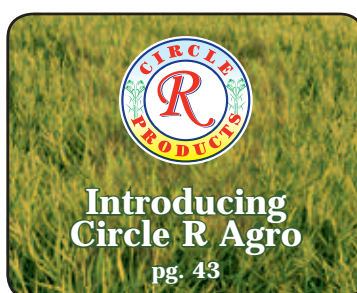


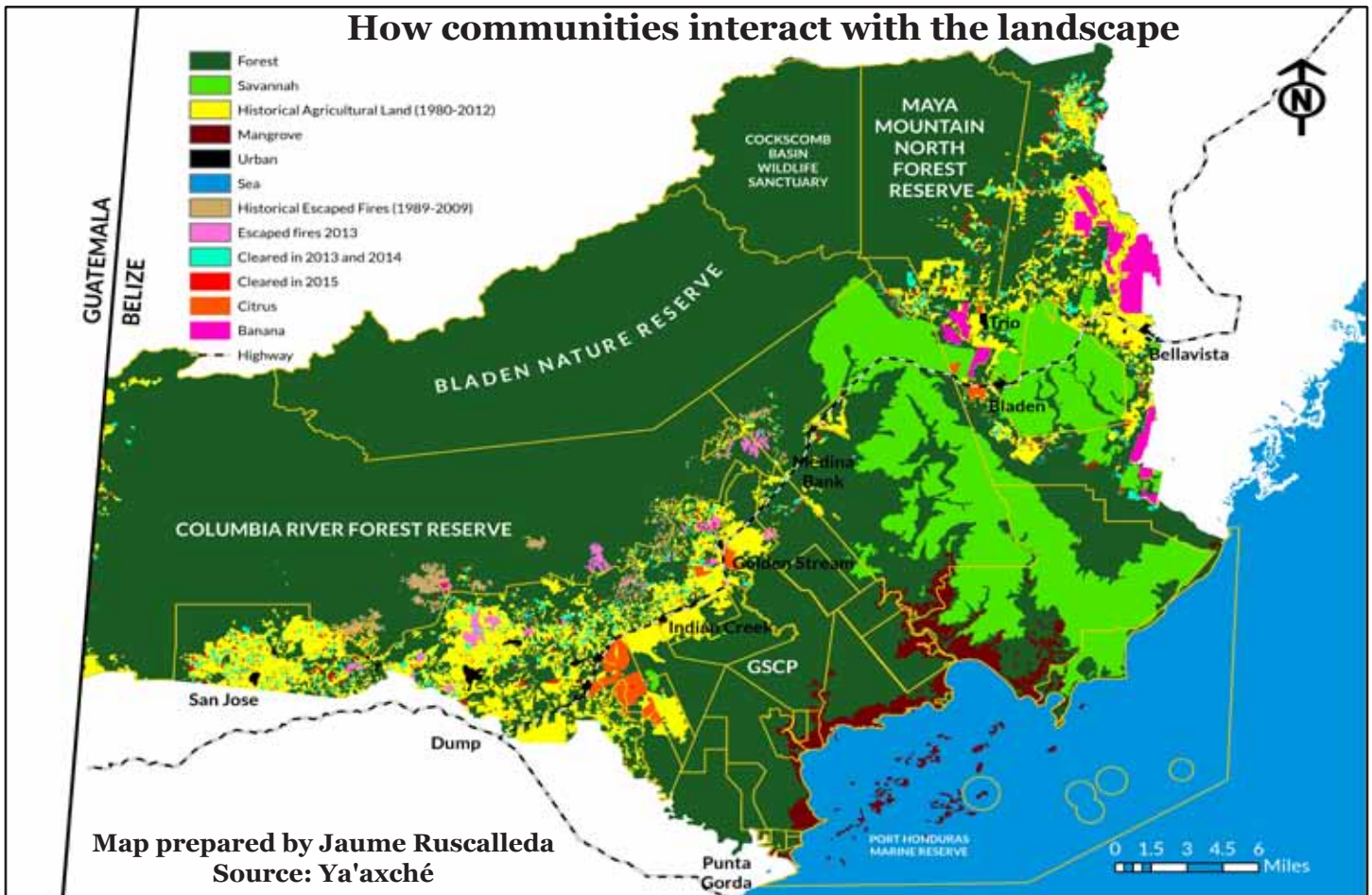
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# Deforestation in Belize: Why Does the Agriculture Sector Need Standing Forests?

By Jaime Ruscalleda

Belize has lost more than 770,000 acres of forest since 1980, which is almost equivalent to the area of the entire Belize District. According to a report published by CATHALAC (Spanish acronym for Humid Tropics Water Centre for Latin America and the Caribbean, based in Panama), between 1980 and 2010 approximately 25,000 acres (more than 7 times the area of Belize City) of forests were cleared every year in Belize. According to another study produced in 2013 by Belizean expert, Emil Cherrington, 33,000 acres of forest were lost in the Jewel, and in 2014 that number rose to 36,000 acres, which shows an increase in the deforestation rate. That trend has continued during the last 2 years. CATHALAC and University of Belize Environmental Research Institute (ERI) used data models, based on past trends, to predict forest cover toward the year 2100. The authors ran the model under different scenarios that ranged from the current deforestation rate being halved to the deforestation rate being doubled. According to the data in the study, in the period from 1980 to 2010, the average deforestation rate was 0.6% per year. Data collected since 2010 indicates that the deforestation rate has increased to close to 1% per year. The scenario in which the deforestation rate is doubled is the closest to reality right now. Under this scenario, the forest cover in Belize by the year 2100 will be reduced to just over 26% (figure 1), compared to 74% in 1980 (figure 2).



Agricultural development is the main driving factor of deforestation in Belize; so it is reasonable to predict that this reduction in forests would correspond to an extraordinary growth of the agricultural sector from now until the end of this century. **But what consequences could forest loss of this extent have for the agricultural sector in Belize and for Belizean people in general?**

Forests are our main source of fresh water. They are a sponge that soaks up water into soils and aquifers during the wet season, and then slowly releases that water during the dry season. If we don't have forests, water runs off the land without soaking in, and we have already seen in neighboring Peten, where increased frequency of drying rivers and ground water levels

dropping beneath well depth are taking place. Consequently, having healthy, large blocks of standing forests distributed in all 35 of Belize's watersheds is absolutely critical for the future of the agricultural industry. The forest is Belize's water factory; it provides this essential economic foundation for free. But, like any factory, it needs reinvestment and maintenance or it will cease to function.

Beyond providing the water to feed and nurture our agricultural products, forests also provide flood risk prevention for both rural farmlands and urban areas. They do this very simply, by slowing down water flow during intense and prolonged rain periods. This slowing protects the topsoil, preventing runoff and erosion, and helps retain valuable nutrients for productive soils.

We cannot ignore the advice of the world's climate scientists: forests are one of our greatest weapons against climate change. **We have to stop considering forests as "unused land";** forests can help us adapt by regulating local weather conditions and by mitigating flooding and extended drought periods, which are predicted to increase in frequency for this region of the world. There is ongoing work in southern Belize to heed the advice. At Ya'axché Conservation Trust we work with small scale farmers to promote agricultural techniques that conserve soils, enabling farmers to stay in the same plot rather than exhaust the soil and move to another one. These techniques include Inga alley cropping (with *Inga edulis*, *I. oestadiana* and *I. feuillei*) which increases production of corn, beans and pineapple, and also cacao and coffee based agro-forestry (in combination with fruit and timber species). This will make agricultural areas more resilient to the effects of climate change, ensuring food security for farming families. At the same time, we use satellite images to monitor land use change within our area of work (a portion of the Toledo district) to see how communities interact with the landscape (see map 1, pg 2).

Belizeans in general, and the agriculture sector in particular, have a vested interest in the conservation of forests in Belize. This calls for a change in the approach that the agriculture sector has had in the last 40 years, and it includes small scale farmers but specifically large scale producers, who are the biggest consumers of water supplied by forests and also the major contributors to deforestation in Belize. Whilst the sector needs to grow to provide for the expanding population, it needs to make sure that this growth is not at the expense of forested areas. Every agriculture producer can seek to improve practices, intensifying existing production rather than clearing valuable forest for low productivity techniques. Certification programs for sugar cane, shrimp, banana and cacao are helping farmers to make this change, whilst improving the prices for their products. There is advice available to help make changes towards better

*Continued on page 21*



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# TO THE EDITOR

January 2016

Dear Editor,

We felt to express our deep appreciation that Belize has not been accepting genetically modified (GMO) crops into the country. We understand that through modern biotechnology, genetically modified organisms (GMOs) are being created that may use animal, virus, or bacteria genes to alter DNA or genetic material in vegetables and other things. These alterations are impossible to achieve from natural pollination or crop breeding, and must be produced in sophisticated genetic laboratories. The resulting "organisms" are then patentable property of the large corporations creating them. Someone has coined a thought provoking an alternative term for GMO: "God move over". In other words, do humans consider themselves wiser than our all-wise omnipotent Creator? Are human beings better able and wiser to design or alter the very blueprint of life that God placed inside each seed and organism? The bible says that God created trees, grasses, vegetables and other forms of life, each "after its own kind... yielding seed after their own kind... and (God) saw that it was good" (Genesis 1: 12-25). We suspect that with time it will prove out that humanity will bring upon itself more problems, rather than less, by meddling with the DNA blueprints God himself designed and called good. Jesus once illustrated that a father whose child asks for an egg or a fish, would not harmfully give the child a scorpion or a serpent (Luke 11: 11-12). Today, children asking for food from a society that mingles genetics may no longer be certain what they are receiving. That which appears like a wholesome egg or fish, may turn out to be a proverbial (or even part of an actual) harmful scorpion or serpent.

There are a number of concerns regarding GMO products.

- 1.) Being under patent, these seeds may be planted only by purchasing them, without saving seed, each season from the companies holding the patent.
- 2.) GMOs can cross-pollinate and change the God-designed genetics of someone else's crops who wishes to keep them from GMO. For instance, GMO corn several miles upwind from an open-pollinated corn may pollinate it so the succeeding seeds are GMO corn. Such cross-contamination would be extremely regrettable.
- 3.) There are concerns that rights to save one's own seeds can be taken away when cross-pollinated by neighboring GMO crops, even in cases when this doesn't happen willfully. Losing the right to save one's own seeds and the difficulty to keep them uncontaminated would seemingly be a poor trade off for the claims of improved proteins, yields, etc., without even mentioning what unknown harm time may prove for these modern innovations. We should not do as Esau, "for one morsel of (food) sold his birthright" (Hebrews 12: 16).

Thanks to the Department of Agriculture and Central Farm, some excellent GMO-free corn varieties have been developed that "bear seed after their own kind" like God made them. More improvements seem possible through using traditional plant breeding efforts. The greatest concern for all of us, for all of humanity, should be that we do not rob God of the glory due to his wonderful name.

The Springfield community will be very appreciative to Belize and grateful to God to see this country remain free from GMO.

Signed,

The Springfield Community Produce Growers

Dear Beth,

Thanks for publishing interesting articles, such as the green banana and many more....

We all enjoy making and trying new recipes. Here we are sending a cake recipe which we all like very much. We want to try more of the green banana recipes.

This flour is a good substitute for cakes and cookies for people who can't handle or tolerate wheat.

We've been using cassava flour for years and now we are thankful to have another flour added.

Thanks again.

Mrs. Wollie (Mary) Miller

Birdwalk Community



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**The Belize Ag Report**, P.O. Box 150, San Ignacio, Cayo District, Belize, Central America  
Telephone: 663-6777 (*please, no text, no voicemail*)  
Editors: Beth Roberson and Dottie Feucht  
Associate: Sally Thackery  
Publisher: Beth Roberson  
Printed by BRC Printing, Benque Viejo, Cayo District, Belize  
**Submissions as follows:**  
Letters to the Editor, Ads & Articles to:  
[belizeagreport@gmail.com](mailto:belizeagreport@gmail.com)  
Deadlines for submissions: 1st of the month prior to publication. 4 Issues per year

## Mission Statement:

*The Belize Ag Report is an independent quarterly agriculture newsletter. Our purpose is to collect, edit and disseminate information useful to the Belizean producer, large or small. We invite opinions on issues, which are not necessarily our own. Belize Ag neither solicits nor accepts political ads.*



## Green Banana Recipe Winners!



In our February Belize Ag Report (issue #31), writer Harold Vernon challenged readers to enter original recipes using green bananas in a contest. Harold's plea for Belizeans to eat this very neglected, nutritious, tasty and cheap starch source stimulated some excellent recipe entries. Below find the winning recipes. More recipes are included in our online version.

The contest winners for the most original and best tasting recipes are Miss Paige Dietrich of Unitedville, Cayo District, and Mrs. Deborah Harder of Upper Barton Creek, Cayo District, Youth and Adult categories, respectively. Each receives a \$50.00 prize.

Thank you, Sally Thackery, Belize Ag Test Kitchen Supervisor and kudos to Harold Vernon for your instigation and prize donation. Thank you also to those contributing recipes. The Belize Ag Report will appreciate readers' suggestions for future recipe contests.

### Green Banana Pockets By Paige Dietrich

#### For the tortilla:

- 3 cups whole wheat or white flour
- Big pinch baking soda
- 1 teaspoon salt
- 2 tablespoons coconut oil
- 1 1/2 cups water

- Mix the flour, baking soda and salt together on a tortilla board. Pour coconut oil and water into the middle of the dry ingredients.
- Mix with your hands until slightly sticky dough is formed. (Add more flour as necessary as you knead.)
- Knead dough for about 2-4 minutes, or until mixed completely
- Roll into a long "snake" (about 18" long) and cut into 10-11 pieces. Oil them and roll into smooth balls.
- Cover and let rise for 35-45 minutes.
- Press into 4 1/2 " x 4 1/2 " tortillas and set aside.

#### For the filling:

- 6 unripe, unpeeled apple bananas
- 5 cloves garlic
- 2 small onions
- 1/2 teaspoon grated ginger
- 1/2 teaspoon salt
- 1 teaspoon black pepper
- Enough oil to deep fry

- Grate the green apple bananas and put into a slightly oiled fry pan.
- Dice onions into small pieces and add to pan, along with the minced garlic and ginger.
- Sauté until bananas have lost starch, stirring until completely mixed.
- Spoon 1 tablespoon of the filling onto half of the tortilla, leaving 1/2" space around the edge. Fold over the filling and press the round side until it is firmly closed.
- Fill a pan with enough oil to deep fry and drop in 1 or 2 "pockets" when the oil is hot enough to fry. Cook until brown and crusty. Repeat with the rest and put aside to cool.
- EAT!!

*Continued on page 30*

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# Restoration of the San Ignacio Town Clock

By Dr. Greg Shropshire



Working on various community projects focused on refurbishing the San Ignacio Police Station in 2014, I became curious as to why the San Ignacio Town Clock wasn't working. I recalled that when I emigrated to San Ignacio in 1982 that it did work. I began to ask citizens why the clock wasn't working. Many said they didn't know or cited its age as the probable cause. Unsatisfied and more curious than ever, I finally got some information from "Jr" Simmons, owner of the venerable Hy-Et Hotel, on the corner of West Street and Bullet Tree Road. He said that the clock and four or five others just like it were gifts from Great Britain to the soldiers of British Honduras, in the late 1940's, to honor our men who served during World War II. Mr. Simmons said the clock tower was built and the clock was installed by 1950; the former San Ignacio Postmaster, Emilio Zetina, served as keeper of the clock for many, many years until he retired, when the keeping of the clock became the responsibility of the San Ignacio Town Board.

By Spring of 2015 the other projects undertaken by the People's Coalition of Cayo (PCC) with assistance of the US Embassy, (Police Station floor tile repair and replacement, entry and parking lot lights, and emergency backup generator), were completed. I began trying to find who had the keys to the clock tower door lock, only to find that they had been given to a town board worker who had had a bad accident and couldn't be reached. Mayor Earl Trapp gave me permission to drill the lock and replace it, which I did. I found an amazing three story counterweight pendulum clock with two main windlass wind up crank stations. Needing advice and guidance before attempting anything with the mechanism, I approached Errol, the watch repair man in Santa Elena; he declined to assist because the three flights of ladders to climb inside the clock tower were too much for his rheumatism. Next I contacted Omar Tut, Civil Engineer, of Maya Engineering and together we explored the mechanism to find it in working order except for some wood debris fallen into it from the bell tower frame and louvers which were in need of replacement and painting. The steel cable to the bell strike was also rusted through at the cable clamps and needing repair.

We determined that the mechanism of the clock should be preserved with a good coat of heavy grease so after the debris was removed and the bell cable reattached, the clock was wound and the pendulum set in motion. The clock worked for a short while but stopped. More analysis was needed.

Roofers began replacing the San Ignacio treasury, courthouse and bell tower roof zinc so the "Town Clock Project" came to a halt from April 2015 to Feb. 2016. During this interlude Omar Tut realized that the minute hand on the north was jammed into the face of the clock ring itself, thus stopping the mechanism. In Feb. 2016 Omar borrowed a thirty-foot ladder, scaled the north side of the tower and successfully pried the minute hand away from the clock face's outer metal ring. That was it! The clock worked!

My workman will wind and maintain the clock once a week.

So my brothers and sisters, "Ask not for whom the bell tolls; it tolls for all a we". I hope the clock will serve, as was intended, as a source of pride for the community.

I am now curious, especially given the heartiness of the clock mechanism, how many of the originally donated clocks are in good condition and with some loving care could work and be an item of pride once again for their communities. Rumors have it that there are sister clocks on Barracks Road in Belize City, Dangriga, OrangeWalk, Corozal and perhaps Punta Gorda.

Find out and contact drgregdn@gmail.com

**Pictures courtesy Rissy Guggenheim**



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Sugar Industry Management Information System

## Update on the Sugar Industry Management Information System (SIMIS)

By Gregorio Canto

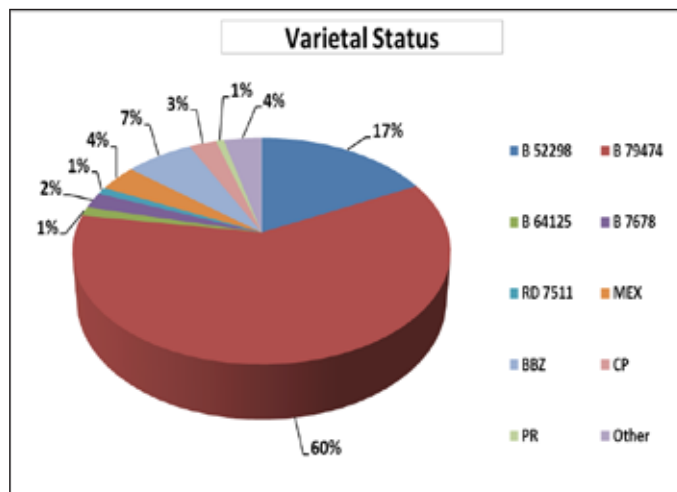
In March 2016 a total of 74,258.87 acres of sugar cane fields under production have been verified in the northern sugar belt of Belize. From data collected it has been analyzed that cane variety B79474 remains the most dominant variety accounting for 60% of total area under production. This is followed by B52298 representing 17% and Belize Barbados varieties (9 BBZ varieties) account for 4% of total area verified. All other varieties are reported as small quantities and available in more detail on the SIMIS database and represented on the pie chart.

Another valuable item of information collected was the spatial distribution of sugar cane fields regarding the actual size of each parcel. Data shows that small parcels between 0.1 to less than 5 acres represent 37,589.85 acres (51%) of sugar cane under production; 5 to less than 10 acres represents 23,543.76 acres (32%); 10 to less than 15 acres represent 7,467.74 acres (10%) and other areas 15 acres and greater represent 5,657.51 acres (7%) under production. This information indicates that the majority of farmers plant in smaller parcels as opposed to doing block farming. This is also due to the fact that farmers carry out traditional methods of harvesting; mechanization is not used by farmers. On the other hand ASR/BSI uses mechanical harvesters and is the cane producer with larger parcels. As case studies have shown, use of a mechanical harvester increases efficiency but the parcels need to be in large blocks. This data will be used by industry stakeholders to make better decisions regarding increasing efficiency of harvesting and delivery.

Also collected was crop class, categorized as Plant Cane (recently planted but not harvested) and Ratoon Cane (cane already harvested once or more). Plant Cane accounts for 9,208.06 acres and Ratoon Cane accounts for 61,791.16 acres verified. This shows that the majority of sugar cane under production is Ratoon Cane and productivity varies depending on the soil type, outbreak of pests and other environmental factors such as drought and excessive rain fall. SIRD has been engaged in a farmer field school that builds the technical capacity of farmers on best practices of sugar cane husbandry for both Plant Cane and Ratoon Cane. The detailed SIMIS database also shows that more than half of Ratoon Cane verified is older than 8 years which is the threshold established to replant sugar cane. This data is very useful in monitoring the productivity levels of each field as it provides data on the need to re-plant sugar cane fields and can also be used to determine economic thresholds for sugar cane production.

Data collection has been completed; a lot of significant data has been obtained. SIRD as the technical arm of the sugar industry in Belize is in charge of doing scientific research, providing reports and recommendations to its stakeholders to increase productivity etc. SIRD is also engaged in its fertilizer trials, clean seed program and demonstration plots to show farmers and other stakeholders the importance of best practices in sugar cane husbandry to obtain better yields. SIMIS is providing the tool for stakeholders to make

better decisions in sugar cane production by providing both quantitative and qualitative data to its stakeholders.



Acreage distribution	Field count	Sum of ACREAGE	Percentage
0-5	15,457	37,589.85	51%
5-10	3,540	23,543.76	32%
10-15	623	7,467.74	10%
15-20	193	3,296.59	4%
20-25	53	1,175.40	2%
25-30	18	481.58	0.5%
30-35	13	428.82	0.5%
35-40	5	187.86	0%
40-45	2	87.27	0%
Grand Total	19,904	74,258.87	100%

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## Importance of Biological Control and its Role in Managing Huanglongbing (HLB) in Belize

**Contributors: Ing. Helen Theresa Choco, Manuel Garcia, Veronica Manzanero-Majil**



The presence of the Asian Citrus Psyllid (ACP), a tiny insect about 4 mm in size (figure 1) was first detected in Belize in 2005. Later, in 2009, the presence of Huanglongbing (HLB) (formerly citrus greening) was confirmed in Belize. ACP is the most efficient vector responsible for the spread of HLB in the Americas.



**Figure 1: Adult Asian citrus psyllid (ACP) and nymphs (Warnert, 2013)**

Considering the potential gravity of HLB based on experiences from other countries, the Citrus Research and Education Institute (CREI), the research arm of the Citrus Growers Association (CGA) in collaboration with the Belize

Agricultural Health Authority (BAHA), the International, Regional Organization of Animal and Plant Health (OIRSA) and other interested parties adopted major parts of the three pronged approach for the management of HLB from China, Brazil and other countries battling the disease. This three-pronged strategy to manage HLB evolved into a four-pronged approach in 2013 with the interventions of a technical cooperation program funded by the Food and Agricultural Organization (FAO) of the United Nations. Through this assistance from FAO, the use of a biological control program to manage the ACP vector of HLB was integrated into the four-pronged approach to manage the disease.

The four components of the management strategy for HLB are to (1) remove infected trees in groves with low incidence of HLB, (2) suppress ACP population using chemical and biological control methods in citrus groves and biological control exclusively for backyard trees, (3) use certified citrus plants for starting new plants or for replanting, and (4) use a robust fertilizer management programme and improve control of other pests (especially *Phytophthora*, *Leprosis*, and greasy spot) in the groves and backyard citrus trees.

Now let's take a look at what biological control really is! Biological control is the beneficial action of parasites, pathogens and predators in managing pests and their damage. This group is the primary group used in biological control of insects. Bio-control provided by these living organisms, collectively called "natural enemies", is especially important for reducing the numbers of pest insects (Dreistadt, 2014). Most parasites, pathogens and many predators are highly specialized and attack a limited number of closely related pest species (Dreistadt, 2014). In the case of HLB management, a tiny wasp called *Tamarixia radiata* is the natural enemy of ACP. This wasp is present in Belize.

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According to Dresitadt (2014) types of natural enemies include:

- Parasites: organisms that live and feed or develop in or on the host's body. Adult females such as wasps feed on and kill their hosts but often only the immature stage of the parasite feeds on the host. NOTE: Although the term "parasite" is used in bio-control, true parasites do not typically kill their hosts. Species useful in bio-control kill their hosts; they are more precisely called "parasitoids".
- Pathogens: microorganisms including certain bacteria, fungi, nematodes, protozoa and viruses that can affect and kill the host.
- Predators: insects that kill and feed on several/many individual prey during their lifetime. Predatory lacewings and wasps feed on various pest insects or mites.

At CREI, the biological control program aims at mass producing parasitoids and entomopathogens to combat the ACP vector of HLB, particularly in backyard citrus and unmanaged citrus groves. Currently, the two major components under the biological control program are (1) mass production of the parasitoid *T. radiata* and (2) the collection and culturing of entomopathogens such as *Hirsutella citrififormis* and species of the *Isaria* and *Bovaria* genus.

### Mass Production of the Parasitoid *Tamarixia Radiata*

In October 2013, the Belize CGA, in collaboration with the FAO, established facilities at the CGA's compound to start the rearing of the parasitoid *Tamarixia radiata* (figure 2). The program entails the mass production of the *Tamarixia* wasp on its host, the ACP reared on *Murraya paniculata* (orange jasmine). After an adult female *Tamarixia* wasp mates with an adult male and becomes fertile, it deposits an egg in the lower abdomen of the fourth and fifth instars (developmental/ juvenile stages) of the ACP nymph. The nymph is killed as the wasp develops inside and then exits by making a hole on the top area of its thorax. The adult *Tamarixia* wasp also feeds on the first to the third instar stages of the ACP. A single female *Tamarixia* wasp can kill up to 500 psyllids in its life span. Currently, CREI has a clean collection of orange jasmine plants and an HLB-free colony of psyllids. Work is now underway to scale up the production of *Tamarixia* wasp at CREI's facilities. Figure 3 shows the rearing facilities for *T. radiata* at CREI donated by FAO.



**Figure 2: Adult *Tamarixia radiata* female (above) and male (below) . (CREI/CGA, 2014)**

### Entomopathogen Collection and Production

The collection and production of entomopathogens aims at determining the different pathogenic fungi that attack and kill ACP in various areas of Belize. The fungi that are identified to cause the highest mortality rate of ACP are selected and cultured in large scale in the laboratory for application by means of spraying in backyard citrus trees and unmanaged and abandoned citrus groves to control ACP populations.

Psyllid cadavers (dead psyllids killed by pathogenic fungi) are collected from groves and brought to the laboratory for

identification of the fungal pathogen (figure 4). Fungal spores from the psyllid cadavers are isolated with the use of a microscope and cultured in special media conducive to growth of fungal pathogens. Upon obtaining a clean fungal culture, scale-up culturing is done using a rice medium. When sufficient spores are obtained, they are collected and released onto backyard trees and groves by means of sprays. If mortality is observed within five to seven days after the application is made, the fungal pathogen is considered to be effective in controlling ACP. Currently, CREI is conducting laboratory trials with two fungal pathogens already identified in Belize and confirmed to kill ACP, the *Hirsutella citrififormis* and the *Isaria fumosarosea*.



**Figure 4: *Hirsutella citrififormis* on ACP cadaver (CREI/CGA, 2010)**

Biological control of ACP using *Tamarixia radiata* to suppress ACP in Belize is a complement to the already existing ACP control program using insecticides, a component of the four-pronged approach to HLB management. While the use of *Tamarixia radiata* is a more environmentally friendly approach to controlling the ACP, experiences from other countries that use biological control on its own in citrus groves have shown that this practice is not sufficient to fully suppress ACP population to a level required to successfully manage HLB. The *Tamarixia* wasp population will always lag behind the ACP population because in nature the wasp has to ensure its survival and thus will seldom eat out all its food. One exception to this example occurred in the Reunion Island as reported by Etienne & Aubert, 1980 whereby conditions on the island and in the grove were more controlled.

Contributors: Ing. Helen Theresa Choco, Manuel Garcia, Veronica Manzanero-Majil



**Figure 3. Facilities donated by FAO for rearing *T. radiata* at CREI. (CREI/CGA 2014)**

### References

- Etienne J., Aubert B., 1980. Biological control of psyllid vectors of greening disease on Reunion Island. Proceeding of 8<sup>th</sup> Conference IOCV, IOCV, Riverside 1980, 118-121.
- Dresitadt, S.H. Biological Control of Natural Enemies. 2015. University of California Statewide IPM Program. Agriculture and Natural Resource. University of California. Publication 74140  
<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74140.html>
- Hoy,M. Nguyen,R. Jeyaprakash,A. 2006. Classical Biological Control of Asian Citrus Psyllid in Florida. University of Florida. IFAS Extension. Integrated Pest Management Florida. Gainesville, FL.  
[http://ipm.ifas.ufl.edu/Agricultural\\_IPM/psyllid.shtml](http://ipm.ifas.ufl.edu/Agricultural_IPM/psyllid.shtml)
- Warnert, J. E. 2013. Newly Found Asian Citrus Psyllids Prompt Quick Action in Tulare. ANR News Releases. Published August 2, 2013. Division of Agriculture and Natural resources. University of California.  
<http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=11039>

# BEYOND THE BACKYARD

## Sweet and Sour Dreams

By Jenny Wildman



March 2015 ( not April Fools day) we are reading in the news that a thousand year old Anglo Saxon recipe found in the British Library that is actually ninety percent effective in the eradication of the superbug MRSA (Methicillin Resistant Staphylococcus Aureus). Following the directions to the letter, scientists concocted a stew of onions, leaks, and garlic, stewed in vintage wine and cows' bile in a brass vessel for nine days to an amazing success. It may appear to be improbable that, after all, this time we are finding simple ingredients have the power to cure devastating diseases, but perhaps we need to pay more attention.

For centuries folk healers around the world have claimed that God created plants to resemble body parts as a clue to what they cure. This is the Doctrine of Signatures written and found recorded in ancient manuscripts created by the wise. The great historian, ethnologist and naturalist, Gonzalo Fernandez de Oviedo y Valdes, created fifty volumes of detailed descriptions of the flora and fauna in the *General and Natural History of the West Indies*. This became the first catalog of its kind drawn from his extensive first-hand experience. Oviedo is credited as bringing back the first documented information on soursop, and the word traveled with Spanish explorers although it was not widely used or cultivated until 1879. Oviedo returned home to Spain with recipes from the native Taino people including the cooking methods of the barbacoa a.k.a. bbq, smoking tobacco and the benefits of the hammock on board ship.

In 1523 he was commissioned by Spain as the historian of the Indies and was part of the colonization of the Caribbean. Imagine how the strange world with its odd exotic fruits and brilliant flowers must have first appeared: jackfruit, durian, custard apple, breadfruit, cacao, soursop and bananas - all so weird and wonderful. Learning their uses, limitations and culinary secrets was to prove very profitable for Europe. This was the beginning of the very lucrative spice age.

Fast forward to 2016: I am in my garden looking at this large prickly lopsided heart and wondering what message is encased within. After being picked, the large green fruit takes five more days to ripen to a pale yellowish green and opens to a reveal delicious sweet/sour white fruit with an abundance of jet black seeds housed in juicy segments. Perhaps the seeds and segments resemble cells. The fruit is grown commercially for the making of ice cream, sorbet and juices but it is also used as a vegetable in Asia. Food value? Rich in carbohydrates, vitamins C, B1, B2, phosphorus and potassium. However when one googles the soursop (Annona muricata), promoted as Graviola, one finds that it is the leaves that gain all the notoriety and also the controversy. They are used as a supposedly affective treatment for certain cancers to inhibit the growth of cancer cells, is antibacterial, anti inflammatory and can help maintain a healthy body. There are as many warnings as there are glowing endorsements so one might be at a loss as to what to believe. Millions of dollars are spent on chemotherapy and pharmaceuticals each year but the humble soursop leaf, so easy to grow, seems to often be only addressed as a last chance alternative. Listen to all the disclaimers and

even recalls for what certain drugs can cause and you may be less inclined to be frightened of a few leaves. In general, boil 15 washed older green soursop leaves and one small stem in a liter of water for 30 minutes, simmer, then leave to steep. Drink 2 cups a day hot or cold half an hour before food. Add honey and mint leaves for added enjoyment. Very refreshing.

Soursop has been used to ensure a good night's sleep just by placing a few aromatic leaves under the pillow. To further induce its soporific and sudorific effect the leaves can be infused to make tea which has a really pleasing taste. This tea is also particularly good for those suffering from gout. Leaves can be added to bath water to reduce fever and promote healing. Older leaves can be mashed for eczema, skin eruptions and aching joints and younger leaves for ulcers.

Not long ago soursop leaves were selling 10 leaves for US\$8; now they cost about US\$ 30 for 500 leaves (US\$.60 for 10 leaves). Other names for soursop are guyabano, guanabana, and corossol.

Now here is a surprising detail: the mashed seeds are an effective pesticide against head lice and bedbugs and the acid flesh can draw out chiggers. So I would recommend keeping the seed out of your smoothy. The bark of the tree can be used as animal poison and the wood contains enough cellulose to make paper.

Soursop is a fast grower from seed bearing fruit in about 3-5 years. The tree can grow to 30 feet but can be topped at six feet for easy harvesting.

For all the "magical" benefits of soursop, the one I prescribe is two scoops in a sugar cone on a hot day.

Good luck and send any information you would like to share to

[jenniferjanewildman@gmail.com](mailto:jenniferjanewildman@gmail.com)

*Pictures courtesy Xen Wildman*



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## Introduction of the African Bee to South America and Belize

### By Montse Casademunt

The African honeybee (*Apis mellifera adansonii*) is a native of Africa, occupying roughly ¾ of the continent, from the Sahara Desert in the north to the Kalahari Desert in the south.

In 1957, 26 swarms of African bees, held for scientific breeding studies in a apiary near Rio Claro, Brazil, escaped, starting the "Africanization" of bees and establishing themselves as feral swarms occupying now the whole of South America (except what seems



to be their climatic limits south of 32° S. on Northern Argentina), Central America, Mexico and the states of Texas, California, New Mexico and Florida and parts of the Caribbean.

The African bee has the same number of chromosomes (16 in drones and 32 for the queen) as the Italian or European races but their development from egg to insect is slightly shorter. They also start working in the collection of nectar and pollen before the European bees. The life of the adult Africanized honeybee is a little shorter than the European races, but they start working in the field earlier and work more hours per day, which makes them more productive. Africanized bees are very aggressive. They usually attack in great numbers once they have been disturbed. Some families are more aggressive than others. Africanized bees pursue their victims for longer distances. They have the tendency to rob. Therefore, the inspection of the hive, feeding, introduction of queens, etc. have to be done at the right time and with great care.

The queen is exceptionally prolific and very constant with her egg-laying even during times of dearth. Bees consume more reserves during the dearth period due to the constant egg-laying of the queen. Prolific egg-laying by the queen may be one of the reasons they abscond (abandon the hive) so frequently. Absconding is very rare in European races. Absconding is also a response to poor climatic and resource conditions. Rather than dwindle and starve, as often happens in European races, Africanized bees abscond in an effort to move to a better location. Other reasons for absconding are lack of water, crowded condition of the hive, attack by predators and even rough handling by the beekeeper. Multiple swarms with several queens move together. Swarming by Africanized bees is very common, averaging 3.2 per colony.

**Climatic adaptations:** Africanized bees adapt extremely well to almost any climatic condition. In the tropics they can build nests in the open, and they occupy crack and crevices in trees and on wall rocks, empty boxes, hive bodies, and other places.

Their natural habitat in Africa ranges from rain forests with an annual rainfall of 197 inches to desert areas with as little as 4 inches per year, but it is in the semi-arid regions where they attain their maximum population densities. All the areas that

have received mass invasions receive less than 80 inches of rain (see Belize rainfall map) and usually between 40 and 60 inches. In areas where the rainfall is high, the initial invasion population attains the maximum density that can be sustained in the new environment.

European races do not survive in the wild for long periods of time as they are unable to deal with the tropical conditions. On the contrary, the success of feral Africanized swarms established in the forest means that even if a certain degree of hybridization occurs, they retain the traits that allow them to be successful under conditions where European bees usually fail. This suggests that selection for many of the African traits may be intensive, making possible the fact that Africanized bees reaching us might be genetically very similar to the African stocks which escaped from Rio Claro, Brazil, 59 years ago.

The average rate of spread between 1957 and 1963 was approximately 60 miles per year probably due to a lapse of population build-ups since the introduction of *Apis mellifera adansonii* was a small one. By 1962 a large number of swarms were established in the countryside. The most rapid movement was between 1963 and 1966 in which the front advanced 330 miles. We have to note that this advance was made in habitats that were climatically very similar to the natural habitat of the *Apis mellifera adansonii* in East Africa where they are extremely abundant. Increasing rainfall encountered between 1969 and 1976 in the north and increasing cold periods between 1963 and 1975 in the south are associated with slower rates of speed. In the region of the Guyanas the front advanced from 165 to 330 miles from 1974 to 1975 and about 200 miles between 1975 and 1976 in an area with no feral swarms and few managed colonies. The front moving through the rain forests in the Guyanas travelled 200 miles from 1974 to 1977 to Venezuela. A second, faster-moving front entered southeastern Venezuela from Brazil, advancing 300 miles per year.

The African bee was first detected at the Panama-Colombia border in 1980 and has since spread to Panama, Costa Rica and Trinidad & Tobago, only 7.5 miles off the coast from Venezuela. The first swarms in Belize were registered in 1986 in both Blue Creek (O.W. District) and Punta Gorda. Movements of Africanized honeybees into new areas is said to occur by means of large numbers of swarms. Swarms flights, lasting from 45 to 90 minutes and covering 11 to 30 miles are possible. The density of the front varies according to climatic and resource conditions.

*Continued on page 15*

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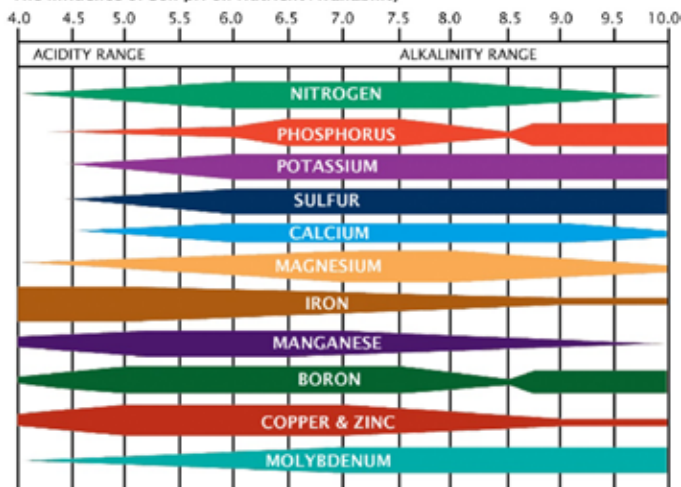
## LOOK OUT FOR OUR BRAND!

## Limbe Lime By Milton Dueck

Back in 1976, citrus farmers in southern Belize were in need of agricultural lime (ag lime or white lime) in order to improve the pH levels in their soils. As a result of numerous tests being done in limestone deposits in the Spanish Lookout area, Mr. Abraham L. Dueck discovered high quality lime that has come to benefit the farming industry tremendously over the years. Forty years later, the company he started is still in business, managed by his son Milton; Limbe delivers its agricultural lime to a host of farmers, including citrus, banana, corn, teak, and many others. It is also widely used in the aquaculture industry.

Agricultural lime, or white lime, is essential to soil because it increases the soil's pH, which results in more nutrients being

The Influence of Soil pH on Nutrient Availability



available to crops. The following chart shows that the most nutrients are available to soil with a pH range between 6.5 and 7.5 although iron is on the low end of the pH value and potassium, sulphur, and molybdenum are readily available to a pH of 10.

Neal Kinsey of Kinsey Agricultural Services, Inc. specializes in analyzing soil samples and making recommendations on what to do to grow the best crops on those soils. After testing soils from over 65 different countries around the world, Neal Kinsey states: "One of the major limiting factors in farming is that of understanding calcium: when it's necessary, how much to use, and what that will do for the crop - not just in terms of yield, although it can make a big difference in yield, but also in terms of nutrient values as well."

Although fertilizers are often marketed as "all you need to have a high quality crop", research is now showing that fertilizers are second to having adequate amounts of calcium and magnesium. Neal Kinsey explains: "Calcium is necessary to get every other nutrient into the plant. If we don't have enough calcium it takes more nitrogen to do the same job, it takes more phosphorous to do the same job, it takes more potassium to do the same job, it takes more of all the trace elements to do the same job. So calcium is the doorman; it's the element that needs to be in the soil to open the door to get all the other elements into the plant. If we don't have enough calcium, it takes more fertilizer to grow the same crop."

As you can see, calcium is vital to have in your soil, so that all other nutrients can be taken up. Additionally, having the right

balance of calcium and magnesium will:


- Cause crops to be much more resistant to all types of diseases.
- Enhance the effectiveness of herbicides.
- Improve water penetration of the soil.
- Promote root development and plant growth.
- Lower toxic levels of aluminum, manganese, and iron.
- Cause citrus to be more resistant to the disease caused by the Asian citrus psyllid and other diseases.
- Ensure your crops have enough calcium and other vitamins in your final product.
- And much more...

Neal Kinsey has also stated: "Limestone is **the most under-valued material** that makes a difference in terms of production for agriculture in the world. Not just under-valued in terms of **price** but also under-valued in terms of **what it will do for you**. Because until you get the calcium right, you **don't** have the potential to get the right yield."

The only way to determine how much lime you need is to do a soil test.\* Unfortunately, every soil is different. To fully know what your soil needs, you need a thorough soil analysis that not only tests for pH but also how much calcium, magnesium, potassium, and sodium is in your soil. All of these affect the pH on your soils. In many cases, the pH level is ok, even though the calcium is deficient; the reason the pH is ok is that the magnesium is too high. In that case, lime that is high in calcium, or calcitic lime, must be applied, since calcium brings the magnesium level down.

Limbe provides a few different types of lime: lime that has a balance of calcium and magnesium, lime that is calcitic, or very


**Continued on Page 13**






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# Understanding *Bacillus Thuringiensis* (Bt)

## By Sam Vigue

"Do you use chemicals on your vegetables?" is a question that the farmer selling directly to the customer is likely to hear. Often the farmer answers, "Only when necessary" or "No, I am organic". For questions like this, it is hard to give an accurate answer because most farmers whether organic or not, use some form of chemicals on their farms. Some farmers that are strictly organic must avoid certain chemicals but are still likely using some "natural" forms that are considered non-toxic.

The scientific definition of a chemical is any basic substance that is used in or produced by a reaction involving changes to atoms or molecules. It is evident then, that chemicals include many things which may be harmful or helpful. Chemicals come in many forms. They can kill instantly, be completely safe - even beneficial to our health, or slowly cause damage to our bodies over the long-term. The inherent properties, method of use, concentration, and other factors determine the effect on the human body whether dangerous or not. For example, vinegar, bleach, sulfuric acid, glyphosate, and cyanide are all chemicals and have very different effects on our body and on living things in the environment. A better question then is for the customer to ask the farmer "What types of chemicals do you use?"

I find it a little alarming that sometimes farmers are not able to specifically answer that question very well in a way that gives the customer an informed understanding of the subject. What is used to grow the food we are eating is important to all of us. It is important for the farmer and the customer to know about types of chemicals used in agriculture so wise decisions can be made about the food we grow and eat.

With that goal in mind, I would like to discuss *Bacillus Thuringiensis* (Bt) which is used in both organic and conventional farming. Bt is actually a specific species of bacteria that is found naturally in the soil. It can be classified as one of a group of substances called biopesticides or biologicals. Biopesticides are certain types of pesticides derived from plants, bacteria, fungi, animals, or certain minerals. The term *biological* means that they are the product of natural chemical synthesis usually coming from a living substance. Because something is classified as a biological in itself doesn't indicate whether it is toxic to the human body; it only indicates that it comes from a naturally occurring source. Certain plants, for example, can contain strong poisons that could kill you very quickly. Therefore, it depends on an analysis of the specific components of the biological to determine its toxic or non-toxic properties.

Based on research up to this point, Bt has been observed to contain components that are non-toxic to the human body when used in sprays because it does not penetrate the cellular wall of the plant cell, but deadly to certain types of insects. This bacteria produces a protein that, when inside the intestines of certain types of caterpillars or worms, forms protein molecules that cause holes to form in the intestinal lining of the insect. The worms then disintegrate from the inside out and are soon shriveled and black in the garden. Bt bacteria is widely accepted as a non-toxic spray and allowed even in some of the strictest organic farms. It is applied as a liquid spray or a dust to the leaves of the plants where the worms are located. Since it contains a living bacteria in the ingredients, the Bt concentrate needs to be kept in a sealed container out of intense heat and light. It is usually able to be found for sale in farm chemical supply stores.

Our discussion of Bt would not be complete without mentioning the topic for which this bacteria is infamously known for. This is the name given to a genetically modified (GM) trait common in certain corn varieties that are widely grown in the United States. Capitalizing on the action of the proteins produced by this Bt bacteria species, scientists found a way to take the DNA in this bacteria cell that is specifically responsible for creating the deadly insect killer molecule and insert that DNA into a cell taken from a corn plant. The cell is then multiplied in a laboratory with the result that after several steps, full size plants are able to be produced. These plants can be grown to produce corn seeds that contain genetic information that automatically produces the same protein originally produced by the Bt bacteria in every cell of the corn plant. The result of this technology has been incredible. Now with every cell of the plant containing protein molecules that are toxic to caterpillars and worms, the two greatest pests of corn, (corn borer and corn earworm) are almost completely controlled without sprays. Now every time the eggs of these pests hatch on the corn plant, the larvae immediately have only a food source that is almost 100% deadly to them. There is however a very small number of these pests that somehow are resistant to the Bt toxin. Because of this, it is a concern that at some point in the future this technology will no longer be effective as an insect control if a population of insects resistant to Bt is eventually able to dominate.

In conclusion, Bt is the name of two things. Both have a deadly effect on the target insect pests. However, the similarities stop there. One is a biopesticide containing a live bacteria used in both organic and conventional agriculture, and the other is a modified genetic trait created within a plant to manufacture certain proteins within the plant. One is sprayed in small quantities on the exterior of the crops and the other is genetically produced within every plant cell. Both are said to be safe for consumption but to date there hasn't been comprehensive research to determine the long-term effects of the bacteria or the specific proteins after they are consumed. Research is needed to determine how these protein molecules are absorbed in the digestive system and the short term and long term effects on the body.

### ***Limbe...Continued from Page 12***

high in calcium and very low in magnesium, and lime that is high in magnesium. Every year we take numerous tests to make sure we provide our customers with the optimum lime for their specific needs to produce the greatest yield and most nutritious crop. Limbe's lime also provides the advantage of long-term/slow release to the soil. It takes from 3 to 4 years until the lime is fully integrated into the soil; therefore, the most benefits of the lime will not be realized until the second or third year of application.

There is an understanding in the farming community in Belize, that fertilizers and lime cannot be applied at the same time. But according to Neil Kinsey, this does not matter with good soil fertility management including a base saturation of calcium and magnesium = 80%. Once you know what nutrients are in your soil, it can be determined what type of lime you need.

Applying the lime is very easy, since Limbe provides spreaders to spread the lime.

Check out our website at [www.limbebz.com](http://www.limbebz.com), where you can see interviews with Mr. Neil Kinsey and our customers and a variety of other information on agricultural lime and its benefits.

\*Soil samples can be sent to the Kinsey Lab via Agro-Base in Spanish Lookout.

## Considering Potassium and Manganese in Soil Fertility for Potatoes

### By Neal Kinsey



Many growers feel that producing good yields of potatoes must involve the application of large amounts of fertilizer directly under the seed row. The perception is that potato roots do not spread out much, and that they tend to grow straight

down below where the seed is placed. This does show to be the case in many fields where potatoes are grown, but such limited root growth is actually abnormal compared to what should and does happen on potato fields with adequate levels of fertility.

In fact, when soil fertility reaches the level it should be for growing potatoes, the plants send out roots that even spread across the middles, growing right on past roots coming from the next adjacent row of potatoes on each side. When possible, roots grow to where the needed nutrients can best be taken up. Because of the false perception that potato roots do not spread out, large amounts of fertilizer ordinarily tend to be placed directly under each row. This application contributes to certain problems on every soil. One such negative set of consequences has to do with soil nutrient supplementation and plant nutrient uptake. The soil is the plant's stomach. Feed the soil and the soil will then properly supply nutrients to the crop. Therefore, when misconceptions begin to influence growers to forego the needs of the soil and apply what is perceived as just what is needed to grow the crop, soil health and plant health can be adversely affected. Furthermore, depending on various nutrient levels unique to each individual soil, several different problems can be brought about or seriously aggravated by applying large amounts of fertilizer under the row.

The first rule to consider in such cases is what Dr. Andre Voisin called, "The Law of the Maximum." Too many farmers and growers fail to take this rule seriously enough. One such example involved a large potato grower/processor in Africa who hired us for a farm visit to help solve a problem he was concerned about in his potato crop. His potatoes would begin to grow off well, but then suddenly the plants would develop weak vines and fall over, resulting in scorching or sun scald on the stalks. Then after a time, the potatoes would stand back up and begin to grow as they should have all along. But since they had been injured by the sun the concerns were how much this damage was affecting his potato yields and how to prevent it from happening time after time.

Soil samples had been taken and sent to us for analysis and recommendations. With a copy of the tests for those fields in hand it was possible to evaluate several conditions standing right there looking at those plants. Potassium (K) levels were quite high in the fields, but still some additional potassium was needed to achieve the potato yields these fields had the ability to produce. And even though our recommendations plainly stated all fertilizers were to be broadcast, I asked if he had applied potassium under the row as most potato growers do. Sure enough, *he had ignored the broadcast instructions and put the potassium directly under the row.* When everybody does it, it must be the correct thing to do – right? Well, not in this case! Placing the potassium directly under the row caused

the potassium level in the soil to increase by too much. In such cases, the first effect is to tie up boron in that soil. Because once potassium exceeds 7.5% of the soil nutrient holding capacity (commonly called the "CEC"), this begins to tie up the boron, and then if enough boron is not replaced via foliar applications it results in smaller potatoes. But boron was not what was causing the temporary weakened stalk problem in these fields. **If the potassium applied directly under the row, combined with the sodium also present there, exceeds 10% of the soil's nutrient holding capacity, it can cause plant uptake of manganese to begin to be blocked.** In such cases, soil tests show the soil has plenty of manganese, but there is so much potassium and/or sodium there that the manganese has trouble competing in terms of plant availability. This was the problem the potatoes were having in this grower's fields. The higher the percentage goes above 10% K, the harder it will be to get manganese taken up by the plants.

When the potassium and other nutrients were placed below the seed, the potatoes sent their roots down to take up needed nutrients. But the extra potassium applied in that confined area was too much for that soil and once the potatoes roots entered that area, the blocked uptake of manganese caused the problem that resulted in sun scald on the stalks.

Potassium is the first key to stalk strength, but manganese is also needed for strong stalks. When the potatoes could not take up enough manganese, all that potassium was no substitute for the needed manganese. The potato stalks became weak and fell over. Once the roots were sufficiently able to grow out of that excess potassium zone, the plants could again take up enough manganese and the vines straightened up and began to grow as they should.

That was several years ago and since that time, no potassium is placed under the row on potato land there except in the case of new land with extreme K deficiency. Since then, there has been no problem with weak stalks in potatoes grown there.

Even though very important to vine strength, manganese provides several other benefits to land used for potato production. Without manganese plants grow more slowly. It also affects seed set. And in terms of common scab, the worse the manganese deficiency in the soil, the more problem there is with this disease. One big question for growers is "What really is enough manganese in the soil for potatoes?" The answer tends to be confusing because

*Continued on page 33*



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### **Bees...Continued from page 11**

**Impact of the Africanized bee in Belize:** In general terms, the beekeeping industry in all the countries where the bees are found has been severely affected by the Africanization of the



bees. Small or amateur beekeepers usually find their bees too aggressive to handle and abandon or destroy their colonies. Large producers also find it difficult to maintain production since the

management of Africanized honey bees is generally more unpredictable and labour-intensive. The first swarms of Africanized honeybees arrived in Belize in..... with the same consequences. A low level of assistance and technical skills, coupled with the aggressive nature of the Africanized bee and the alarm among the general population, caused many of the beekeepers to give up their bees. It is a fact that the Africanized bee represents a real threat; over the years they have killed people and livestock in the areas where they have been established.

The public should be advised not to go near colonies and swarms and, under no circumstances, disturb them. The National Fire Service and the Ministry of Agriculture continue to attend to calls to remove bees in buildings; people should not attempt

to handle the bees themselves. Persons with allergy to bee stings or anyone experiencing dizziness should seek medical treatment as soon as possible. People who are stung 50 or more times should also be taken to a medical facility in case treatment is necessary.

Most bee attacks have occurred in the wild or because people do not report bees in the vicinity of their homes until the swarm has been established. Nevertheless as a precautionary measure, aviaries should be fenced, located at least 200 yards from houses and animals and have a sign indicating their presence.

**The Africanized bee, friend or foe:** In the first years after the arrival of Africanized bees, most countries, including Belize, reacted with enforcement to capture and destroy the swarms and feral colonies, coupled with an intensive selection process in order to maintain the original genetic stock of European bees. Most recently, the trend in some countries has been to reverse their policies, having recognized the positive characteristics and many advantages of working with Africanized bees: their general resilience, resistance to disease and changes in climate, and extreme laboriousness. Native to the tropics and environments with many natural enemies, Africanized bees recognize enemies and fight them furiously for the survival of the colony. They do not get sick easily because their highly hygienic habits make it difficult for diseases to get established.

When properly managed, they are excellent producers of honey, wax, pollen and propolis. Cayo Quality Cooperative has been training beekeepers for several years in the proper management of Africanized bee colonies. The results have been very positive. Our philosophy is that there is much to gain from working alongside nature and with species that are adapted to our climatic conditions and our environment.



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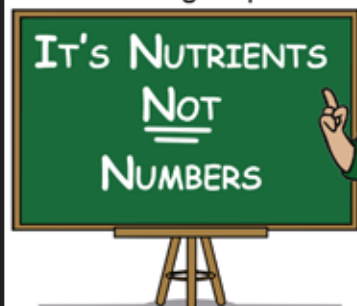
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## Remembering Mr. Anil Sinha



Mr. Anil Kumar Sinha's name is synonymous with CARDI, the Caribbean Agriculture Research and Development Institute he served for 34 years as an agricultural scientist, first in Guyana for a year and then the agriculture sector of Belize

from 1983 until his sudden death on 20 February 2016. He was appointed the country representative for CARDI in 1989 and served as the CARDI representative on many technical and advisory boards, including the Pesticide Control Board as chairman. What a legacy he has left! His stewardship and accomplishments advanced Belizean agriculture far more than his breeding and development of cereals and grain legumes adaptable to the tropics. His efforts at partnering with other organizations, countries and Belizean farming communities for the conduct of numerous projects enriched agricultural pursuits in the entire Caribbean region. The list of his accomplishments below, obtained from CARDI, also does not include his personal dedication to solving problems for individual farmers, his tireless effort to mentor his staff, his willingness to offer advice in his own quiet, humble way, nor attendance at endless meetings to share his valuable insights and considerable experience in agriculture, climate change, and natural resources management.

- Development of post-production technologies for the harvesting, drying and storage of cereals and grain legumes
- Development of a testing and certification system for red kidney beans, which laid the foundation for the export of this commodity from Belize to the Caribbean community (CARICOM)
- Initiation and development of the CARDI 70 rice variety, one of the varieties cultivated in Belize in the early 1990's that led to the country's self-sufficiency in rice production
- Annual evaluation, development and maintenance of a seed bank for commercial varieties of soy beans, corn, red kidney beans, peanuts and rice. This effort enabled CARDI to supply seeds to Haiti and Dominica in the post disaster recovery in those countries.
- Publication of more than 40 technical papers and books

Mr. Sinha earned tremendous respect among his colleagues, staff and individuals who had the pleasure of knowing him and his personable ways. His vast contribution to the agriculture sector in the Caribbean region was recognized in 2009 when he was awarded the Chairman's Award for Excellence. As Mr. Barton Clarke, Executive Director of CARDI stated, "Anil's life and work can be perfectly summed up with the quote, 'be pure, be true, be helpful, be attentive and be reverent'."



## The Toledo District By Harold Vernon

My last article left us at the northern boundary of the Toledo District. The soils of the Toledo District have all been formed under conditions of higher temperatures and higher rainfall. The dominant landform is the Maya Mountains and associated

foothills that create the largest number of drainage courses of the 7 watersheds. This district has the largest number of rivers that are relatively fast moving and are broken up into many sub-units or tributaries. The mountains form a barrier that collects moisture from the coast and create conditions of condensation as rain and serious flooding. The floodplains of the Monkey River, Deep River



and Golden Stream constitute the Northern Coastal Plain while the Rio Grande, Moho, Temash and Sarstoon constitute the Southern Coastal Plain. Using the rock types as reference parent materials, these plains are very diversified and are classified as hillsides, upland soils, northern/southern coastal plain soils and alluvium deposited. Limestone is widely dispersed, although highly weathered, containing rocks in many places. The soils of the Maya Mountains are inaccessible and are not considered in this article.

As we proceed south from the junction of Independence access road and the Southern Highway, we see a continuance of pine forested areas interspersed with swampy patches featuring palmetto and scrub grasses that are highly fibrous with low nutrition content. Extremely leached soils or Ultisols that have the underlying hardpan or compacted clay predominate on the right. These areas are complemented on the left side by sandy soils deposited by floods that extend all the way to the sea coast. The old mango farm was established on these sandy soils as mangoes are tolerant of these conditions. Banana farms have been established on the recent alluvial terraces of the Trio and

Bladen branches with mixed results. These acid soils slowly give way to soils that are formed by old and new alluvial deposits including limestone and thus have a more favorable pH. The vegetation changes to an admixture of broadleaf in forested areas that have higher densities of large trees. The main soil types are Alfisols\* that occur and are bordered by alluvial soils such as Entisols (old alluvium) and Inceptisols (new alluvium) on the river terraces and flood plains. Alfisols form in semiarid to humid areas, typically under a hardwood forest cover which results in organic matter and relatively high native fertility on the surface. However, most are shallow as they have clay-enriched subsoil and hard pans. The Alfisols, in addition to some calcium from the limestone, have aluminum (Al) and iron (Fe) that make the soil neutral to acidic, especially in the lower horizons.

Interestingly, the coastal area known as Port Honduras has large spans of swamps with peat bogs and muddy inlets, rocky outcrops in the sea and long stretches of granitic sand beaches. Many of the swamps and flooded areas are impacted by sea water and are saline. The Paine's Creek National Park is a good example of one of these areas.

As we go further south, we encounter limestone hills and soils in association with the karst (limestone hills) on the upper and lower portions of the coastal plains. Many of these hills have parcels of land that are fairly arable in the areas that have flowing rivers nearby but can be subject to flooding and high water retention. The Deep River flood plain initiates the transition to the Southern Coastal Plain and land form is mildly undulating on the coastal side with higher hills occurring on the western side. Citrus and rice have been grown in flatter areas and upland rice, corn, beans and now cacao on the higher and sloping elevations. Significant areas have been utilized for pasture with native grasses the predominant vegetation. Due to the constraining factors of high rainfall, tree crops are mostly recommended although significant milpa farming occurs with virgin land increasingly becoming scarce. Coconuts are to be found everywhere.

The Rio Grande and Moho Rivers terraces and flood plains constitute the areas with the largest cultivable spreads but the landscape is punctuated by rivers and streams and limestone hills; many of the soils have stones that allow only hand cultivation and are hostile to mechanical cultivation. Native vegetation is cohune and broadleaf forest including valuable hardwoods. The lower reaches of the Moho have a few areas that are suitable for a number of crops but are currently used for corn, beans and rice. Flooding is a persistent enemy and in the lower reaches can last for weeks in some areas as water comes down from the hills in surface and subterranean channels. The soils are easily saturated and swamps are the dominant feature of the Temash and Sarstoon flood plains. Rice in these areas suffers from lack of water control infrastructure, especially drainage.

**Author's Note:** This article is the last in the series and the information provided by technical observations of the author and was adapted from the separate publications published – "Resource Surveys of Northern Belize, Stann Creek and Toledo Districts" published by Natural Resources Institute, Kent, UK and available in print only.

\***Alfisols:** a soil order in USDA soil taxonomy. **Alfisols** form in semiarid to humid areas, typically under a hardwood forest cover. They have a clay-enriched subsoil and relatively high native fertility. "Alf" refers to aluminium (Al) and iron (Fe).

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## How Sweet It Is Making Ice Cream at Western Dairies By Feucht/Roberson



Dipping the *Delights*

Standing in line is not always a bad thing, especially if you are in line to buy ice cream at Western Dairies (WD) in Spanish Lookout

and have not decided among 24 flavors which one(s) to buy. Behind the scenes are 6 busy people packaging the ice cream into 3 gallon, 1 gallon, ½ gallon, quart, pint, and 5 oz. cup size. The 3 gallon size is the best seller; it is the size that restaurants, resorts, and WD ice cream shops buy to serve their customers. Vanilla, chocolate and cheese cake seem to be the favorites sold in that size. However, vanilla counts for 35% of all sales.

The newest product is an ice cream bar, vanilla ice cream coated with chocolate on a stick, called *Delight*. Soft ice cream mix is poured into a mold that hold 22 bars; then it's covered with a top that has the sticks inserted into it and quickly put into a special freezer for 11 minutes. The freezer, which holds 4 molds, has a chilling medium 98% alcohol that holds the temperature at -34°

F. The frozen bars are then dipped into melted chocolate which is 85° but instantly hardens on the bars. The bars are then put on a conveyer where a Finamac machine automatically slips the wrapper on to the bars and they are packaged 10 per box. Five thousand of these delicious *Delights* are produced every 9 hour workday. WD is in the process of purchasing a machine to produce *Delights* all automatically; then they can expand the flavors of both the ice cream and the topping; strawberry ice cream with cheesecake flavored topping, for example.

All of WD ice cream starts out the same way: milk is first pasteurized in a steam-heated tank for 30 minutes at 180°F, then piped to a homogenizer for a few minutes, which keeps the milk and cream from separating (emulsifies the fat globules at 2300 psi causing them to be equally distributed throughout). The milk passes through the homogenizer to a heat exchanger where the

milk is cooled to 35 - 40°F as it passes over water cooled plates on its way via pipes to one of two 300 gallon tanks in the processing/packaging room to be made into ice cream. The tanks are



thoroughly cleaned in between use. Powdered milk, cream, sugar, salt, and stabilizer are added to the 250 gallons of 3.5% butterfat milk in the holding tank and mixed constantly for 16

*Continued on page 19*

# Western Dairies

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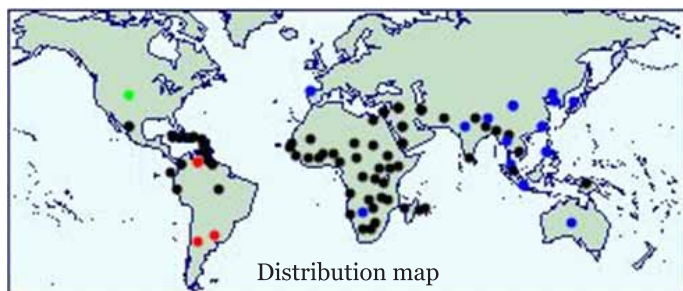


# A New Pest: The Yellow Sugarcane Aphid Infesting Sorghum in Belize

By Adriano Vasquez

Plant Health Department, Belize Agricultural Health Authority

The yellow sugarcane aphid (Hemiptera:Aphididae) is an invasive specie introduced in the new world and spreading rapidly throughout the American continents. The primary hosts of this pest are sorghum, sugarcane and oats, and secondary hosts are rice, corn, and some pastures. The weed Johnson grass is a preferred host of this pest. If this pest is not controlled on time it can affect the production of sorghum, sugarcane, and other grains in Belize. Air and machinery movements are spreading the aphids.

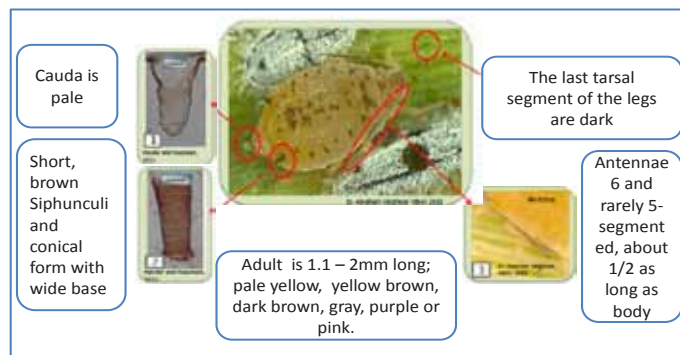


The origin of this aphid is Africa and the Middle East. The aphid is also present in Mexico, Guatemala, El Salvador and recently detected for the first time in Little Belize in February 2016 attacking sorghum. Since, the discovery of the aphid in Belize a delimiting survey was conducted in Corozal, Orange Walk and Cayo Districts. The survey results revealed a widespread of the pest in Belize.

The reproduction of the yellow sugarcane aphid is predominantly asexual. Adult female aphids are winged or wingless and both give origin to nymphs. This aphid has 4 nymph stages which develop in 5.4 days at 25°C. The average life cycle of this insect takes 15 days to 28 days to produce approximately 96 nymphs per female. *Wingless* adults have a life span of 11.7 days average and produce 46 nymphs per female. *Winged* adults have an average life of 7.5 days and produce 10.6 nymphs per female. A sorghum plant can be infested with 30,000 aphids.

The yellow sugarcane aphid measures 1.1 mm – 2.0 mm. This aphid is variable in colour depending on the host plant and climatic conditions: pale yellow, yellow-brown, dark brown, gray or pink. The beak reaches the second pair of coxae. Fully grown nymphs may have scattered brown markings randomly distributed on abdominal tergum. Sometimes inter-segmental lines are marked brown. The antennae are usually 6-segmented and rarely 5-segmented, about 1/2 as long as the body. The cauda is pale and has 4 setae on each side. The siphunculi are short and brown and the tarsal segments are dark.

Sugarcane aphids colonize the lower surfaces of lower leaves first and then advance to the upper leaves. The aphids are usually found on the upper surface of the leaves. In some situations if they are not controlled, the aphids may even colonize the grain sorghum head. When conditions are favorable, some colonies can quickly grow to large colonies and produce a large amount of honeydew. Highly sticky leaf surfaces may help protect the aphids from predation. The damage caused to sorghum by this pest depends on a number



Taxonomic identification of the yellow sugarcane aphid

*Continued on page 41*

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## Ice Cream...Continued from page 18

hours to improve the texture. Five hundred gallons of mix are used every day as the foundation for all WD ice cream products; mix is transferred 5 gallons at a time to the batch freezer where 2 oz. of flavoring is mixed into it with a paddle for 15 minutes (5 minutes for bars), which increases its bulk, at a temperature below zero to the soft stage. Containers of the various sizes are then filled and labeled and placed in the ice cream vault at -4°F. The 5000 gallon capacity vault should be called *ice cream heaven* with its rows and rows of shelves of ice cream. It's the favorite spot of the 7,800 students (195 student groups) who tour WD every year.

WD has come a long way. They got their start making ice cream in the early 1990's when good quality ice cream was \$32/gallon in Belize City. As soon as they purchased a new machine in 1994 and began making ice cream they could hardly keep up with the demand. Now they have outlets in Orange Walk, San Ignacio, and Belize City. Having worked toward *Hazard Analysis Critical Control Point* (HACCP) certification since 2005, WD is now HACCP certified which means among other things that through a batch number system they can trace milk to its source. HACCP certification also opens up export possibilities.





## Fire - Useful or Harmful Vegetation Management Tool for Belizeans

By Dr. Stephen F. Zitzer

Fire, in the case of burning vegetation, consists of many processes and characteristics operating at various temporal and spatial scales that can result in even more diverse outcomes in terms of impacts on the biosphere. Relatively few terrestrial ecosystems have not been directly affected by fire, at one time or another, with both positive and negative outcomes. Today, due to the global scale of intentional and unintentional burning of native vegetation and agricultural crop residues, the overall biosphere is being affected more adversely than positively. Of course, as everyone knows, fires can be either started by humans purposely or accidentally, while conversely natural wildfire in native plant communities can occur annually or with frequencies of greater than centuries. However, for most ecosystems the frequency of fire is low, including most of the plant communities in Belize, with the exception of pine savanna communities along the coastal plain and in the Mountain Pine Ridge. Nevertheless, fire is such a powerful ecological factor and vegetation management tool that even a frequency as low as once every two or three centuries may be a major determinant of total community biodiversity and sustainable productivity.

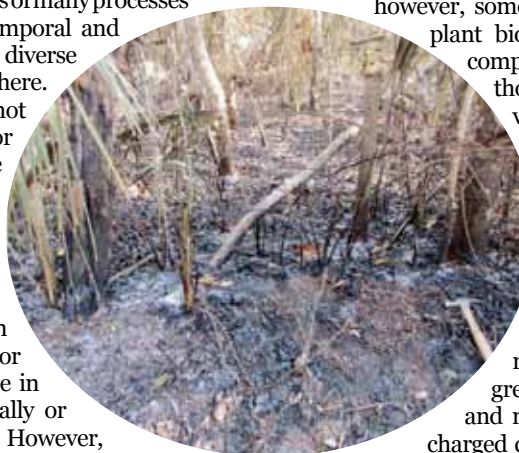
Unfortunately, generalizations about the ecological effects of fire are difficult to make because no two fires are alike due to site specific climatic, soils and vegetation characteristics that interact to influence the frequency, duration and intensity of a fire. Consequently, the

direct effects on plants, animals, soils and water and air quality can vary from beneficial to highly detrimental. These effects may be short term as in the annual pre-harvest burning of sugarcane fields or irreversible after massive deforestation of tropical forests accompanied by the permanent loss of biodiversity. There are,

however, some basic chemical reactions that occur when plant biomass is burned because most plants are composed of the same sixteen essential elements, though the concentrations of each element can vary greatly between species (grasses versus trees) and plant tissue types (leaves versus wood). During burning or combustion, most of the carbon is lost to the atmosphere as carbon dioxide (CO<sub>2</sub>) because it begins to volatilize at lower temperatures than the other 15 elements. Most of the nitrogen, phosphorus, sulfur and chlorine are converted to anions (molecules with negative charges) that volatilize in much greater quantities than calcium, potassium, and magnesium which are converted to positive charged cations. Furthermore, fire temperatures can range from 300° to 1400° C, with nitrogen losses beginning at 200° C, while phosphorus does not begin to volatilize until 500° C. Consequently, even for low temperature fires most of the carbon and nitrogen is lost to the atmosphere. Conversely, many nutrients are still contained in the ash which may or may not be retained at the burn site. This helps explain why there are often short term increases in many surface soil nutrients after burning.

The second major set of impacts of burning is the potential effects on soil structure and the ability of the soil surface to absorb precipitation due to the combustion and loss of soil organic matter. Once again

*Continued on page 42*



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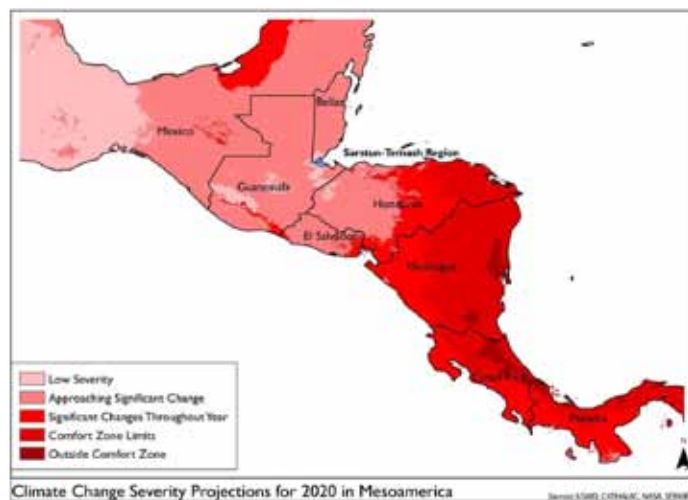
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## Climate Change Impact on Agriculture By Dottie Feucht



Adaptation measures to climate change and variability were the focus of a forum in February when the stakeholders of the agriculture sector and livestock producers met with representatives of the Ministry of Agriculture, Forest, Fisheries, the Environment and Sustainable Development (MAFFESD); Inter-American Institute for Cooperation on Agriculture (IICA); and National Climate Change Office (NCCO). The participants developed specific recommended adaptation measures for both direct effects (changes in rainfall and temperature) and indirect effects (changes in pests, diseases and soil fertility) on agriculture crops and livestock.

The measures recommended for excessive rainfall and flooding include:

- Drainage infrastructure, systems and mechanisms
- Well-designed and drained road infrastructure
- Available rainfall forecasts
- Relocation of animals and annual crops

The measures recommended for drought include:

- Irrigation, including drip irrigation
- Use of renewable energy sources
- Watershed management
- Water harvesting

The measures recommended for climate variability include:

- Seasonal production
- Timely, specific, and localized weather forecasts

The measures recommended for temperature increase include:

- Selection of heat-tolerant crops, pasture varieties and livestock breeds with emphasis on indigenous genetic diversity
- Irrigation to alleviate heat stress on plants
- Silvopastoral systems
- Heat alleviating infrastructure or appropriately ventilated housing designs for poultry, pigs, sheep and goats

Measures recommended for adapting to changes in climate and environment for aquaculture include:

- Improved brood stock
- Access to clean water sources
- Adequate water storage
- Use of renewable and alternative sources of energy
- Information and technology transfer from expert sources
- Improvement in regulatory services

The agriculture sector is in a good position to implement the proposed adaptation measures in terms of technical capacity, institutional and policy environment and stakeholder attitude.





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### Deforestation...Continued from page 3

practices for all Belize's major agricultural products, including cattle ranchers, through organizations like the Inter-American Institute for Cooperation in Agriculture (IICA), the World Wildlife Fund (WWF) and the Wildlife Conservation Society (WCS), all of which have representatives in Belize.



Since humans began using agriculture around 11,000 years ago, we have removed more than half of the world's forests. Belize is an exception to this trend, as it still has more than half of its land covered by forests, and has a unique opportunity to learn from the mistakes of other nations that are facing disastrous consequences of climate change.



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# Agriculture Prices at a Glance- \$\$\$\$

MAY 2016

A-B denotes the difference between 1st preference & 2nd preference and sometimes between wholesale & retail and bulk or small amounts . Trend (H) means Higher over last 30 to 60 days (L) Lower (S) Steady.  
Prices intend on being farm gate in Belize dollars - usually price per lb

BELIZE CATTLE by District - Provided by BLPA					
	T	Dist.	Per lb	Dist.	Per lb
Fattened steers	L	Czl	2.00	OW	2.45
750-1100 lbs	L	Cy	1.80	SCr	N/A
	L	Czl	2.25	OW	2.40-2.45
Weaner steers	L	Czl	2.25	OW	Bze
"	L	Cy	2.00	SCr	Tol
Breeding heifers	L	Czl	1.85	OW	1.75-1.90
"	L	Cy	1.80	SCr	N/A
Cull cows	L	Czl	1.25	OW	1.45-1.50
"	L	Cy	1.20-1.40	SCr	N/A
U.S. CATTLE					
U.S. price - corn fed - 1000-1200 lbs	L	US\$ 1.25550			
U.S. price - feeders 600-800 lbs	L	US\$ 1.46025			
BELIZE HOGS					
Weaner pigs - 25-30 lbs - by the head	S	100.00-120.00			
Butcher pigs 160 - 230 lbs, per lb	S	1.95		1.75	
BELIZE SHEEP					
Butcher lambs	S	2.75		2.50	
Mature ewes	S	2.50		2.00	
BELIZE CHICKEN					
Whole sale dressed (Sp Lkt)	L	2.38			
Whole sale dressed (Bl Crk)	L	2.40			
Broilers - live per lb (Sp Lkt)	L	1.22			
Broilers - live per lb (Bl Crk)	L	1.27			
Spent hens per 4 lb bird (Sp Lkt)	S	4.00			
Spent hens per 4 lb bird (Bl Crk)	S	4.00			
CITRUS					
Oranges per lb solid	S	2.0735			
Grapefruit per lb solid	L	2.520			
COCONUTS					
Green Coconuts, del'd to Cayo, bulk	S	sm .40		med .45 lg .50	
Dry Coconuts, del'd to Cayo, bulk	S	.35 - .40			

\*\*\*These prices are the best estimates only from our best sources and simply provide a range to assist buyers and sellers in negotiations.\*\*\*

GRAINS, BEANS & RICE					
	T	A	B		
Belize yellow corn, bulk (Spanish Lookout)	L	N/A	.24		
Belize yellow corn, bulk (Blue Creek)	L	N/A	.28		
Yellow corn/local retail (low volume, Sp Lkt)	H	.335			
Belize white corn, (Cayo)	L/S	.295 (bulk)	.35 (low volume)		
US Corn, #2 yellow	H	US\$4.21 /56 lb bushel			
US organic, yellow corn feed grade	L	US\$8.06 /56 lb bushel			
Belize soy beans (Spanish Lookout)	H	.45-.47	N/A		
Belize soy beans (Blue Creek)	L	.50	.45		
US soy beans, #2 yellow	H	US\$10.3575 /60 lb bushel			
US organic, feed grade soy	L	US\$17.04 /60 lb bushel			
US organic, food grade soy	S	N/A			
Belize milo (Spanish Lookout & Blue Creek)		.22			
Red kidney beans (Spanish Lookout)	H	.70			
Red kidney beans (Blue Creek)	S	N/A			
Black eyed peas (Spanish Lookout)	H	.90	.80		
Black eyed peas (Blue Creek)	H	1.00	.80		
Paddy rice per pound (Spanish Lookout)	S	.40-.53 farm price, dried			
Paddy rice per pound (Blue Creek)	S	.40-.45 farm price, dried			
SUGAR/HONEY					
Sugar cane, ton, February estimate 2016 crop	S	\$45.25			
Bagasse, per ton cane	S	0.51			
Honey per lb (Cayo)	S	2.50 (approximately 12 lbs/gal)			
Honey per lb single source/variatal (Cayo)	S	3.75 (approximately 12 lbs/gal)			
SPECIAL FARM ITEMS					
Eggs - tray of 30, farm price	L	5.28 (Sp Lkt)	5.70 (Blue Creek)		
WD milk per lb to farmer	S	contract .57; non contract .42			
Raw milk (farmer direct sales)	S	8.50 gal (5 gal + 8.00 gal)			
CACAO					
Cacao beans (TCGA) /lb	S	3.00 dried fermented			
Cacao beans (TCGA) /lb	S	1.10 wet beans			
US Cacao beans, metric ton	H	US\$ 3,212.07			

## Birding in Belize A Visitor's Perspective

By Eric Moore

In February, my wife and I traveled to Belize for the primary purpose of bird watching, but our vacation also included snorkeling the barrier reef and visiting ancient Mayan ruins.

Shortly after arriving in Belize City, we took a short flight on Maya Air over to Caye Caulker Island where we spent the next three days bird watching, relaxing, and walking, as our primary means of transportation on the island were our feet! Spending time on Caye Caulker was thoroughly enjoyable and stress free; the pace on the island was slow and pleasant. Being an avid birder, I particularly enjoyed the variety of Caribbean specialty bird species we observed on Caye Caulker such as Rufous-necked Wood-rail, White-crowned Pigeon, Green-breasted Mango, Yucatan Vireo, Caribbean Elaenia, Black Catbird and Mangrove Warbler. If we had not visited the island, we would not have seen any of these species on our trip.

Our second day on the island we got outfitted at a dive shop and experienced a guided snorkeling adventure in the Hol Chan Marine Preserve. The water temperature was perfect, and the sea life was as colorful as it was abundant. We swam with stingrays, nurse sharks, barracuda, moray eel and observed the colorful coral formations that make up the second largest barrier reef in the world. This was my first time snorkeling and I loved the experience!

After three nights on the island, we flew back to Belize City and drove by van to Crooked Tree Lagoon to continue our relentless search for birds. The diversity of habitat in this area contributes to high species-richness. At the end of each day, we would sit down together as a group and tally our bird list. We usually came up with a list exceeding one hundred bird species each day! The highlight of our time at Crooked Tree Lagoon was a guided boat trip on the lagoon where we saw amazing bird species such as Snail Kite, Black-collared Hawk, American Pygmy Kingfisher, Montezuma Oropendula, Boat-billed Herons and Bare-throated Tiger Herons. On land, we spent time walking the diverse habitats surrounding the lagoon and we saw an incredible variety of birds including Jabiru, Yucatan Jay, Laughing Falcon, Gray-necked Wood-rail, Roseate Spoonbill and Vermilion Flycatcher—just to name a few. Our short time at Crooked Tree illustrated how challenging semi-tropical forest birding is with the density of the vegetation—quite different from birding in Arizona, where I am from.

Our final destination was duPlooy's Jungle Lodge and the neighboring Belize Botanic Garden. What an incredible setting, right in the heart of a semi-tropical forest. When we returned to duPlooy's each afternoon, I headed out on my own in search of more birds and never came back disappointed. In the Belize Botanic Gardens I saw Keel-billed Toucans, White-crowned Parrots, Northern Potoo, Band-backed Wren, Chachalaca, and so much more.

Each day we did day trips out and back from duPlooy's. One day we went to Black Rock Lodge and Xunantunich, another day to St. Herman's Cave and the Blue Hole, and on another day we drove to Mountain Pine Ridge National Park. Each location provided us with the opportunity to see the beautiful countryside and the amazing birds in the surrounding habitat.

I added new bird species to my life list every day; birds that I had only seen in pictures and field guides were now right before my

eyes. I literally could not get enough of the birds, and I thoroughly immersed myself in the opportunity of being in Belize. I admit that I am a hard-core birder, and I felt I got a lot out of the trip because I put a lot into it. By the end of our eleven-day, ten-night trip I recorded over 270 species of birds and was very satisfied with the whole experience.

In Belize it is a common sight to see bumper stickers and billboards with the expression, 'You better Belize it'. When it comes to birding in Belize, I am a believer!

**Editor's Note:** Eric Moore is an avid birder and backyard wild bird store owner (Jay's Bird Barn) with locations in Prescott, Sedona and Flagstaff, Arizona. You can find his regular column at [www.jaysbirdbarn.com](http://www.jaysbirdbarn.com)



American Pygmy Kingfisher on Crooked Tree Lagoon



Red-legged Honey Creeper observed at the fruit feeders at Black Rock Lodge



Slaty-tailed Trogon observed near duPlooy's Jungle Lodge



## Wildlife Impacts from Changing Landscapes

### By Paul Walker

With Belize's growing population, spreading urbanization and expanding agricultural footprint, inevitably



there are impacts on wildlife as portions of their habitat are cleared for new houses, roads, milpas and large-scale agriculture. Whilst large tracts of wildlife habitat are protected in central and southern Belize by the protected areas that provide critical environmental services such as water supply, flood control and protection from landslides, the wildlife of coastal and northern Belize are more limited in the provision of safe havens from land-use change. The gradual loss of wildlife across the landscape is going unnoticed.

One species that makes an interesting case study is Belize's charismatic Yucatan black howler monkey, better known as the baboon or saraguato, one of Belize's two species of monkey. The howler monkey is an important part of Belize's wildlife. Its loud roar is enjoyed not only by Belizeans, but its presence also provides an important tourism resource, contributing toward the economy of Belize. It also plays an important role in maintaining Belize's forests, dispersing seeds as it moves through the forest canopy. Like its cousin, the spider monkey, this specie is globally endangered, with populations declining across its range. Unwilling to expose themselves to attack from terrestrial predators, howler monkeys are generally unwilling to cross significant distances on the ground and more and more reports are being received of howlers being found stranded in small forest remnants left scattered across an increasingly agricultural landscape. A family group of three to eight howler monkeys need only a few acres of forest rich in their favourite trees, including bri-bri, ramon, fig and Cecropia, and left undisturbed will call loudly to advertise the boundaries of their territory and raise their offspring. They thrive even in narrow bands of trees left along river banks and creek edges and surrounded on all sides by cane fields or cattle pasture, as long as these are linked to other forest areas, providing corridors for them to move through the landscape.



One of the problems, though, is the agricultural and other developmental barriers that block "overflow," like people, adolescent howler monkeys become more assertive as they reach maturity, and eventually the mature male of the troop will have had "enough" and eject his troublesome sons. Encircled by farmlands, there is sometimes nowhere for these "teenage" monkeys to go, and they can end up escaping to the only other trees in sight: coconut, mango, mahogany and other trees dotted through rural villages, trees that provide structure but very little or no food to the monkeys. The human environment is dangerous for these monkeys, with the threat of being run over by cars, chased and killed by dogs, or stoned by children. Increasingly often, these stranded monkeys have to be translocated to other, safer forested areas by the Forest Department and its partner in primate conservation, Wildtracks, a non-profit organization that rehabilitates and releases monkeys.

Observing national legislation and policies in leaving vegetation along river and creek edges as well as using the Baboon Sanctuary model of leaving forest around the borders of farms can do a great deal to assist Belize's monkey populations, leaving not only



quality habitat, but also connectivity to allow groups to establish territories and for youngsters to disperse and establish their own family troops. Planning large-scale forest clearance projects with clearing in the direction of contiguous forest will allow monkeys and other wildlife to escape; clearing from the perimeter towards the centre is a sure way to trap monkeys without an escape route. A little prior planning can go a long way to minimize negative impacts on Belize's very special and endangered primates!



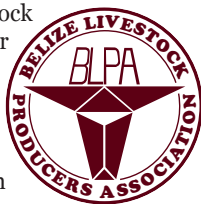
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## Belize Livestock Producers Association Holds 38<sup>th</sup> Annual General Meeting

On March 19<sup>th</sup>, 2016, the Belize Livestock Producers Association (BLPA) convened for their 38<sup>th</sup> annual general meeting (AGM) at their headquarters at Mile 47 1/2 George Price Highway. Ranchers gathered from all over Belize, and those renewing their membership found a special price of \$25.00 annual dues in effect for the day.



Chief Executive Officer (CEO) of the Ministry of Agriculture, Forestry, Fisheries, Environment and Sustainable Development Mr. Jose Alpuche, always a welcomed attendee, made a short presentation noting that a reduction of the entry tariff [of cattle] into Mexico and the Government of Belize's (GOB) cooperation "will provide a foundation for you ranchers to build upon". He also noted that we need to attach "a proper value on the cattle industry [of Belize]".

Long time rancher and former chairman of BLPA, Mr. John Carr of



Banana Bank, was the guest speaker. He discussed the different passions which he and others feel for the industry – for example, the passion at the birth of a calf, and also the passion of finding the skin of a stolen animal. He advised more unity within the industry to better meet goals, and mentioned the possibility

of Belize eventually exporting cattle by boat to Houston, now that we have better marketing and a traceability system in place. Another suggestion by Mr. Carr was the formation of a Livestock Protection Association, such as that of Texas. We might study their organization and adapt that to Belize as many ranchers are suffering from rustling.

BLPA's own CEO Dr. Carlos Itza, former head of Sweep 3, joined BLPA in the fall of 2015 and has brought much expertise to the team in collection and collating long-needed baseline industry data. This was essential for BLPA to move forward, see accurately where we have been, where we want to go as an industry and also to manage and access funding.



*Continued on page 27*

## Belize Livestock Producers' Association



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### **BLPA...Continued from page 26**

He announced that the current phase of the cattle sweep ends on 31 March, 2016. There will be a Sweep 4 and 5 for approximately 15% of the national herd. We anticipate reaching a "National Tuberculosis Free" status in 2018. Dr. Itza noted that 54 Belizean farms remain under Belize Agricultural Health Authority (BAHA) quarantine, which entails a fine of \$2,000. per farm. Ranchers are cautioned not to buy from a quarantined farm, as that can result in the buyer's farm being placed under quarantine as well.

During 2015, 8,845 head of cattle were exported and 6,687 head were slaughtered for local consumption, a combined direct value of BZ\$42,000,000. Export declined slightly in 2015, but domestic consumption remained steady. The total estimated value of the industry as a whole, including all related business and labor, is approximated at BZ\$600,000,000. Although cattle prices in the region have temporarily decreased, they increase as one travels northward; the highest increases are in the EU. BLPA attributes some of the regional decline on the devaluation of the Mexican peso. Overall domestic prices are anticipated to remain over \$2.00 Bz\$/lb/live weight.

Other ideas expressed for the industry included the formation of purebred registries. BLPA reminded ranchers that there is a BLPA police bounty payable upon conviction of rustling, and noted that an ear tag is not proof of ownership. Only a registered brand (\$10./year) is proof of ownership.

Elections for new members for the Board of Directors was held, with successful nominees being: Mr. Abdala Bedran, Mr. John Dyck, Mr. Ramon Galvez, and Mr. John Banman.

During the lively question and answer period at the conclusion of the gathering, several topics arose, the main one being the ongoing problem of losses from jaguar predation. Ranchers are advised that meetings will be scheduled for October of this year with Dr. Rafael Hoogesteijn of Panthera, who is looking forward to discussing strategies directly with ranchers in various locations. See notice on this page.

## **Noted Jaguar Predation Expert, Dr. Rafael Hoogesteijn, Returns to Belize in October 2016**



Panthera, Belize Forestry Department of the Ministry of Agriculture, Forestry, Fisheries and Sustainable Development, and the Environmental Research Institute of the University of Belize, together announce that Dr. Rafael Hoogesteijn, will return to Belize in late October for meetings with ranchers and a presentation to the public. Rafael has met many ranchers on previous trips and is known as a fellow rancher who also happens to be a veterinarian and a jaguar predation expert. Come to discuss your situation and concerns regarding the ongoing conflicts between the big cats and the cattle industry. Come learn what other regions have done to lessen their losses.



Rancher meetings will be scheduled for:

- Blue Creek, Orange Walk District
- Belize Central Corridor – Crooked Tree area, Belize District
- Spanish Lookout, Cayo District
- Punta Gorda or Golden Stream, Toledo District

A presentation for the public will be held in Belmopan.

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# Climate Change, Land Use, and the Future of Water in Belize

## By Stephanie Smith

The reality of climate change has many of us questioning how the change in weather patterns will affect the agriculture industry. Not only have we seen a marked difference in the length of wet and dry seasons and when they occur during the year, but we're noticing more extreme weather behavior in terms of flooding and drought. These abnormalities lead us to wonder what the long-term effects of increasing average temperatures will be. The answer is not easy to pin down as it depends on many factors, such as how much average temperatures rise and how much more forest cover is converted to other land uses.



Because so many people are interested in knowing how climate change will affect different places around the world, scientists have produced different computer-based models for predicting how possible scenarios could translate to local impacts. A recent study conducted by Cherrington, Kay, and Waight-Cho<sup>1</sup> utilized an array of these models to assess how much rainfall, runoff, and erosion we might see across Belize's 16 watersheds by the year 2050, given different climate change conditions and deforestation rates.

Overall, the models indicated that climate change will result in decreased rainfall in Belize, particularly in the north. At the same time, the amount of runoff, water which flows over or through the soil rather than soaking into it, will increase. So by 2050 the country will be receiving less precipitation and less water will be infiltrating the soil to provide moisture for crops. Although the decrease in rainfall and increase in runoff are inevitable, the rate of erosion is highly dependent on the amount of forest cover.

Currently, 70.6% of the area in Belize's watersheds is forested. If deforestation continues at the same rate, forest cover in these watersheds will be reduced to 54.6% by 2050. Alternatively, cutting the rate of deforestation in half results in 69.3% of this area being maintained as forest. How does deforestation impact erosion? The root systems of trees in forests hold the soil in place so that as runoff flows over the ground, it doesn't take the topsoil with it. When the trees are cleared, there is nothing to hold the soil in place, and as the water washes over the earth, it carries the sediment to the river. Therefore, the less forest cover there is in an area, the more erosion occurs, and as the fertile top layer of soil



is swept away, the land becomes less productive for agriculture and surrounding rivers and streams are impacted. Furthermore, the presence of forests across the world is a major factor that mitigates climate change, so clearing forest exacerbates the effects of climate change, leading to even drier conditions.

It is important to note that climate change is not occurring in a vacuum, and there are other dynamic factors that might interact with climate change to multiply the effects we experience. For instance, the national rate of population growth is currently 2.4%, and at this rate, the population of Belize will double in 20 to 25 years. In other words, as the water supply is decreasing, the demand will increase. This could cause a hike in water prices, especially considering the fact that the water suppliers will likely have to go to greater lengths to remove the increased sediment from the water due to higher rates of erosion.

What actions can the agriculture sector take to ensure a more stable future in the face of changing weather patterns? The use of agricultural methods that don't require further clearing of forest, such as agroforestry and inga alley cropping, will be essential. These methods naturally provide nutrients for the soil and retain sediment to prevent erosion. Additionally, with the reduced availability of water, taking steps to improve efficiency of water use will help the sector adapt. The key is to look into the future and begin to modify agricultural practices now in order to prepare for and alleviate the coming changes. If we begin to make adjustments now, Belize can thrive in the face of climate change.

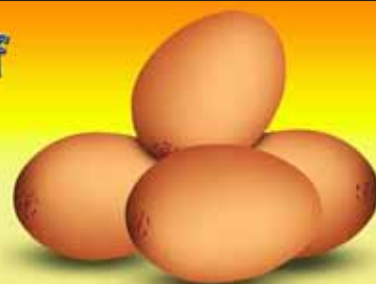
<sup>1</sup>Cherrington, E.A., Kay, E., and I. Waight-Cho (2014). Technical Report – Modelling the impacts of climate change and land use change on Belize's water resources: potential effects on erosion and runoff



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Recipes...Continued from page 5

## Green Banana & Squash Casserole By Deborah Harder

4 green bananas  
1 lb squash (green pumpkin or zucchini) shredded  
1 onion, finely chopped  
1 cup milk (regular or coconut)  
1/2 cup fresh cilantro, finely chopped  
1 1/2 tsp salt  
1/2 cup sour cream  
1 egg, beaten  
1/2 cup cheese or cooked meat (optional)



Boil the bananas whole in enough water to cover entirely. When done, the peels will crack and open. Remove from heat, pour off water and cool. Peel and grate or mash.

In a small pan, sauté squash and onion in butter or oil for several minutes. Add bananas, and stir together. In a bowl, combine beaten egg, sour cream and milk. Add banana-squash mixture, and stir until completely combined.

Pour into a small casserole dish, and bake at 350 degrees for 45 minutes to one hour, until top is browned and firm. (If you want cheese, add on top about 1/2 way through cooking time.)

### Note from Deborah:

I also tried using mashed green bananas in place of a portion of corn masa, in both corn tortillas and tamales (about 1/3), with good results. I would like to continue to learn to cook with green bananas, a useful staple crop which grows well without chemicals.

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## Pro-Organic Belize Visits Pesticides Control Board Understanding Pesticide Labels

On March 11<sup>th</sup>, 2016 a delegation from Pro-Organic Belize (POB) met with Pesticides Control Board (PCB) staff at the PCB headquarters at Central Farm, Cayo District. Present from PCB were Pesticides Registrar Ms. Miriam Serrut, and PCB team members, Ms. Jenelle Canto, Mr. Selwyn Molina, Mr. Nonanto Canto and Mr. Ginnel Ozaeta.



Nearly all of Cayo's POB members joined their "delegation", such was the interest level in learning more about how pesticides become registered and how to understand their labels.

Belize recognizes 5 grades of pesticides, which are graded by *hazard classification*, shown in color, using the World Health Organization (WHO) *Acute Oral Toxicity Tables* for chemicals. Of the 2 reds and 1 each of yellow, blue and green classes, all of the reds and some of the yellow are classified as restricted. Ten (10) percent of all registered pesticides in Belize are restricted. Every 5 years registration is reviewed for all PCB-registered pesticides.



All labels carry information of a product's LD 50, that is, the dose at which 50% of [test] animals die. Therefore, the smaller the LD 50 rating is, the more toxic a product is, gauged by ingestion or inhalation.

PCB offers a one day course for attaining a license to purchase restricted pesticides (\$25.00 fee). In Cayo the Spanish training is

every month, and the English training is every 2 months. PCB also offers 2 hour worker sessions, which are different from the course for the purchaser's license. Belize is notable in that we are the only country in our Central American region offering training sessions to farmers/users.

Other interests of POB expressed to PCB during the nearly 2 hour visit included questions about pre-harvest intervals (between application and safe harvest) and ongoing market surveillance for domestically-raised produce. At this time, there is no regular or ongoing market surveillance for pesticide residues in our fruits and vegetables. POB asks that those concerned about pesticide residues in our foods contact their area representatives and request higher priority for this expensive task. Also notable is that there is no regular system for testing imported produce [from Mexico or other origin] for pesticide residues. POB members opined that perhaps importers should bear those costs for testing imported produce in Belize Agricultural Health Authority (BAHA) laboratories.

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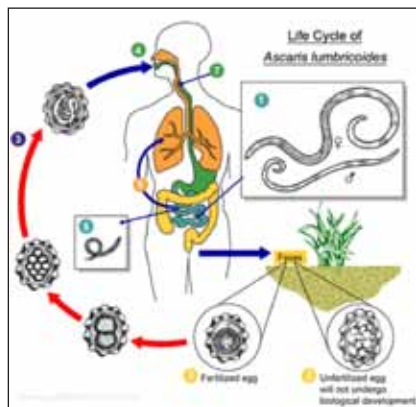
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## PARASITES

MARGUERITE FLY BEVIS, RN, BSN



Headaches, pain, joint inflammation, nausea, weight loss, vision problem, cancer, even death. What do these symptoms have in common? All can be caused by parasites. Parasites are organisms that cannot live independently of their host. They are much more common than you may think. In a

documentary made by National Geographic called "The Body Snatchers," they reported, "in fact, parasites have killed more humans than all the wars in history." Dr. Hulda Clark writes that all cancers are caused by parasites. I don't know if that's true, but the subject is serious enough to warrant investigation.

While this is an unpleasant subject, even repulsive to some, it is a problem that can affect everyone. Parasites can enter the body through the skin or the mouth, by breathing the air, by walking barefoot in the dirt and by eating contaminated food. If you eat meat or fresh fruit and vegetables, you are a candidate. Do you have unexplained abdominal discomfort? Parasites can lodge in joints causing inflammation. This may be misdiagnosed as arthritis.

There are two types of parasites: protozoa and helminths. Protozoa are one-celled organisms which multiply inside the human body. The most common in Belize are giardia, amoebae, malaria and leishmania. Helminths are multi-cell worms. Hookworms, tapeworms and pinworms are common all over the world. These are only a few of the thousands of types of parasites.

Leishmaniasis, commonly known as bay sore, or chiclera, is a protozoa transmitted by a sandfly (*Plebotomus papatasi*). The most common type in Belize is cutaneous leishmaniasis which causes sores on the skin. It begins as a tiny spot. It doesn't itch so one may not notice it until a few weeks later when there is a small ulcer that won't heal with all the normal treatments. Over time, the ulcer begins to grow exponentially and can become infected with secondary bacterial infection.

Visceral leishmaniasis is more severe in that it can affect internal organs and bone marrow. People infected may not be aware of the infection; those who do, experience fever, swelling of the liver or spleen, weight loss and abnormal blood tests.

If you think you may have Leishmaniasis, see a tropical medicine specialist who can assess, determine the species, and decide which treatment is most appropriate. There are several "bush remedies" but none seem to be very effective. Cutaneous leishmaniasis can heal on its own in some cases depending on the immune system of the individual. If a lesion gets to be 1 cm or more, I recommend seeing the doctor. You can distinguish Leishmaniasis from *Staph aureus* in two ways. *Staphylococcus aureus* bacteria emit a golden liquid which is visible with a magnifying glass. Leishmaniasis ulcers generally form a hole in the center with raised red edges. The protozoa live in the edges. One form of treatment is to inject these raised ridges with a pentavalent antimonial compound. This should be done under medical supervision and is usually

*Continued on page 37*



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## Spanish Lookout Commercial and Industrial Expo 2016

By Business Chamber of Spanish Lookout



The Commercial and Industrial Expo held at Countryside Park in Spanish Lookout every other year continues to draw large crowds. The fourth annual expo, held on February 26 and 27, had 15, 500 attendees, 1,000 more than Expo 2014, who came from every district in Belize. For the 1,000 students who came by the busload on Friday and the crowd on Saturday it was a fun time of horseback riding, ATVs, boating, buggy and "train" rides, jumping on the trampoline, and enjoying a great variety of delicious food.

The number of booths also increased from 130 to 140 with 15 new exhibitors. Although there was an increase in livestock showing, probably the largest category of exhibitors was car dealerships with their latest and greatest. Improved parking and livestock infrastructure added to the show's features. Improvements planned for Expo 2018 include another building so that all exhibitors can be indoors and better organization of exhibitor parking.

## Kinsey...Continued from page 14

of the various ways to measure and report manganese on soil tests. In fact, the numbers we recommend just to be at adequate levels in the soil is reported as toxic levels on some other soil test reports.

A word of caution is needed here: *even soils that have a sufficient amount of manganese can develop a problem with common scab if enough lime is applied to cause manganese to go from sufficient to deficient.* This can happen when calcitic lime is applied on soils that have barely enough manganese (with even worse results when the soil is already too deficient in manganese), because when calcium is applied, it always ties up a certain amount of manganese.

If the soil has enough manganese to stand the amount of calcium applied, manganese will not become a problem there. That is one reason why in some areas potato growers can apply calcium limestone and have no problems with common scab, but in other areas no one will dare apply it. And due to soils needing calcium for adequate uptake of all the other nutrients, including nitrogen (N), phosphorus (P) and K, if the problem is not solved, potato production will not only suffer but even decline in terms of yield.

Just keep in mind that the primary elements, N-P-K, truly are primary in terms of sufficiency to grow the crop. But when any one of these three are over-applied, providing more than the soil can tolerate, those same elements can cause a whole new set of problems, not just for potatoes, but for all types of crops and growing plants.

**Editor's Note: Neal Kinsey will again return to Belize for a course at UB CF, in February 2017. Plan to attend and bring all your fertiliser questions. See page 40 for details.**



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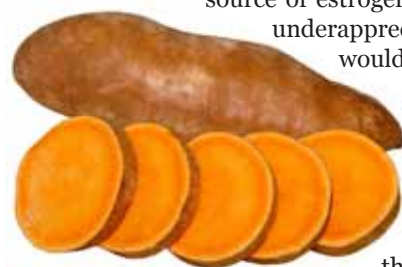
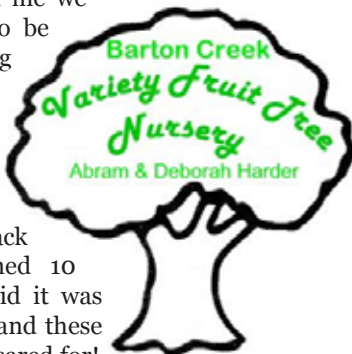

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## Yam- A Gentle Giant of Tropical Roots

### By Deborah Harder

In January my husband told me we have several yams waiting to be dug, and we should start using them before the potato crops come in, here in Barton Creek. I asked why he didn't tell me sooner. Soon afterwards a large, brown, muddy, knobby specimen appeared on our back porch; it must have weighed 10 pounds. But my husband said it was only half of the smallest one and these grew up as volunteers and uncared for!



Yam, not to be confused with the smaller and unrelated sweet potato and also not to be confused with the wild yam, a herbal source of estrogen, is surely one of Belize's underappreciated foods. A vine that would thrive climbing up a tree in your orchard, it grows from seeds that look, strangely enough, like miniature yams, borne on the vine like flying potatoes. How manifold the variety of our Creator's creations! If yams are not "kind" enough to grow voluntarily at your place, plant the seeds in June or so in a hole either below a tree they can climb or in the garden with some structured support, which can be as simple as a tepee of poles. You would expect the second option to yield more fruit, but so far we have actually had better success just planting them in unplowed ground.

You can start eating them about nine months later (the following dry season) but you can leave them in the ground for quite a while after that; however, over time they become woody and eventually rot. One elderly bachelor had a large one which he could not eat all at once, being only one person. He harvested the yam piece by piece, letting the vine grow. In the end he calculated that it must have weighed 70 pounds! If you harvest your yam all at once it also keeps quite a while in the house as you use pieces of it. The cut end dries out so you just have to re-trim it. I have a piece like that in my pantry which has been there for several weeks and shows no sign of spoilage.

A full grown yam is easy to find as it sticks partly out of the ground, with a finger-thick vine growing out of it. To harvest your yam, cut off the vine with a machete, unless you want to leave it growing as the above-mentioned bachelor did, and dig around with a pick until you can see how to pry it from the ground. Don't forget to search the ground for yam seeds, resembling tiny yams, ranging in size from a jumbo marble to a smallish potato. Better yet, if you get them before they drop, you can take them from the vine. Stick a seed in the ground where you just dug out your yam, if you'd like to repeat the experience the following year, and gather the rest, each one a camouflaged pear, to plant elsewhere or share with friends.

Yams are a bit of a challenge to handle, due to their slimy quality when raw and their tendency to cause itch. (These qualities are

reversed by cooking.) I used to always stab them with a fork and peel with a knife so I could do it without touching them, though lately I discovered I could touch them a bit without adverse side effects. It may depend on how sensitive you are. If you didn't scrub it before peeling, which might be a good idea, then you must wash the peeled yam chunks. Now your yam is ready to be cooked.

Yam can be used the same way as potatoes: shredded and fried; diced and added to soup, stews and curries; or boiled and mashed, which is our most common way of preparing them. Boiling and mashing them require the least handling of the slimy chunks, and they do mash beautifully. I usually add butter, cream and milk, salt and freshly ground pepper. Even better, my family likes the patties I make from the leftover mashed yam. Add a few eggs, some diced onions, and a half-cup or so of flour (I use cassava flour) to 3 or 4 cups of mashed yam. Drop by heaping tablespoonfuls into a greased skillet and fry till golden brown, turning once. This same mixture, with a little more milk added, and perhaps some leftover bits of cooked meat, makes a good casserole when baked.

The potato crop has, indeed, flooded Barton Creek now, though not as abundantly as some years, due to the irregular weather; but there are plenty that can be used up before they spoil, potatoes not keeping as well as more tropical roots like yam. Potatoes are certainly delicious and versatile, as we are enjoying them, but I'm not neglecting my yams; mashed yams make an excellent base for bread-making, a nutritious addition to any loaf. So let's give thanks to our Creator for yam, the gentle giant of tropical roots.



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## Breadfruit Basics

by Marc Ellenby, Tropical Agro-Forestry



Beautiful tropical breadfruit trees are very well-adapted to Belize's growing conditions including the rainy season; however, they can get water-stressed, resulting in partial defoliation in the dry season months but the tree continues to grow and bear fruit.

The breadfruit tree has an exotic, lush tropical appearance due to its very large, lovely, lobed leaves.

Breadfruit, (*Artocarpus altilis*) is in the plant family Moraceae. There are both seeded and seedless breadfruit varieties. Other cultivated *Artocarpus* species include *Artocarpus camansi*, known as breadnut; *A. heterophyllus*, jackfruit, and *A. integer*, champedak. Another relative of the breadfruit called dugdug is *A. mariannensis*, and the popular marang is *A. odoratissimus*. The seeds in all *Artocarpus* species may be boiled or roasted; they are both starchy and delicious.

When breadfruit is mature but still firm and starchy it can be sliced the thickness of bread and buttered and fried for a bread/toast substitute (the thinner the slice, the crisper the chip). However, this versatile fruit may also be cut into chunks and steamed, boiled, baked, or roasted. The cooked fruit is puffy and similar to bread or buns, thus its name. Immature, young and very green fruit may be boiled and reportedly tastes like cooked artichoke hearts. The people of the Pacific islands roast the whole, starchy, mature green breadfruit on pre-heated rocks in an outdoor underground oven. Fully ripe breadfruits, both sweet and soft, are eaten as dessert fruits; they may be eaten raw, cooked or baked.

Breadfruit is native to a broad area of the western Pacific, near Papua New Guinea and the Malay-Indian archipelago and has been widely grown in the Pacific islands and the Philippines for thousands of years. Breadfruit trees yield large amounts of fruit and may have a productive life of more than 80 years.

Having been carried by travelers, breadfruit plants have been planted throughout the tropical Americas and the Caribbean islands. First introduced into Jamaica as early as 1784, it is commonly grown there both in dooryards and in small commercial plantings.

Currently, there is a renewed interest in large scale breadfruit production in the Hawaiian islands, where breadfruit is called Ulu. Many thousands of breadfruit trees have been planted, and fruit production is used both fresh and in value-added products, notably breadfruit flour. Current information on breadfruit cultivation may be found on the website of the Breadfruit Institute in Hawaii, a non-profit educational institute: [www.Breadfruit.org](http://www.Breadfruit.org).

Seed is planted to multiply the seeded breadfruit varieties. But propagation of the seedless breadfruits is done vegetatively,

generally by severing root suckers from the mother tree. This may best be done in stages, so that the young sucker develops roots of its own in place before full separation from the mother tree. Air-layering or marcotting is another method used for propagation; marcotting is best done when the plants are actively growing. Also, root cuttings of 3-4 cm diameter that are 12-30 cm long may be propagated in sand or a well-drained organic potting soil.

Both male and female flowers are on the same tree, and pollination is assured by wind and by insects of many kinds. Breadfruit trees planted in the field grow rapidly in size. Its soft wood may be easily pruned for tree height control and for a good selection of sturdy horizontal limbs. Generally though, our dooryard trees in Belize are very large and are not pruned, and this makes harvesting challenging. Still, a broad and spreading low tree canopy may be developed with some judicious pruning cuts.

Mature breadfruits are ready for harvest about three months after flowering, exhibiting a yellowish color break as the sections, or eyes, seem to spread open. When mature, skin texture is less pointy, and becomes more smooth and flattened. Natural skin cracks begin dripping small amounts of sap. The color of the fruit stem also becomes more yellow-green.



Breadfruit is an excellent tree in traditional agroforestry systems, and many other food plants such as banana, cacao, taro, and soil-building legume crops such as perennial peanut (*Arachis spp.*) and Lablab bean (*Lablab purpureus*) thrive as companion plants.

Short term vegetable crops such as tomato and pepper or quick perennial fruit crops such as pineapple and papaya may be planted between young breadfruit plants. Diversity created in agroforestry systems is environmentally sound and beneficial to the broad ecosystem; yields are more continuous, nutrients are shared and conserved, and pest pressure may be minimized.

Tropical Agro-Forestry, Ltd. is always in search of new fruit varieties for the forest edges and cultivated areas. As sustainability remains important on our farm, we will continue to explore both fresh production and value-added products for nutritious breadfruit.

Please visit our website [www.BelizeAbility.com](http://www.BelizeAbility.com) -- Spanish Creek Rainforest Reserve -- and enjoy a nice video on our Home page to meet our crew.



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## Belize Ag Youth Reporter Visits Miss Chrissie's Whiz Bang Chicken Plucker

### By Roberson/Feucht



This is not a fiction article, although from the title it might be about a farm beside "Willie Wonka's Chocolate Factory". Belize Ag Youth Reporter Nick Roberson\*, is fascinated and curious about all

aspects of chickens and other domesticated fowl - guineas, turkeys, ducks, geese, he loves them all. Nick is always ready to accompany Belize Ag writers out on any chicken story. So when Ms. Chrissie Tupper announced to a few friends that she acquired a brand new *Whiz Bang Chicken Plucker*, imported from the USA and ready for assembly at her farm behind the Tupper's restaurant, *Cheers With a Tropical Twist*, at Mile 31 on the George Price Highway, Belize Ag planned to check it out. March 23<sup>rd</sup> was the big day. Chrissie had completed the plucker assembly and fine tuned it and Nick was on spring break from San Ignacio's Sacred Heart Primary School; she invited us over for a demonstration.

The first step, of course is to humanely slaughter the birds, accomplished in the "killing cones" on the farm. The next step is to scald the birds in Chrissie's new scalding tank, custom-made from a recycled 20 gallon propane hot water heater tank with the top cut off. The scalding tank has a central core, running from the bottom and rising out of the tub up approximately 36 inches. On this core near the top is a nifty rack called a gondola for hanging 4 birds upside down by their feet (the feathered body dangling down). With a manual lever, the bar is lowered and the chickens are submerged into scalding water, ideally kept at between 140° and 145° F. The birds are scalded until their wingtip feathers can easily be plucked off by hand - approximately 1 minute. If the bird is under-scalded the feathers are difficult to remove. If the bird is over-scalded, by hotter temperature or excessive time, then the skin becomes ultra-fragile, and can easily tear while in the plucker. Chrissie was still trying to adjust her tricky thermostat, which was giving problems, to maintain the steady temperature with less than 4° variance.



Next step is to put the chicken into the wondrous *Whiz Bang Chicken Plucker* (WBCP), designed by small chicken farmer, Herrick Kimball, who was searching without success for such a device for his own use. He eventually made his own and wrote a book on how to make the plucker and the scalding tank and now sells kits and parts for the system.



The birds, up to 3 at a time, are placed "loose" into the plucker drum. A 3/4 hp electric motor is started and the birds begin to dance. (Neither motor nor drum comes with the WBCP.) The watchful attendant has a hose in hand, to gently rinse the birds as they are bounced around, and the hose water washes the feathers around and eventually out, down the drain at the bottom of the tub, under the raised false bottom. The feathers are used in fertilizer on her farm.

A mere 15 - 20 seconds, and the *Whiz Bang Chicken Plucker's* rubber "fingers" inside the rubber tub (made from half of a 50 gallon drum, (see picture) neatly de-feather the bird. The time for an experienced plucker to manually pluck might be 5 minutes, so this gadget is a great time saver and investment to upgrade a hobby farm to a revenue earner.

After plucking, the birds are gutted, and iced down, ready for cooking or freezing for a later day.

At [www.whizbangplucker.blogspot.com](http://www.whizbangplucker.blogspot.com) you can access more information on the plucker, scalders and other eclectic poultry-related products and topics. the WBCP kit cost is US\$415; the freight from New York to Belize and duty for Chrissie's totaled BZ\$380.

Chrissie's diverse and growing farm behind Cheers provides all the fresh eggs for use in the restaurant, and an increasing amount of the broiler chicken meat and occasionally pork as well.

**Editor's Note: Yes, Nick Roberson is the grandson of Editor Beth Roberson. Who will be the next Belize Ag Youth Reporter?**



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## Antibiotics off the Menu by Mary Susan Loan

The Belize Bureau of Standards commemorated "World Consumer Rights Day 2016" in Belize on March 14<sup>th</sup> at the Belize Biltmore Plaza Hotel by hosting a seminar with the theme *Antibiotics off the Menu*. The World Health Organization has identified the over-use of antibiotics in animal feed as a world crisis.

The event focused on the risks of antibiotic use in the poultry, pig and cattle industry. "The widespread use of antibiotics is used to control, suppress or to kill micro-organisms," stated Armando Cowo, manager of the Belize Poultry Association. Mr. Cowo urged the use of antibiotics to be limited and used only "when it is absolutely necessary." He recommended that farmers use best practices by keeping barns and animal lots clean and decreasing the population density of animals. Antibiotics in animal feed also perform the function of growth enhancers for animals, growing animals faster and larger. John Bodden, Principal Public Health Inspector, noted, "It is the improper use of antibiotics that leads to resistance, classified as antimicrobial resistance, which threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi." Mr. Bodden further stressed, "If there are residues remaining in the food animal, there is potential for that organism to be transmitted to the human on consumption." Mr. Bodden said his agency is committed to help minimize the spread of antimicrobial resistance. One of his presentation points advised, "**Clean hands save lives**", noting that frequent hand washing is an important habit to employ to help prevent disease.

Dr. Natalie Gibson, Deputy Director of Food Safety at Belize Agriculture and Health Authority, noted that medications which were once used to treat infections are no longer useful. "Antimicrobial resistance to food-borne zoonotic bacteria, salmonella, and campylobacter in humans have been clearly linked to antibiotic use in food animals," Dr. Gibson stated. She advised the following steps to combat antimicrobial resistance: "Commit to a comprehensive financial national plan with accountability and civil society engagement; enhance infection prevention and control; and foster innovations and research and development for new tools."

Other speakers noted that some farmers are requesting antibiotic-free animal feed, citing enzymes can be effectively used rather than antibiotics. Ms. Genae Thompson Palacio, representing the Belize Pharmacist Association, said consumers tend to overuse antibiotics inappropriately when they are ill with viruses and organisms that do not require or respond to antibiotic use; this practice helps create antibiotic resistance to infections when antibiotics **are** needed. She recommended a national informational plan to regulate sales and use of antibiotics and more consumer education.

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## Parasites...Continued from page 32

very effective. Severe cases are treated intravenously (IV) or by intramuscular injection (IM). These patients need to have frequent blood tests to monitor the effects of the medication on the liver and other organs.

As they say, "Prevention betta than Cure!" When spending time in the jungle, especially during the dry season, wear protective clothing, spray clothing with DEET, use insect repellent on any exposed skin. Use mosquito nets or screen windows. Check your water source. If in doubt, boil drinking water for at least a minute. Install a good water filter system. Don't go barefoot where animals live, especially at night. Hookworms come out of the soil at night just waiting for someone to walk over them. They then latch on and

begin to bury their way inside. Every day eat some fresh raw garlic, apple cider vinegar, pumpkin seeds, cayenne pepper, cinnamon, cloves, and probiotics such as kombucha, kefir, cultured yogurt or fermented pickles, vegetables and fruit. Eat high fiber foods and lots of colorful fruits and vegetables. Drink lots of water!

### How to Eliminate Parasites From Your Body and Stay Parasite-Free

Now that I have you thoroughly freaked out, let's talk about the good news: You can rid your body of them and stay parasite-free. I won't go into the horrid details of each parasite; there are too many. Do a quick google search for parasites. You can find out everything you need to know.

Basically, if your gastrointestinal system is healthy, if you have frequent bowel movements (two or three a day) your body can eliminate most parasites naturally because their gestation period is about 36 hours. Otherwise they can settle in, reproduce, grow, move to other parts of the body and begin to cause pain and discomfort.

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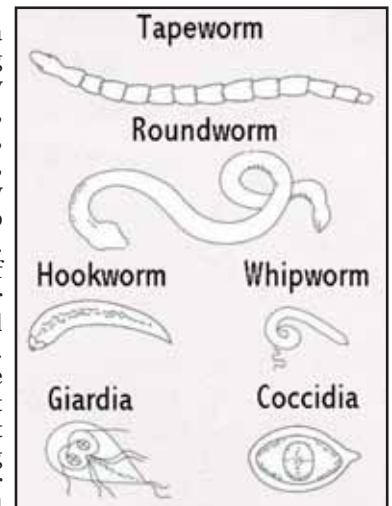
A good way to do a thorough parasite cleanse is to go to this website and order the Parasite Cleanse by Dr. Hulda Clark for US \$49.05. You need one set (three items) per person. It is an 18-day cleanse and no change in diet is necessary. It is a potent systemic microbial cleanse. It works throughout the body, not just in the gastrointestinal system. There is also a weekly maintenance plan which keeps you parasite-free. The problem with this choice is that it is expensive. Thankfully, there are other methods, if used faithfully, that will do the job and keep you and your family free from these tiny nuisances.

### Bentonite Clay

Bentonite clay (montmorillonite) and other clays help detox by absorbing parasites and other foreign particles and eliminating them through the digestive system. Add flaxseed or psyllium to the protocol for fiber. Clays remove all bacteria, both good and bad, so remember to supplement with probiotics to restore healthy bacterial flora after your cleanse and selenium to eliminate any metals. Drink lots of water.

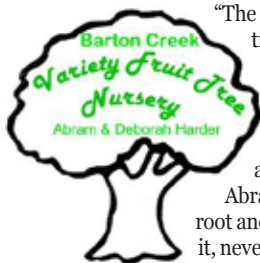
### Diatomaceous Earth

In his book, "33 Ways to Get Rid of Parasites: How to Cleanse Parasites for People and Pets With All Natural Methods" by Stephen L Tvedten (available on Amazon), the author says, "Diatomaceous



**Continued on page 42**

## POB Speaker Abram Harder



"The biggest mistake people make when planting a tree seedling is to plant it too deep," said Abram Harder, speaker at the Pro-organic Belize (POB) April meeting. That statement riveted the attention of the 23 people who came to hear him and exchange information with other attendees about growing trees and plants with "low input".

Abram went on with specific instructions: find the tap root and plant the tree so that the soil is only 1 inch above it, never deeper, then clean it around the stem and mulch the tree well. He said that manure from either chickens

or cows can be used as fertilizer but the important thing to remember is to keep it away from the trunk. Cow manure has more potassium than chicken manure. He further advised that most trees respond well to applications of Epsom salt (1 cup Epsom salt to 1 gallon of water) because it adds magnesium to the soil. Abram enumerated the growing characteristics of many of the trees in his nursery; for example, he said that avocado trees thrive in the white marl that is prevalent in the Pine Ridge area.

Abram's attentiveness to nurturing the seedlings in his nursery reflects his firm belief that we should be good stewards of God's creation. He has spent most of his life around trees and seedlings as he learned how to recognize seedling potential, graft trees and care for seedlings from his father who owned a nursery.

When fruits are in harvest, Abram's wife, Deborah, one of the writers for the Belize Ag Report, goes to work canning, dehydrating fruit, making mango butter and many varieties of fruit vinegars, and develops recipes for produce such as cassava.

See POB list of upcoming speakers in upper right column of this page.

## Wild Squash or Wild Pumpkin (Sikil) By Harold Vernon

Belize has a number of indigenous foods that are increasingly being neglected. One such fruit (vegetable) is the "sikil" *C. hurdelliana*; origin: Mexico, Guatemala, Belize. Sikils, about the size of a husked coconut, are white with green striations. All the people I have sampled recently cannot remember the last time they had eaten this highly nutritious food. It is usually grown without pesticides. All persons reported that they cooked it (to death) with meats. None reported eating it raw. All squashes can and should be eaten raw to obtain maximum benefit. This squash make the best coleslaw I have eaten when julienned and/or complimented with fresh tomatoes and fresh cheese for a simple salad. Please tell us how you prepare and consume this native food.



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## Pro-Organic Belize (POB) Speakers Calendar

POB meets the first Tuesday of every month at noon and the regular venue is Maya Mountain Lodge, 3/4 Mile, Cristo Rey Rd, Santa Elena, Cayo District. Lunch can be ordered off the menu during the meetings. Lively question and answer time follows the presentations. Everyone is welcome. Call 677-9658 for more information.



Speakers commence at 1 p.m.

May 3rd - Mr. Bill Lindo of Lake 1 Development Co. Ltd.

June 7th - Mr. David Thiessen of Agro-Base

July 5th - Mr. Michael Somerville, Belizean author of The Garbage Menace

August 2nd - Dr. Thomas Mathews of Belize Spice Farm

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## FAO Food Indices



Note the worldwide trend in food prices on these FAO Food Price Indices, with general downtrends except for sugar and oils. Prices of Belize's farm products (*see centrefold Ag Prices at a Glance, pg 23*) mirror these, showing either stable or slightly lowered prices as well.

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# AG BRIEFS



The 2016 Wine and Chocolate will be held on Friday, May 20th at The Lodge at Big Falls in Big Falls Village. The Saturday, May 21st event will be held on Front Street in Punta Gorda town and Sunday, May 22nd

will be at Julian Cho Technical High School at Dump Area, San Antonio Road. Contact <info@chocolatefestivalofbelize.com> or call 722-2531.

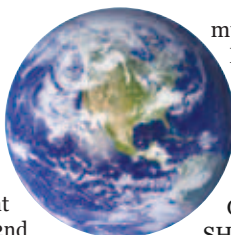
The University of Belize College of Agriculture at Central Farm (UBCF) will host prominent soil fertility expert Neal Kinsey for the 3<sup>rd</sup> time in Belize, on February 27<sup>th</sup> – March 1<sup>st</sup> 2017 (the 2016 course was held earlier in Feb 2016). The upcoming course will be a new course to Belize; the 3 day Intro 2 course begins with a day and a half of trace minerals. Workbooks for the new course are available now for paid registrants of the next year's Intro 2 course. All are welcome to attend this course – students, teachers, private sector. Contact David Thiessen at 670-4817 or [thiessenliquid@gmail.com](mailto:thiessenliquid@gmail.com). Neal reports that this is "the favorite course" of farmers.



The Cayo chapter of Belize Tourism Industry Association (BTIA) is planning a Corn Fest to be held on October 14th & 15th, 2016 at Macal Park, downtown San Ignacio. Details contact [rayleeaust@yahoo.com](mailto:rayleeaust@yahoo.com) or call Lee at 667-2740.

Cayo Quality Honey Producers Cooperative in collaboration with the Department of Cooperatives, the Ministry of Agriculture, GEF/SGP, and GIZ-Selva Maya is announcing the celebration of Belize's 1st Beekeeping Symposium and Honey Day. The event will take place at the Cayo Welcome Centre on Friday 27th and 28th of May, 2016, and intends to engage all beekeeping stakeholders in a discussion to review the challenges and potential of the beekeeping industry as an agro-forest activity that promotes the conservation of biodiversity. You are all cordially invited!

The 2016 Hopkins Mango Fest will be held on Saturday May 28<sup>th</sup> and Sunday May 29<sup>th</sup>. Arts and Crafts, Food, Mango Cooking Competition, an "Under the Mango Tree" storytelling competition, live



music and other activities are planned. Contact the Hopkins BTIA Chapter at [intolive@yahoo.com](mailto:intolive@yahoo.com) or call Nisha at 61503003 for more information or to register for a booth.

Mark your calendars for Sustainable Harvest's Annual Organic Fair, which will be held on Friday October 28<sup>th</sup> and Saturday, October 29<sup>th</sup>, 2016. Further information contact SHI as per their advertisement on pg 38.



Pro-Organic Belize meets monthly in Santa Elena, Cayo District, on the first Tuesday of the month with a speaker. Details on pg 31. All are welcome.



CARDI will commence field trials in early May, planting 8 varieties of open pollinated corn, including white, yellow and purple. The objective is to evaluate which will give better yields without irrigation. Fields will be irrigated for germination only.

Dr. Ken Foster, Department Head of Purdue University's Department of Agricultural Economics visited Belize in March. Ken was on the faculty of the College of Agriculture at Central Farm from 1981 to 1984 while he was serving as a US Peace Corps Volunteer. Many of his former students and colleagues reunited for a breakfast at the University of Belize College of Agriculture at Central Farm, hosted by Dr. Gordon Holder. A lunch with some of Spanish Lookout's row crop farmers and field visits there were other highlights of the trip. Ken visited agricultural operations in Toledo as well during his stay.



The US Senate voted down HR1599 in early 2016, a bill which had passed in the US House in July of 2015. This bill would have nullified all existing state legislation regarding biotechnology and labeling in the food industry, transferring all powers in these fields to the federal government. The bill's proponents are expected to re-write parts of the bill and resubmit it for another Senate vote.

No-till farming is used on approximately 38% of acreage of the USA's 4 biggest row crops, while cover crops are estimated to be utilized on less than 5% of acreage. Look for more about these in our August issue.

## For Information on the status of the Iguana Creek Bridge

waters rising or falling, out of water, under water, go to [iguanacreekbridge.blogspot.com](http://iguanacreekbridge.blogspot.com)

The Iguana Creek Bridge crosses the Belize River near Black Man Eddy Village, off the George Price (Western) Highway.

## Local and Regional Fuel Prices



	Cayo, Belize	Quintana Roo, Mexico	Peten, Guatemala
REGULAR	↑ \$8.97 Bz/Gal	↑ \$5.74 Bz/Gal	↓ \$6.31 Bz/Gal
PREMIUM	↓ \$9.11 Bz/Gal	↑ \$6.09 Bz/Gal	↓ \$6.57 Bz/Gal
DIESEL	↑ \$7.89 Bz/Gal	↑ \$6.00 Bz/Gal	↓ \$4.87 Bz/Gal



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The EMTs are trained to meet or exceed standards set by BERT and are retested every year. We've also been giving First Aid classes to schools and other organizations.

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[BelizeNews.com](http://BelizeNews.com)



## A New Pest...Continued from page 19



Shows entomopathogens infection on aphids. Credit: Mr. E. Guzman.



Shows *Z. longipes* on sorghum leaf. Credit: Mr. G. Mai.

of factors including the population density and duration of the infestation which can occur immediately after germination, but a significant infestation happens during the last stage of growth and during the dry season. The sugarcane aphid causes yellow to red or brown leaf discoloration on both sides. The honeydew may also support the growth of black, sooty mold fungus. Infestation of seedlings can kill young grain sorghum plants and late infestations can prevent grains from forming. High infestations of aphids can cause grain yield losses between 30%-100%.

*M. sacchari* can transmit sugarcane mosaic virus (SCMV) and sugarcane yellow leaf virus (ScYLV) and other diseases.

An integrated pest management approach is recommended to manage the yellow sugarcane aphid.

**Cultural control:** Eliminate host plants before and after planting, eliminate crop residues, schedule early planting of sorghum and plant resistant sorghum varieties.

**Biological control:** In Belize several beneficial insects that help regulate aphid populations were collected during the yellow sugarcane aphid survey and later identified as Coleoptera; Coccinellidae; Spotless lady beetle (*Cyclone dasanguinea* L.); Hemiptera; Reduviidae; milkweed assassin bug; *Zelus longipes* L.; Neuroptera; Chrysopidae; green lacewing (*Ceraeochrysa* sp.); Diptera; Syrphidae larvae; parasitic wasps and entomopathogens

**Chemical control:** The criteria used to control the yellow sugarcane aphid on sorghum is the detection of 50-100 aphids per leaf. Apply systemic chemicals for seed treatment: Engeo 24.7 SC, Pirimicarb, Muralla 10 EC and Malathion 57 EC (Drexel) for corn; Malathion 57 EC (Drexel) for rice, sorghum and pastures; Muralla 10 EC for sugarcane and sorghum; apply pyrethroides Karate Zeon 2.5 CS to control the aphid. To avoid pest resistance to insecticides use biorational chemicals and rotate them by different modes of action.



Shows an adult syrphid fly on sorghum head. Credit: Mr. E. Guzman.



Shows *C. sanguinea* on sorghum head. Credit: Mr. G. Mai.



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# MONKEY FALLS



Riverfront homesites, Minutes from San Ignacio

### **Fire...Continued from page 20**

though, there can be both negative and positive effects, but as fire intensity and duration increase to the point of removing all surface plant litter, there is potential for significant increases in water runoff and soil erosion.

Most traditional burning of vegetation in Belize occurs during the dry season from March through May, though pre-harvest burning of sugarcane begins in late November. Otherwise, depending on very local conditions, there is a high probability that somebody is burning vegetation on any given day of the year somewhere in Belize. Commonly the main objective of vegetation burning is the huge labor savings while disposing of unwanted vegetation during land clearing in preparation for cultivation. In the case of sugarcane there is also the economic saving due to removing and not transporting the excess leaf material that is burned off the cane while it is still standing live in the field before it is harvested.

The current official burning of vegetation regulations in Belize are defined in *Fire (Negligent Use Of) Act Chapter 117, Revised Edition 2003, Burning Vegetation Rules*. The regulation states: "No person shall burn or cause or permit to be burned any vegetation for cultivation unless there is a firetrace completely surrounding the area containing such vegetation. Such firetrace shall be of a width not less than the average height of the vegetation before it was cut, provided that in no case shall width be less than six feet, be cleared of debris in such manner as to render it fireproof before the 31 March in any year, and be kept cut and cleared of all debris so as to be fireproof at all times between 31 March and 30 June whether the cutting of the vegetation which it surrounds is not yet started or is incompletely cut".

Consequently, burning is legal year round without a permit, but a firetrace or fireproof buffer around the proposed burn site must be maintained essentially from the beginning of the dry season 31 March and extending to 30 June or after the rainy season has started. Additionally, it is unclear about the required state of the vegetation, alive or dead, standing or cut during which time it can be burned. Unfortunately, the reality of most burning in Belize is that it is motivated by the labor costs saved on removal of non-consumable biomass, with little consideration of the many potential negative impacts on soils, water quality, the loss of biodiversity, ecosystem services and, of course, increased greenhouse gases emissions that are driving climate change. Despite the long traditional use of fire as a vegetation management tool in tropical and subtropical ecosystems, it is now being viewed as an increasingly excessive and environmentally abusive method for disposing of unwanted vegetation. Therefore, it is prudent for Belize to significantly reduce or discontinue the somewhat indiscriminant and poorly monitored use of fire and the lack of compliance with constructing firetraces. Instead, the main and long term benefits of vegetation management techniques should be to convert as much non-consumable plant material into soil organic matter as possible, instead



Is this how we want to care for the "Jewel"?

of atmospheric carbon dioxide. This shift away from the over use of fire can only improve the health of many soils, significantly reduce greenhouse gas emissions, and slow the currently declining health of the planet.

### **Parasites...Continued from page 37**

earth (DE) is the best natural anti-parasitic medication the author has ever researched, studied, and/or used." Plain food-grade DE is safe for humans and pets, even for children, but the dosage must be carefully calculated. DE works by dehydrating insects, worms and parasites. The adult dosage is one tablespoon per day for seven days.

#### **Fasting**

Use green vegetables for a juice fast lasting several days. Choices to juice are broccoli, cucumbers, leafy greens, carrots, onions, garlic, leafy greens, along with lemon juice and spices such as turmeric. Because there is not much fiber in juices, you need to add a mild laxative, psyllium, flaxseed, or magnesium supplement to keep the bowels moving to expel toxins and dead parasites. You can fast as long as you are willing because you are receiving rich sources of vitamins and minerals.

#### **Lemon Juice**

Perhaps the simplest and cheapest method is to do a lemon juice cleanse. Add lemon or lime juice to water and drink throughout the day. Lemon juice works at the cellular level, starving parasites who cannot survive a clean environment.

#### **Apple Cider Vinegar**

Organic apple cider vinegar does not kill parasites but it makes the environment inhospitable for parasites to survive. Try to find Bragg Organic raw, unfiltered apple cider vinegar with "the mother." Take one or two teaspoons of vinegar in 8 oz. of water. If sweetening is desired, add one or two teaspoons honey, maple syrup, molasses, or 4 drops of stevia. Drink three times a day.

#### **Garlic**

Garlic, *Allium sativa*, can be effective for treatment of Giardia lamblia and Ascaris (roundworm). Eat freshly cut or diced garlic before meals to stimulate gastric secretions which effectively destroys a parasite's chance of survival. Chop up three or four cloves and eat within 15 minutes for maximum benefit. Add to salad dressing or drink it using grape juice to disguise the flavor. Do this at least once a day, up to three times a day if you are ill.

#### **Avoid Sugar and Processed Foods**

Parasites love the foods you love. They especially love sugar. If you find yourself craving sweets, consider the possibility that your unwanted hitch-hikers have taken your appetite hostage. Avoid sugars, dairy products and all refined foods.

Drink plenty of water and juice to help eliminate toxins and to avoid dehydration. I can't overemphasize this. Maintain frequent bowel movements by adding fiber such as chia seeds, flaxseed and psyllium to smoothies or salad dressings. If necessary use a mild laxative but only for a short period of time. You can take magnesium, aloe vera or acidophilus if needed. Aches, fatigue, mood swings, and headaches are some of the signs your body is eliminating toxins. They should be temporary and can be considered a good sign.

The existence of parasites in our lives, much less in our bodies, is something we prefer not to think about. Yet we suffer from various ailments that may be caused by parasites. This document barely scratches the surface of the subject. If you are concerned, ask your doctor to run tests. Unfortunately it is very difficult to detect some parasites even under a microscope. A cleanse two or three times a year along with a maintenance plan would help eliminate them from your body so you can enjoy better health. The simple lemon or lime cleanse can be done by anyone anywhere. At the very least, be aware and consider the possibility. Treatment can literally mean the difference between life and death.

**Disclaimer: The purpose of this column is to share useful information about health that is relatively inexpensive and generally readily available for everyone. The information is not meant to be a substitute for health care, i.e., regular visits to a healthcare provider and as necessary when you are ill.**



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