC agreement
BSA / Marlon & Team	Hillbank	?	530	N	Red	Soy Beans	Huasteca 400 430 acres 3296 100 acres			TBA	Waiting finalization of HAC agreement
Thiessen Brothers	SC	T1	131	80 Y 51 N	Black-red loam	Corn	Dekalb 7088 131 acres (30,000)	June 6-7	June 9-10	14-36-12 150lb 18-46-0 50lb	Reviewing germination
Thiessen Brothers	SC	T2	139	80 Y 59 N	Black-red loam	Corn	Pioneer 4226 139 acres (30,000)	May 29	June 1	14-36-12 150lb 18-46-0 50lb	Reviewing Germination results Germination good Vigor good
Thiessen Brothers	SC	Trial TB-1	51	36 Y 15 N	Red	Corn	Syngenta Impacto 26 acres (30,000) 25 acres (35,000)	May 28	May 31	14-36-12 150lb 18-46-0 50lb	Reviewing Germination results Germination good Vigor good
Thiessen Brothers	SC	Trial TB-2	52	36 Y 16 N	Red	Corn	Dekalb 7088 26 acres (30,000) 26 acres (35,000)	May 28	May 31	14-36-12 150lb 18-46-0 50lb	Reviewing Germination results Germination good Vigor good
Thiessen Brothers / Marlon Dyck Trial	SC	Trial MD-1	131	71 Y 60 N	Red	Corn	Syngenta Impacto 30.5 acres (30,000) 30.5 acres (35,000) Dekalb 7088 35 acres (30,000) 35 acres (35,000)	June 7-8	June 10-11	14-36-12 150lb + liquid AlgaEnzims 1L/ac AlZinc .5L/ac Complex NPK 10L/ac Complex NS+P 10L/ac SinerFos 6L/ac	Trial Plot managed by Marlon Dyck Reviewing Germination results

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										SinerPotasio 8L/ac SinerPlus 1L/ac	
Thiessen Brothers	SC	Trial Castings	8	N	Red	Corn	Syngenta Impacto (35,000)	June 6	June 8	14-36-12 150lb + liquid AlgaEnzims 1L/ac AlZinc .5L/ac Complex NPK 10L/ac Complex NS+P 10L/ac SinerFos 6L/ac SinerPotasio 8L/ac SinerPlus 1L/ac	Black Casting Trial Plot managed by Marlon Dyck Reviewing Germination Germination Good Vigor Good
BSA / Marlon & Team	Blue Creek	?	80	N	Sandy loam	Corn?	(seeds/acre)			TBA	Waiting finalization of HAC agreement
TBA	Blue Creek	?	200	N	Sandy Loam	Soybeans Milo?	(seeds/acre)			TBA	Waiting finalization of HAC agreement
Marlon Dyck	Rio Bravo	210-212 220-226 231-237	420	Y	Heavy Black	Rice	Cheniere (local supplied)	March 12-13	Vigor issues	Base liquid fertilizers 40-0-0-6s 81lb 10-36-10-6.8s-9zn 68lb 40-0-0-6s 75lb 10-36-10-6.8s-9zn 75lb 40-0-0-6s 100lb 10-40-5-7s-7zn 30lb	210-220-230 planted Significant Issues due to bad seed 210 Series now much improved 220-230 Very Promising
Jacob S Neufeld	Rio Bravo	110-114 121-123	230	Y	Heavy Black	Rice	Cheniere	March 5-7		15-15-15 65lb 12-24-12 65lb 40-0-0-6s	236 acres planted Some algae in 110s, one field, 122, suffered from poor seed, replanted. 121-122 now looking very good Yield potential very good

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										50lb 13-11-21-2s 30lb 40-0-0-6s 50lb 46-0-0 50lb 19-4-19+mg 30lb 40-0-0-6s 50lb 46-0-0 50lb 13-11-2 30lb 40-0-0-6s 75lb	
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