

# The Belize Ag Report

*Belize's most complete independent agricultural publication*



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Caribbean Agricultural  
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**GOSS CHOCOLATE**



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## Control Postbloom Fruit Drop (PFD) In Citrus Production

Edwin Gomez, Raymond Arnold, David Saravia, Davilmar Avilez

### INTRODUCTION

Postbloom Fruit Drop (PFD) in citrus is caused by a fungus identified as *Colletotrichum acutatum*. Based on Florida Citrus Pest Management Guide, 2016, the fungus affects all species and cultivars of citrus, but severity of the disease varies based on flowering time and precipitation.

Spores of this fungus are produced directly on the surface of infected petals and are dispersed by rain to healthy flowers within 24 hours. Symptoms of the disease are visible in 4 to 5 days after inoculation (N.A. Peters and M. M. Dewney, 2016).

Two models have been developed to determine fungicide application to control PFD: the PFD model and the PFD-FAD system. (Both model descriptions available at University of Florida Web page.)

A fungicide trial was conducted at Barton Creek, Cool Shade, Cayo District to control PFD from 16<sup>th</sup> June, 2017 to 18<sup>th</sup> July, 2017. Area under trial were 15 acres treated and 15 acres as control. Plant rootstock was sour orange, scion Valencia, plant density at 96 plants per acre. Grove age, 25 years.

### OBJECTIVE

1. Apply a Strobilurin in combination with a Triazol fungicide to control Postbloom Fruit Drop (PFD) and improve orange fruit set at flowering. 2. Elaborate an estimated cost benefit analysis after fruit set in treated area to compare with control.

### METHODS

1. Select a problematic area with PFD 2. Choose most significant flowering period of grove. (For this trial, fungicide application was done in June for second flush.) 3. First application done at pinhead previous to flowering with a strobilurin **Regnum 25 EC** at

185 cc per acre 4. Second application to be done 10 to 12 days after the first application, mix a Strobilurin (**Regnum 25 EC**) at 185 CC per acre, combine with a Triazol at 200 cc (**Difecor 25 EC**). For both applications use 300 litres of water per acre, regulate water pH with **Pegador pH** and a sticker **Silkawet** 5. Count fruit set after 20 days of second application in 18 trees in treated area and control area to develop an estimated cost benefit analysis.

### RESULTS AND ANALYSIS

#### COST OF FIRST APPLICATION

APP	PRODUCT	DOSAGE (cc/ acre)	COST/UNIT	COST/ ACRE
1	Regnum 25 EC	185.00	\$ 155.00	\$ 28.68
	Pegador pH	378.00	\$ 18.50	\$ 6.99
	Silkawet	378.00	\$ 6.50	\$ 2.46
	App Cost/Ac	0.00	\$ -	\$ 4.00
<b>TOTAL</b>				<b>\$ 42.13</b>

#### COST OF SECOND APPLICATION

APP	PRODUCT	DOSAGE (cc/ acre)	COST/UNIT	COST/ ACRE
2	Regnum 25 EC	185.0	\$ 155.00	\$ 28.68
	Pegador pH	378.0	\$ 18.50	\$ 6.99
	Silkawet	378	\$ 6.50	\$ 2.46
	Difecor 25 EC	200.0	\$ 75.00	\$ 15.00
	App Cost/Ac	0.0	\$ -	\$ 4.00
<b>TOTAL</b>				<b>\$ 57.13</b>

#### ESTIMATED REVENUE BASED ON FRUIT SET COUNT PER ACRE

TRIALS	AVE/BOX/AC	SALE/PRICE	TOTAL
Treated	105	\$ 14.50	\$1,518.31
Control	34	\$ 14.50	\$ 488.92

#### COST BENEFIT

TRIALS	SALES/ACRE	APP COST	REVENUE
Treated	\$ 1,518.31	\$ 99.25	\$1,419.06
Control	\$ 488.92	\$ -	\$ 488.92
<b>INCOME INCREASE</b>			<b>\$ 930.14</b>

### OBSERVATION/DISCUSSION

1. Estimated yield in treated area accounts three time more compared to control in second flush. (105 boxes per acre /34 boxes per acre equals 3.088) 2. Estimated revenue in treated area sum \$930.14 after deducting application cost and product input cost. 3. Based on results obtained, combination of a Strobilurin with a Triazol is effective to control PFD; the key to positive result is in line with time of application.

# Unleashing the Potential of Underutilized Crops

## Breadfruit

By Santiago Juan



Belize has been blessed with edible landscapes. Take breadfruit, or masapan in Spanish, for example. In Belize you can see breadfruit growing in all our districts. In both northern districts you see old trees still producing well in very calcareous soils; in southern Belize

large trees can be seen in low lying areas and brackish water like in Hopkins Village or along the Sittie River, a testament to the great adaptation ability of this humble plant. Most Belizeans have eaten breadfruit at least once in their lifetime; yet it is probably the most underutilized crop growing in Belize. Nowadays, it is attracting the attention of gourmets and some Caribbean countries are making small shipments to the United States, Canada and Europe for specialized ethnic markets. Breadfruit has great potential in Belize serving the growing market for visitors to our country who are gluten intolerant, vegetarian or vegan.

### Food Uses

Like the banana and plantain, breadfruit may be eaten ripe as a fruit or green as a vegetable. In the green stage, the fruit is hard and the interior is white, starchy and somewhat fibrous. Sliced, buttered and pan-fried, it makes a tasty breakfast "toast". When fully ripe, the fruit is somewhat soft; the interior is cream-coloured or yellow and pasty and sweetly fragrant. It can be baked whole with a little water in the pan. Some cooks remove the stem and core before cooking and put butter and sugar in the cavity, and serve with more of the same. Others may serve the baked fruit with butter, salt and pepper. Ripe fruits may be halved or quartered and steamed for 1 or 2 hours and seasoned in the same manner as baked fruits. The steamed fruit is sometimes sliced, rolled in flour and fried in deep fat. The pulp scraped from soft, ripe breadfruits is combined with coconut milk, salt and sugar and baked to make a pudding. A more elaborate dessert is concocted of mashed ripe breadfruit with butter, 2 beaten eggs, sugar, nutmeg, cinnamon and rosewater, a dash of sherry or brandy, blended and boiled. Breadfruit is also candied, or sometimes prepared as a sweet pickle.

The dried fruit has been made into flour; combining it with wheat flour has been found to be more nutritious than wheat flour alone. Breadfruit flour, much richer than wheat flour in lysine and other essential amino acids, contains 4.05% protein 76.70% carbohydrates, and 331 calories per 100 grams. (Cassava flour contains 1.16% protein, 83.83% carbohydrates, and 347 calories.) In Jamaica the flour is boiled, sweetened, and eaten as porridge for breakfast. Soft or overripe breadfruit is best for making chips; these are being manufactured commercially in Trinidad and Barbados. In Jamaica, Puerto Rico and the South Pacific, fallen male flower spikes are boiled, peeled and eaten as vegetables or are candied by re-cooking for 2-3 hours in syrup, then rolled in powdered sugar and sun-dried.

All parts of the tree, including the unripe fruit, are rich in milky, gummy latex. There are two main types: the normal, "wild" type (cultivated in some areas) with seeds and little pulp, and the

"cultivated" (more widely grown) seedless type, but occasionally a few fully developed seeds are found in usually seedless cultivars. An unpublished report of 1921 covered 200 cultivars of breadfruit in the Marquesas. In 1966 the South Pacific Commission reported 166 varieties in the region; in Fiji 70 named varieties are locally separated into 8 classes by leaf forms.

### Origin and Distribution

Breadfruit belongs to the mulberry family, Moraceae. It is believed to be native to a vast area extending from New Guinea through the Indo-Malayan Archipelago to Western Micronesia. It is said to have been widely spread in the Pacific area by migrating Polynesians; Hawaiians believed that it was brought to Oahu in the 12th Century A.D. It is said to have been first seen by Europeans in the Marquesas in 1595, then in Tahiti in 1606. At the beginning of the 18th Century, the early English explorers were loud in its praises and its fame; together with several periods of famine in Jamaica between 1780 and 1786, inspired plantation owners in the British West Indies petitioned King George III to import seedless breadfruit trees to provide food for their slaves.

There is good evidence that the French navigator, Sonnerat, obtained the seeded breadfruit in the Philippines and brought it to the French West Indies in 1772. The story of Captain Bligh's first voyage to Tahiti in 1787 and the loss of his cargo of 1,015 potted breadfruit plants on his disastrous return voyage is well known. He set out again in 1791 and delivered 5 different kinds totaling 2,126 plants to Jamaica in February 1793. It has been suggested that the seeded breadfruit was carried by Spaniards from the Philippines to Mexico and Central America long before any reached the West Indies.

### Culture

Young breadfruit trees are planted in well-enriched holes 15 inches deep and 3 feet wide. The trees are spaced 25 to 40 feet apart in plantations. Usually there are about 25 trees per acre. They can also be propagated by transplanting suckers which spring up naturally from the roots. One can deliberately induce suckers by uncovering and injuring a root. Pruning the parent tree increases the number of suckers and root pruning each sucker several times over a period of months before taking it up contributes to its survival when transplanted. Those grown from root suckers bear in 5 years and are productive for 50 years. Some growers recommend pruning branches that have borne fruit and normally die back, because this practice stimulates new shoots and also tends to keep the tree from being too tall for convenient harvesting. The breadfruit tree is handsome, fast growing, and long-living; it can reach 85 feet in height, often with a clear trunk

*Continued on page 5*



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### INTRODUCING in 2018:

A new mid-quarterly online-only issue, **The Mid-Q begins in 2018**. Our regular printed and online quarterly issues – published every February, May, August and November will continue unchanged.

### Mid-Q Features:

- \***Ag Prices at a Glance**
- \***Ag Interviews**
- \***Farm Profiles**
- \***Ask Rubber Boots** (sadly booted-out of the printed issues for lack of space there...)
- \***The Treasure Crop - Youth in Agriculture**
- \***More Articles**
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Have you a suggestion for an article topic or have a finished article about Belizean agriculture to share?.....

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### 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.*

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## TO THE EDITOR

Dear Editor

Yes, I love that you have both print and online versions and really love the Ag Report! It's been such a great tool to find people and places that provide needed materials. It's so helpful for us as far as providing information about local/medicinal plants and growing/processing methods in tropical conditions. I think my favorite part is that it includes the voice of so many people and allows them to respectfully share their opinions, information and the diverse projects that are happening in their areas.

Thanks for all of your hard work and efforts to bring to light the wealth of knowledge here!

Cissy Stanko, Rancho Dolores, Belize District

## Breadfruit...Continued from page 3

to 20 feet becoming 2 to 6 feet in width and often buttressed at the base, though some varieties may never exceed 1/4 or 1/2 of these dimensions. Breadfruit is borne singly or in 2's or 3's at the branch tips.

### Harvesting and Yield

Breadfruits are picked when maturity is indicated by the appearance of small drops of latex on the surface. Harvesters climb the trees and break the fruit stalk with a forked stick to make the fruit fall. Even though this may cause some bruising or splitting, the fruit is eaten quickly; so very few losses are recorded due to bruising. Productivity varies between wet and dry areas. In the West Indies, a conservative estimate is 25 fruits per tree. Studies in Barbados indicate a reasonable potential of 6.7 to 13.4 tons per acre.



Leaves: Breadfruit leaves are eagerly eaten by domestic livestock; they are fed to cattle and goats, horses and pigs. Horses are apt to eat the bark of young trees as well, so new plantings must be protected from them.

### Other Uses

Leaves: Breadfruit leaves are eagerly eaten by domestic livestock; they are fed to cattle and goats, horses and pigs. Horses are apt to eat the bark of young trees as well, so new plantings must be protected from them.

Latex: After boiling with coconut oil, the latex is used for caulking boats and mixed with colored earth, as a paint for boats.

Wood: The wood is yellowish or yellow-gray with dark markings or orange speckles, light in weight, not very hard but strong, used for construction and furniture. In Samoa, it is the standard material for house-posts and for the rounded roof-ends of native houses. Because of its lightness, the wood is in demand for surfboards. Traditional Hawaiian drums played with the palms for hula dances are made from sections of breadfruit trunks 2 feet long and 1 foot wide. Wood rough-sanded by coral and lava, smoothed with the dried stipules of the breadfruit tree itself, and seasoned in mud is made into household articles.

Fiber: Fiber from the bark is difficult to extract but highly durable. Malaysians fashioned it into clothing. Material for tape cloth is obtained from the inner bark of young trees and branches. In the Philippines, it is made into harnesses for water buffalo.

### Medicinal Uses

In Trinidad and the Bahamas, a decoction of the breadfruit leaf is believed to lower blood pressure, and is also said to relieve asthma. Crushed leaves are applied on the tongue as a treatment for thrush. The leaf juice is employed as ear-drops. Ashes of burned leaves are used on skin infections. A powder of roasted leaves is employed as a remedy for enlarged spleen. The crushed fruit is used as poultice on tumors to "ripen" them. Toasted flowers are rubbed on the gums around an aching tooth. The latex is used on skin diseases and is bandaged on the spine to relieve sciatica. Diluted latex is taken internally to overcome diarrhea.

*Breadfruit photos courtesy of Belize Spice Farm.*



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## Cheese Making By Nadege Thomas

Almost four years ago I decided to start making my own cheese for our resort, Mystic River Lodge because of a lack of good cheeses in Belize and also because we use so much of it in our cooking that I was spending a lot of time in Belize City looking for cheese! Being French born and a great lover of cheese myself, I had a keen interest in goats and their milk; cows have never done very much for me, so goat it was! That decision led to some amazing discoveries about goats: where to get them in Belize and most importantly how to make the cheese itself since I had not a clue; but I was willing to learn. I took a one week course on “101 cheese making” and I was off. The rest is all about learning as you go, mistakes and all; I can say in all honesty that there were a few but none that I could not eat!



Over a period of a few months we put together a small herd of about 15 odd goats, mostly Saanen blood lines. Over time we started breeding only the best milkers from our herd after we learned that milking capacities are passed on from mother to kid!

Overall, Saanen and local breeds produce the most milk and are the hardiest goats here. We had problems with the kids at the beginning but got that sorted out with a proper vaccination routine and proper feed. On our 25+ acres of pastures we grow Mombasa and Guinea grass which the goats will graze during the day and we also feed them a grain mixture prepared ourselves from local products, such as cracked corn, citrus pellets, soybean meal and of course multivitamins! We also grow mulberry and purple elephant grass for them to eat; mulberry is their preferred food. We keep 5 goats per acre of fenced plot (no electric fence needed) and we rotate accordingly.

Our average milk production varies from 2 pints to half a gallon per goat so during milking season, we can get anywhere from 4 to 6 gallons of milk per day; it takes about 2 gallons of milk to yield one to one-and-a-half pounds of cheese, depending on the cheese being made.

While Eber, our livestock manager, and I were busy putting the herd together, our construction crew built a “cheese house”, a special place for me to make the cheeses, et voila! “La Fromagerie” at



Mystic River Resort was born. We have been supplying all the cheeses and yogurt for the resort ever since, and have even recently added a “Wine & Cheese Tasting” palapa for our guests to sample some of our creations. We offer the tasting by appointment only and it truly is a lot of fun.

One of my personal favorite cheeses is our coconut cheese, which is a soft cheese rolled in shredded coconut (We have many coconut trees here!), then fried. Yummy! I add a little bit of sweet and sour sauce on



top and what a treat! I also love the cheesecake our Chef David makes and love to see the look on people’s faces when I tell them the cheesecake is made with goat’s milk. I found that there is a big misconception about goat cheese out there. Most folks think of goat cheese as a pungent soft cheese when really you can make any kind of cheese with goat’s milk. It is all about the culture you use and the aging process of the cheese that determines the final cheese. I also found it great to offer dairy to our guests who are lactose intolerant. Being lactose intolerant has to do with an inability to process cow’s milk but not goat’s milk: it’s really nice to see folks who usually do not eat cheese do so and really enjoy it!

I also started going to the market every Saturday recently to sell our cheeses because we had so much milk I was having trouble eating it all! The favorite cheese at the market is our spreadable cheese with herbs and garlic. A lot of folks won’t try it because, as I am told, “they don’t like goat cheese”, again because of the belief that it is a pungent cheese. I don’t twist arms, but for those who take the plunge and try it....they love it! I found that it is my best seller after all! Our cheesecake has also done very well and on a few occasions, I have run out! I also make a fabulous cheddar style cheese which is great for shredding over just about anything: burgers, salads, pasta, etc.; a little “crotin” rolled in vegetable ash, a very dry cheese full of flavour; mozzarella; camembert and a variety of other cheeses filled with garlic, herbs, hot spices or even mushrooms! I have also tried a blue style cheese but I am not pleased with the results so will keep on trying to come up with the crumbly blue cheese.

We love our goats! They are fun, each with its own personality; some of them are downright saucy! We had them in one of our

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## Ministry of Investment, Trade and Commerce Trade Opportunities with Cuba By John Rivero

Deputy Prime Minister (DPM), the Honourable Patrick Faber, made an official visit to the Republic of Cuba from 22<sup>nd</sup> to 26<sup>th</sup> of May 2017. The objective of this state visit was to strengthen a bi-lateral relationship with Cuba. He was accompanied by a delegation of ten from the Government of Belize which included ministers, CEOs, directors, and Ambassador Burns accredited to Cuba. Belize and Cuba have always had good relations but bi-lateral trade and investment have been almost insignificant despite an existing trade agreement in place.

The CARICOM-Cuba Trade and Economic Cooperation Agreement (TECA), originally signed by both parties in 2000, was recently re-negotiated with a Second Protocol to amend the TECA. Belize's trade officials have learnt, from a recent meeting of CARICOM's Council on Trade and Economic Development (COTED) held the week of May 8<sup>th</sup> to the 17<sup>th</sup>, that all CARICOM member states signatory to the agreement had indicated their approval of the Second Protocol. This means that the Secretary-General of the CARCIOM Secretariat, who has approval from the heads of government, is now in a position to sign the protocol on behalf of the community.

Over the past three years, bilateral trade between Belize and Cuba has been minimal. Belize imports from Cuba on average BZ\$ 112,000, focusing on a few products, mostly cigars and heparin, a blood thinning agent. Our exports to Cuba are even lower, approximately BZ\$ 75,000 worth of personal and household goods. Evidently Cuba imports more than 80% of its maize and poultry and other products from the USA despite the embargo. Belize has the potential to supply high quality non-GMO products including: HACCAP-certified poultry products, maize, beans, cornmeal, and juices. Most of the products in the table above are covered for duty-free market access under the trade agreement except for maize.

Following the DPM's visit to Cuba, there has been a significant increase of activities and discussions to gauge Belize's capacity and interest to export goods to Cuba. H.E. Mr. Malmierca, Cuba's Minister of Foreign Trade, extended an invitation to Belize to have a presence in their trade fair, Fair of Havana. H.E. Ambassador Burns along with representatives from the Directorate General for Foreign Trade and BELTRAIDE have met with various productive sectors to create awareness of such opportunities. In the recent past local producers have expressed willingness to trade the following products: milk and cheese; rice - wholly milled; dried, shelled kidney beans, black beans and other legumes; frozen concentrate orange juice; sauces, jams and jellies. And with proper awareness and preparations, other trade opportunities are highly possible.

### Products of interest to Belize Imported into Cuba

Unit : BZ Dollar

Code	Product	2014	2015	2016
2.07	Meat of poultry, fresh, chilled or frozen	\$393,812,000	\$410,376,000	\$361,614,000
4.02	Milk and cream, concentrated	\$432,338,000	\$321,244,000	\$232,688,000
4.06	Cheese and curd	\$24,236,000	\$130,634,000	\$24,300,000
7.13	Beans, Peas	\$130,634,000	\$74,642,000	\$139,078,000
10.05	Maize (corn)	\$408,404,000	\$296,520,000	\$338,756,000
10.06	Rice	\$167,828,000	\$183,296,000	\$100,080,000
20.07	Jams, fruit jellies	\$880,000	\$574,000	\$2,018,000
20.09	Orange & Grapefruit juice	\$584,000	\$1,376,000	\$870,000
22.03	Beer made from malt	\$27,808,000	\$61,766,000	\$75,890,000

Some trade facilitation issues will have to be overcome for trade to flourish, including establishing logistics and transportation routes that readily link Belize to Cuba; trans-shipment routes have to be strengthened or created to allow access through Mexico or Jamaica. Cuba's ambassador to Belize has been active in this regard, offering to collaborate closely on resolving any challenges that may stand in the way of improving trade relations between Belize and Cuba.

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# BEYOND THE BACKYARD

## Aloe: An Excellent Choice

By Jenny Wildman

Aloe vera has been revered as a healing plant for centuries and graces gardens throughout the world. The Maya called it *the fountain of youth*. Others know it as *the immortality plant*, *savila*, *kumari*, *first aid plant*, *Barbados aloe*, *crocodile tail*, *lily of the desert*, *xabila*, *simple Bible*, *single Bible* and here in Creole *sink am Bible*, names showing confidence in its power to cure most ailments. There are hundreds of



species of aloe but only one proudly carrying the name “true” ie: aloe vera or *Aloe barbadensis* which is thought closely related to the *Aloe perryi* endemic to Yemen.

Aloe vera originated in northern Africa and is depicted on murals in the tombs of the Egyptian pharaohs, where it was hailed as a true miracle plant. Early alchemists and health practitioners recorded its amazing capabilities and these have been passed down for

centuries. The best legends imply fact though unsubstantiated, contain the element of the supernatural or magic and are often accepted as history. Yet “if it da no so, da nearly so.”

There are 6 references to use of aloe in the Bible, the most notable John 19. 38-40, referring to the retrieval of the body of Jesus following the crucifixion. There are many versions of the Bible but consistent in saying that Nicodemus comes to the tomb carrying linens and hundred Roman pounds (75 by today’s conversion) of myrrh, aloes and cinnamon to embalm the body for burial as was the Jewish custom. Psalm 45.8 “All your robes are fragrant with myrrh, aloes and cassia” In fact all references allude to fine aroma which our cactus like aloe vera most certainly does not possess. This refers to *Aquilaria malaccensis*, aloeswood or agarwood, a very large tree whose light wood was prized for its heartwood, which, when infected with a mold, produces a dark aromatic juice used as a perfume, fragrant spice and essential oil for embalming. This was the prized aloe that early traders sought thus causing over-harvesting and near extinction. It is said that Alexander the Great was dangerously wounded in battle by an arrow. His miraculous recovery was attributed to aloe obtained from the Isle of Socotra, Yemen in the Indian Ocean. It was said to have made him invincible. Both Cleopatra and Nefertiti used the aloe gel in their daily beauty regimes. In Egypt, aloe vera was used to embalm and its ability to inhibit bacteria and fungus gave it the reputation of being able to bestow eternal life. The Jewish sect, the Essenes, who consumed it as a superfood, are reported to have commonly lived to 125 years of age.

Whether by accidental misinformation or by its links to celebrities like Nero, Cleopatra, Dioscorides, Aristotle, Columbus and Marco Polo or by its own diverse achievements, aloe vera has been acclaimed for over 5000 years, most certainly achieving immortality. Sickness was first thought to be the product of evil demons and still superstition abounds and aloe is thought to protect against bad spirits. It can be seen at the doorway of many Mexican households to ward off evil and bring good luck. It is given as a gift to newlyweds to protect their relationship, household accidents and fire. With the belief that there is life after death they also plant aloe on graves of loved ones to promote safety whilst awaiting rebirth and ensuring a peaceful transition.

Whilst we see that the diverse beneficial powers of aloe have been known and used in many rituals for centuries, the extent of its use began with increased research. Following the radiation exposure caused by the atomic bombs at Hiroshima and Nagasaki, Japanese scientists found that those who consumed aloe and applied its gel to their skin recovered much sooner. This led to the discovery of the powerful antioxidants that aloe contains. Aloe is known to most for its benefit to skin as a moisturizer and particularly for soothing of sunburn. Today more than 250,000 gallons of gel per year are used in cosmetics alone. Yet its uses stretch far beyond skin care. Here is a short list of the ailments it purportedly treats when taken internally: constipation, stomach upsets, fungal issues, hemorrhoids, and diabetes; it is anti-bacterial and antimicrobial; it reduces inflammation, assists with weight loss, dispels parasites, improves blood circulation, cures mouth ulcers and it is also an ingredient used in commercial yoghurt, desserts, bitters and beverages.

Topically it is used on bug bites, itches, rashes, as an ingredient in soaps, hand sanitizers, body gels, make up removers, for arthritis relief, and as an exfoliate and emolument. These you can make yourself. Fresh is always more potent.

Raw gel is easy to harvest. Select healthy thick leaves from the lower part of the plant. Working from the base remove the side



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thorns from the leaf and then open, filleting the skin from the top and bottom of the leaf. Gently remove the transparent gel, discard the skin and yellow sap. This can be used as medicine but contains aloe in which is an irritant and is extremely bitter. Although allergies are seldom, some people who are allergic to latex may also be allergic to aloe. Do not use if you experience a tingling sensation on contact with the plant. As aloe is now an ingredient in so many products such as toilet paper, band aids, chapstick and diapers this could be good advice.



The gel can be made into ice cubes to use topically. For consumption to obtain vitamins A, B, C and E, many important minerals, antioxidants, sterols and polysaccharides it is best fresh not refrigerated and can be juiced or added to smoothies, salsas, dips and soups. A luxurious spa in the Yucatan touts its importance and includes aloe in their massage, beauty therapy and fabulous hydrating drinks. I surely always want to have it in my garden readily available for my guests.

Aloe is slow growing but easy; yet there are some pointers to remember. It grows best in indirect sunlight in well-drained sandy alkaline soil. Do not over water and allow it to completely dry before re-watering. If you do not live near the sea, occasionally give it a saline drink. It can be grown in pots, preferably clay, as they are porous and afford good drainage. Remember to remove the new pups to avoid overcrowding. Never over-harvest, always leave three or four healthy leaves and the plant will survive for

many years growing to as much as one metre in height. Generally the plants are pest-free but keep an eye out for bugs and changes in the plant colour indicating a problem.

You may read that there is no scientific proof for some of these claims of healing but its reputation has endured since the beginning of time. The story perhaps begins with the romantic legend that tells of the banishment of Adam and Eve from the Garden of Eden. The angel Gabriel, feeling sorry for the pair, granted them the right to take just one thing. They chose aloe, which has since been called *the shoot of paradise* and as it is *the plant of immortality*, the story is never ending.

Please send any comments or information you would like to share [jenniferjanewildman@gmail.com](mailto:jenniferjanewildman@gmail.com)

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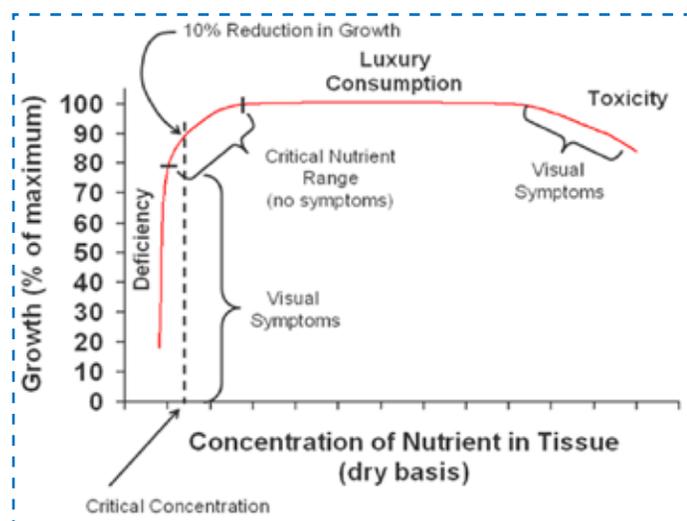




## AgScience for Better Crops Plant Nutrition By: Felix C. Cawich

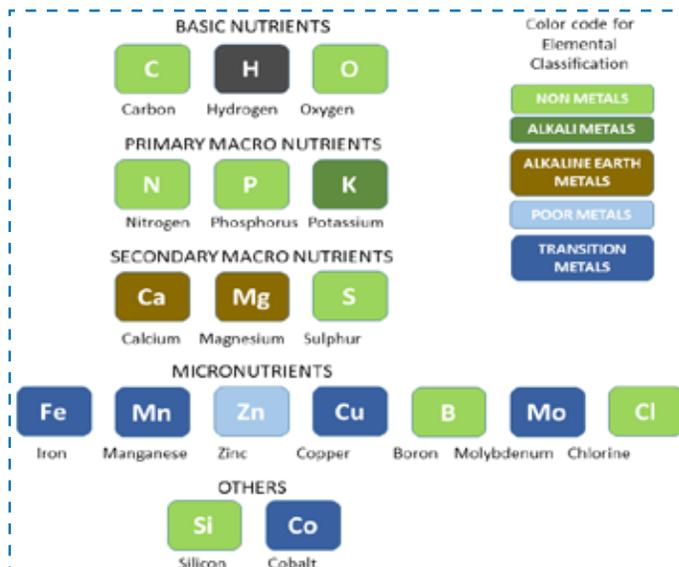
All living organisms require nutrients for adequate growth, development and functionality in order to survive. Plants have the capacity to produce their own food through the conversion of light energy into a sugar (glucose), in a process called photosynthesis, which is the base of biomass formation. For this, plants require sufficient light, suitable temperature, substances such as CO<sub>2</sub>, oxygen and a number of nutrients (FAO, 2006). As plant constituents, nutrients play a vital role in biochemical reactions, and the production of organic material. To obtain high agricultural yields an optimal nutrient program is required, whereby plants absorb nutrients from soil reserves or external sources, where water is the main carrier. Nutrients can be added either to the soil or leaves (foliar application) by using granular or liquid fertilizers, organic manures, soil amendments, among other sources.

Plants absorb most of their nutrients through their root system; hence, it is important to develop healthy and strong roots. Nutrients are absorbed and transported to aerial parts of the plant, and stored or used for metabolic processes. Despite the importance of applying external sources of nutrients to ensure a good nutrition program, there is a chance of over applying and reaching toxicity levels. Figure 1 shows a relationship between the concentration of nutrient in tissue and the growth of plants. A critical concentration exists, which when below, signals deficiency levels and visual symptoms are observed. There is also a critical nutrient range that is the optimum level of nutrients required for plants to grow adequately. When the level surpasses this range, there is a phase of luxury consumption, followed by toxicity levels, which show visual symptoms. Therefore, a good crop nutrition program must always aim for the critical nutrient range for optimum growth.



**Figure 1. Growth vs. Nutrient Concentration**  
(Salisbury and Ross, 2000)

It is known that plants require at least 16 elements for growth and full development (Arnon and Stout, 1939). Plants utilize three basic nutrients, carbon (C), hydrogen (H) and oxygen (O), which are considered non-mineral nutrients because they are derived from the air and water. Other important nutrients are classified as macro and micro nutrients, as shown in figure 2.



**Figure 2. Essential elements for plant nutrition**  
(Taiz and Seiger, 2006)

It is important to understand the role of each element or nutrient in the plant metabolic functions. Below is a very brief description of the main functions of them in a plant (Salisbury and Ross, 1991).

Carbon (C) – Constituent of carbohydrates; necessary for photosynthesis.

Hydrogen (H) – Maintains osmotic balance; important in numerous biochemical reactions; constitutes carbohydrates.

Oxygen (O) – Constituent of carbohydrates; necessary for respiration.

Nitrogen (N) – Necessary for formation of amino acids and proteins; vital for plant growth; directly involved in photosynthesis.

Phosphorus (P) – Involved in photosynthesis, respiration, energy storage and transfer; promotes early root formation and growth; increases water-use efficiency.

Potassium (K) – Increases photosynthesis, water-use efficiency; important in fruit formation, quality of seeds and fruit; increases disease resistance.

Calcium (Ca) – Important in cell division and formation; involved in nitrogen metabolism; reduces plant respiration; increases fruit set.

Magnesium (Mg) – Important in chlorophyll formation; improves utilization and mobility of phosphorus; influences earliness and uniformity of maturity.

Sulfur (S) – Necessary in chlorophyll formation; helps develop enzymes and vitamins; promotes nodule formation on legumes.

Boron (B) – Essential for seed and cell wall formation; promotes maturity; necessary for sugar translocation.

Copper (Cu) – Performs a major function in photosynthesis and reproductive stages; increases sugar content; plays an indirect role in chlorophyll formation.

Iron (Fe) – Promotes formation of chlorophyll; acts as an oxygen carrier.

Manganese (Mn) – Increases the availability of phosphorus and calcium; aids in chlorophyll synthesis.

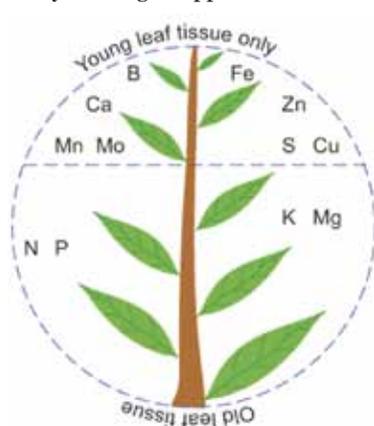
Molybdenum (Mo) – Aids in the formation of legume nodules; plays a role in reducing nitrates to ammonium in plants.

Zinc (Zn) – Necessary for chlorophyll production, carbohydrate and starch formation; aids plant growth hormones and enzyme system; aids in seed formation.

Silicon (Si) – Increases resistance to fungal diseases.

Cobalt (Co) – Component of enzymes and increases drought resistance of seeds; important for nitrogen fixation by the bacteria that associate with legumes.

Nutrients within a plant may be classified by their mobility. There are some that are mobile, very mobile or immobile. Their mobility can assist in determining where and which nutrient may be deficient. Figure 3 shows where in a plant and which nutrient could be diagnosed. Differentiating where the symptom appears is important; for example, yellowing of lower leaves is typical of nitrogen deficiency, and yellowing of upper leaves is sulfur.



Some nutrients may present similar symptoms which require further analysis and expertise.

**Figure 3. Nutrient classification according to mobility (IPNI)**

In a way, plants speak to us visually; understanding their environment and requirements is key in formulating a crop nutrition program. Regular soil and leaf analysis is recommended to maximize crop yields.

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# Establishing A Coconut Plantation

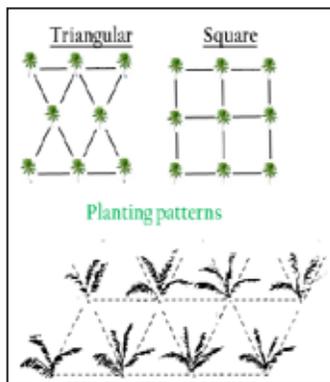
By George Emmanuel and  
Omaira Avila Rostant



Coconut (*Cocos nucifera*) is a palm that flourishes in tropical and subtropical areas, the fruit of which has many uses; it has been a major ingredient in the diets of many people living on tropical islands, creating a very lucrative industry worldwide.

In recent years, the demand for coconut product has increased exponentially. It was reported that from 2008 to 2014 alone the demand for coconut products increased 700%, especially for water, milk, oil, fibres, and cosmetics. Such hasty growth has increased the demand for establishing plantations that can supply the high worldwide demand for coconuts. In Belize this opportunity has encouraged the establishment of acres of coconuts in new plantations. Here are some factors to be considered and recommendations for establishing a coconut plantation:

- Coconut is a long term crop.** A coconut plant takes 2 to 5 years to enter in production, and can be in production from 35 to 50 years, depending on the variety planted. Therefore, it is important to plant at an adequate distance apart so plants can grow healthy and not compete for light and nutrients. Recommended spacing and patterns are shown to the right.

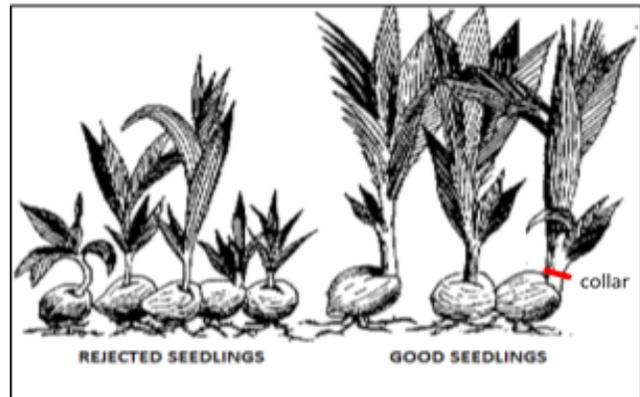


- Coconut variety vs hybrids.** In Belize the more popular varieties are, Malayan Dwarf and local tall; while the hybrids are Maypan and Chactemal. In general the Malayan Dwarf is recommended for the production of coconut water, while local tall is excellent for oil production. The hybrids are the recommended crosses of tall and dwarf varieties to make the plant tolerant to lethal yellowing disease that devastated the coconut industry in the 1980's in Belize. They also are good producers of water and oil. The Ministry of Agriculture and CARDI are working to characterise those varieties of interest in the local industry.

**Best climatic conditions to grow coconuts:** The coconut palm supports temperature ranges from 27° Celsius to 36° Celsius and needs sunlight but also needs a day and night temperature variation at 5° Celsius. The trees grow well under the conditions of rainfall level from 1000 mm to 3000 mm, 2000 ft. height from mean sea level, and 70% air moisture. They also require a good draining facility, sandy soil rich in humus content, in a depth of 3 meters and a soil pH from 6 to 7.

**Best time to transplant a coconut to the field:** For most varieties after approximately 9 months in the nursery bed, coconut seedlings are ready for planting out in the field. This transplanting should generally coincide with the onset of rains. Proper selection of seedlings in the main nursery alone can ensure a 10% improvement in yield. Seedlings should be removed with a spade and the roots carefully cut. They should not be lifted by pulling the leaves or stem. They should be kept out of the sun and planted as early as possible after removal from the nursery.

**Best plants to transplant:** Coconut seedlings that are selected from the main nursery bed should have the following characteristics:

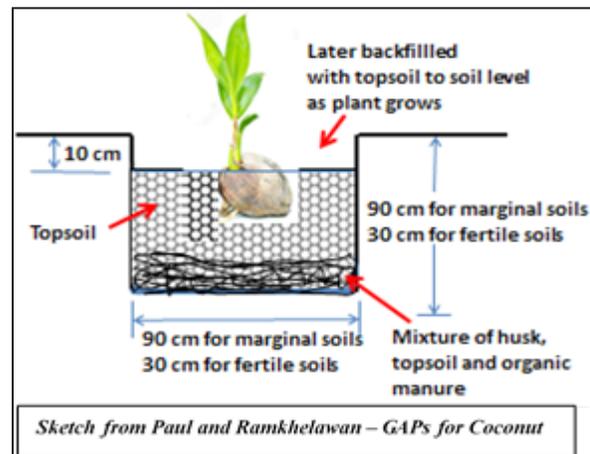


Sketch from Elfick illustrating seedlings which should be selected for planting. Adapted from Paul and Ramkhelawan (2016) Coconut Production Technology

- Shoots should have a girth of 10 – 12 cm at the collar.
- Seedlings should have a minimum of six leaves with the youngest leaf already differentiated into leaflets.
- The leaf stalk should be short and thick.
- Seedlings should have a healthy appearance and be free from pests and diseases.

### Planting in the field

Using the following five-step guide, coconuts trees can be planted in the field at a recommended spacing of 20 feet for dwarf varieties and 25 feet for tall varieties and hybrids.



Sketch from Paul and Ramkhelawan – GAPs for Coconut

**Step 1:** Prepare a well-drained, full-sun site for the coconut palm. Coconut palms thrive in a wide variety of soils as long as the soil isn't soggy or prone to standing water. Work peat moss, wood chips or compost into the planting area to improve drainage if necessary.

**Step 2:** Dig the planting hole to the same depth as the palm's nursery pot/bag and twice as wide. Space the trees approximately 20 feet apart to allow proper light filtration between the palms.

**Step 3:** Lift the palm out of the nursery pot and set it in the planting hole. Add or remove soil from under the palm until it is sitting in the hole at the same depth as it was in the pot. Fill in the hole around the root with soil, firming it into place with your feet.



Central Farm, Belize

**Step 4:** Water immediately after planting, thoroughly soaking the area to at least an 8-inch depth. Water once weekly when rainfall during the week is less than 1 inch.

**Step 5:** Spread 2 to 3 inches of an organic mulch, such as wood chips, over the ground around the palm to help preserve soil moisture. Apply the mulch over the entire area above the root ball.

Finally when planting coconuts, as a commercial enterprise or for house landscaping, it is important to keep records and the records file should include: the names of the varieties, the dates when the seedlings were planted, the nursery source and if possible the source of the seed nuts from the nursery.

Ref: - Chan, Edward and Craig R. Elevitch. April 2006. *Cocos nucifera* (coconuts) (version 2.1). In C.R. Elevitch (Ed.) *Species profiles for Pacific Island Agroforestry* Holualoa, Hawaii: Permanent Agriculture Resources (PAR).

- Compton Paul and Evans Ramkhelawan 2016. *Coconut Production Technology*. CARDI

- Compton Paul and Evans Ramkhelawan 2016. *Gaps for Coconut Production*. CARDI

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## Coconut Oil Standards

By Dottie Feucht

The coconut oil industry in Belize recently had a big boost in terms of standards and specifications for quality. Standards Officer Lloyd Orellano, from Belize Bureau of Standards, assisted by Omaira Avila Rostant, from Caribbean Agricultural Research and Development Institute (CARDI) presented them on September 28 at Central Farm. Omaira's expertise in growing and processing coconuts filled in experiential details to the standards.



Coconut oil comes from the mature kernel of the coconut (*Cocos nucifera Linnaeus*) by a process of expression (extraction by using pressure), solvent extraction or other approved method of processing. In addition to common standards, such as it must be free from admixture with other oils or fats, there are specific ones for the three types of coconut oil:

**Crude:** obtained from the copra (dehydrated or dried coconut kernel) by expression and/or solvent.

**Refined:** obtained from the copra by expression and/or solvent and neutralized, bleached with bleaching earth or activated carbon, or both, and deodorized with steam. A physical refining process involves a wash with citric acid to remove gum bleaching and steam-stripping or deodorizing.

**Virgin:** obtained from fresh and mature kernel by mechanical or natural means with or without the application of heat, which does not lead to alteration of the nature of the oil. (It consists mainly of medium chain triglycerides, resistant to peroxidation; fatty acids in virgin coconut oil are distinct from animal fats which contain mainly long chain saturated fatty acids.)

The CARICOM Regional Standard, developed under the supervision of the Regional Project Team for Coconut Oil, provides uniform level of acceptance for quality for the different types of coconut oil manufactured and traded in the CARICOM community. It is a formulation of standards and specifications from those developed by the coconut community of other regions and incorporates applicable specifications of International Standardization Organization (ISO) and CODEX Alimentarius Commission as well as chemical associations.

Besides general requirements the standard defines specifications for

- food additives, including colors, antioxidants and antioxidant-synergists, and antifoaming agents
- contaminants, including heavy metals and pesticide residues
- hygiene, including guidelines for the establishment and application of microbiological criteria related to foods
- packaging, including those for food grade quality and inert to coconut oil
- marking and labeling, including those for individual containers for retail, external packaging for shipping, and fortification claims.

The standard applies to the domestic as well as the commercial export market for use in the food industry, soap and cosmetic industries, animal feed and other uses.



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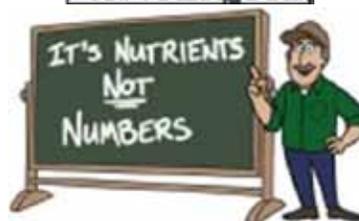
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# Slow Release Fertilizers from Pyrolysis of Agricultural Residues

## Creating value out of agricultural residues to regenerate soil fertility

By Yngrid Espinoza, Stephen Joseph, Vasco Masias, Felix Froese

The goal of this project is to contribute to the preservation of the biodiversity that characterizes one of the most privileged places in the world. An important challenge of the 21st century is to maintain sustainable crop yield for an expanding population and reduce greenhouse gas emissions without damaging ecosystems. To achieve this goal we need to build up soil carbon and beneficial microorganisms and eliminate the lost macro and micronutrients in using renewable energy. This project is unique as it combines pyrolysis of residues with CO<sub>2</sub> capture and the production of healthy food (spirulina).



Figure 1. Peru is listed among the group of the 17 megadiverse countries of the world

### Integrated System for the Production of Algae:



Figure 2. Spirulina pond (left) and the CO<sub>2</sub> injection system (right).

Two companies have combined resources to develop both an algae technology, pyrolysis technology and a slow release fertilizer. The original design of the pyrolyser was developed by Professor Stephen Joseph and is based on Open Source Technology originally developed in collaboration with Johannes Lehmann's group at Cornell University. The detailed design of this 100kg/hr (dry feed in) design was undertaken by Russell Burnett of BES Ltd in Australia and Stephen Joseph. Modifications to the design and detailed design of the heat exchanger was carried out by Peruvian engineers (Samuel Encarnación e Yngrid Espinoza).

The system has 4 components:

1. Pyrolyser that can use a range of residues that are available throughout Peru
2. A heat exchanger that produces hot air for drying the algae and cools the flue gas that is used to grow the algae
3. Algae ponds
4. Algae drier

The pyrolysis of the biomass is carried out at a temperature of between 400-500 °C. The pyrolysis gases are burnt to produce a flue gas consisting mainly of CO<sub>2</sub>, O<sub>2</sub> and N of approximately 8000C. This gas passes through the heat exchanger and then is cleaned and injected into the algae pond. The hot air that is produced in the heat exchanger is used to dry the algae from 90% to 10%. The algae is used for feeding children who may be malnourished or as a feed for animals. The biochar can be used

to help extract the algae and can also be added into animal feed or mixed with other nutrients to make a slow release fertilizer.

### Slow Release Fertilizers:



Figure 3. Dryer for spirulina (left) and spirulina as a supplement for animal feed (right).

We are working to develop six types of slow release organic and inorganic fertilizers. The biochar is the matrix and other minerals, organic matter such as manure and/or chemicals such as urea, di-ammonium phosphate and KCl will be blended and reacted with their matrix. These products are being developed to regenerate 250,000.00 hectares (10% of the agricultural land) of degraded land. Our goal is not only to restore degraded land but to provide incentives for reforestation in these areas.



Figure 4. Biochar from native bamboo (left) and continuous pyrolyzer (right).

The first trials will take place on the Peruvian coast and central Amazon in coffee, cocoa, citrus, grape, potato growing areas. Trials will be carried out in collaboration with different national universities, government and non government institutions and farmers that want to promote sustainable development.



Figure 5. Integrated system from a pyrolyser of continuous production of fertilizers and spirulina. In the image the following phases are described (A) Biomass crusher, (B) entry of organic waste, (C) chimney for the conduction of gases, (D) exchanger for the recycling of heat for the drying of the microalgae and (E) use of CO<sub>2</sub> for the production of spirulina. Photo: Yngrid Espinoza.

PROYECTO FINANCIADO POR GRUPOS ALIMENTA SAC  
DESARROLLADO POR: Yngrid Espinoza, Stephen Joseph, Vasco Masias, Felix Froese

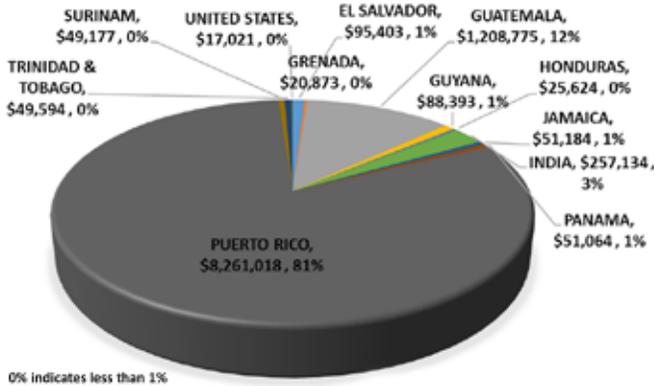


We thank the International Biochar Initiative and Grupos Alimenta SAC for reprint permission.  
<http://www.biochar-international.org>  
For more about Spirulina, see pg 20 this issue.

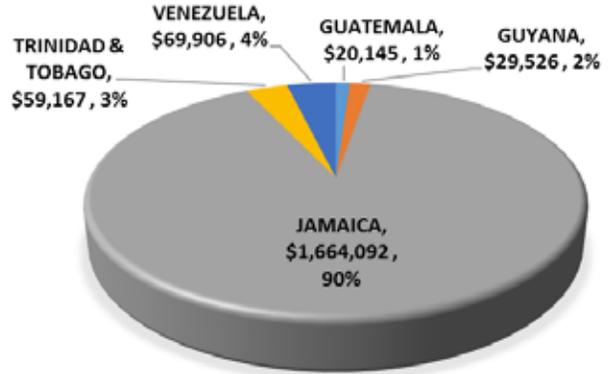


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**DGFT TRADE INTELLIGENCE 2016 DOMESTIC EXPORT TRADE DATA DISAGGREGATION (07/17)**  
 Data Extracted from the Statistical Institute of Belize

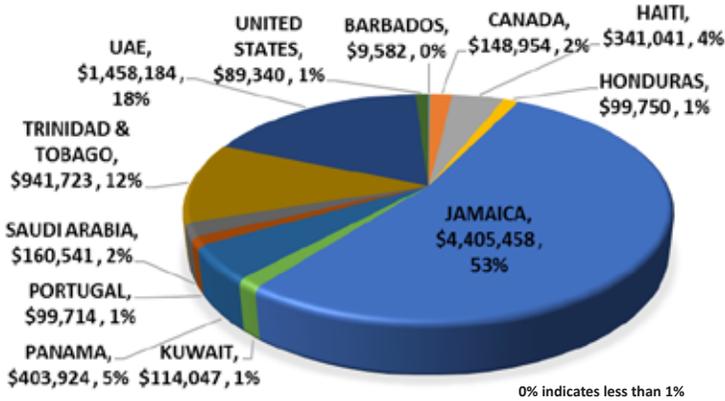
**ANIMAL FEED \$10.1M**



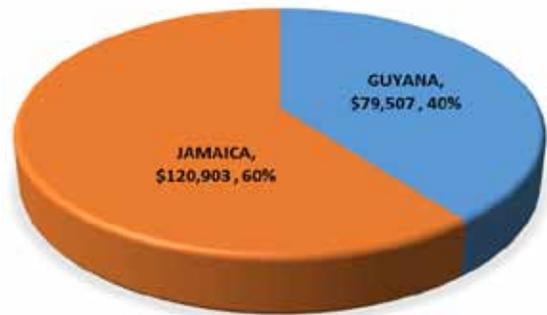
**CORN MEAL, GROATS \$1.8M**



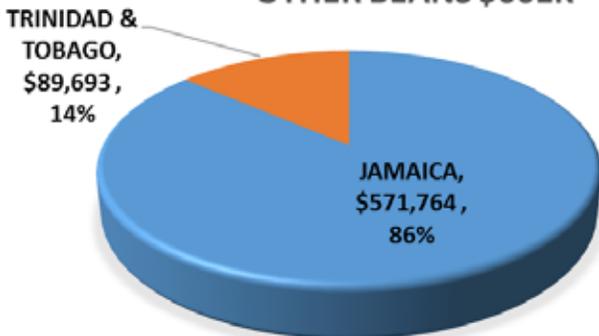
**RED KIDNEY BEANS \$8.2M**



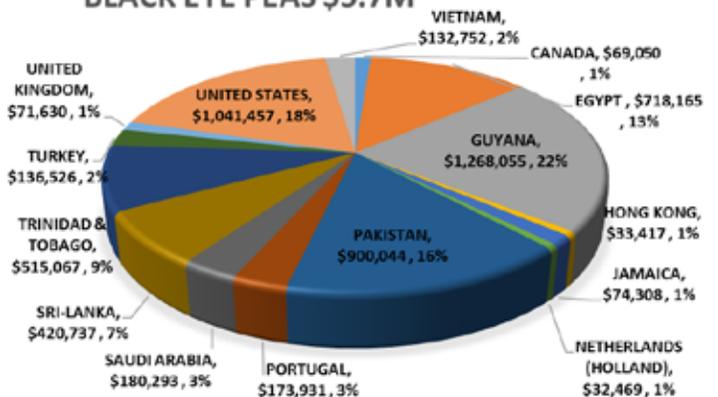
**RED ADZUKI BEANS \$200.4K**



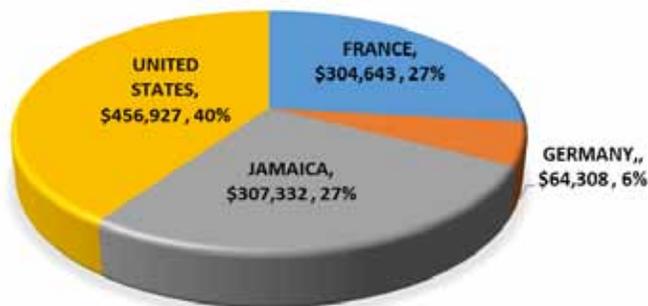
**OTHER BEANS \$661K**



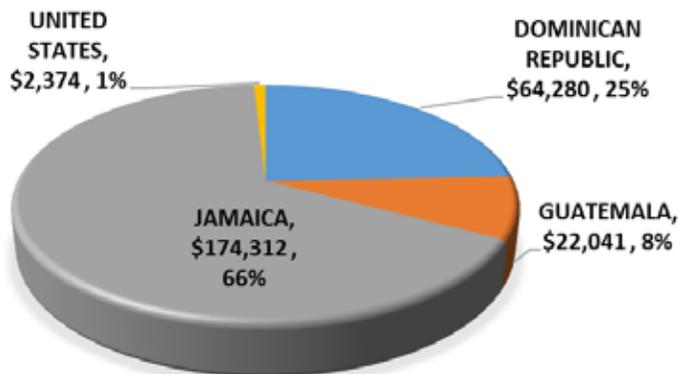
**BLACK EYE PEAS \$5.7M**



### COCOA BEANS \$1.1M



### COCONUT OIL \$263K



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# Agriculture Prices at a Glance- \$\$\$\$\$\$ NOVEMBER 2017

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	Per lb
Fattened steers	H	Czl	2.10	OW	2.10	Bze 2.00
750-1100 lbs	S	Cy	1.75	SCR	N/A	Tol 2.00
Weaner steers	H	Czl	2.20	OW	2.20	Bze 2.10
"	H	Cy	2.00	SCR	N/A	Tol 2.15
Breeding heifers	L/H	Czl	1.60	OW	1.60	Bze 1.60
"	H	Cy	1.75	SCR	N/A	Tol 1.90
Cull cows	L/H	Czl	1.40	OW	1.40	Bze 1.25
"	H/S	Cy	1.40	SCR	N/A	Tol 1.25

### U.S. CATTLE

U.S. price - corn fed - 1000-1200 lbs	L	US\$ 1.1465
U.S. price - feeders 600-800 lbs	H	US\$ 1.5680

### BELIZE HOGS

Weaner pigs - 25-30 lbs - by the head	S	100.00	80.00
Butcher pigs 160 - 230 lbs, per lb	L/S	1.80	1.65

### BELIZE SHEEP

Butcher lambs - live per lb *	L	2.50	2.25
Mature ewes - live per lb	S	2.00	1.75

\*Errata, Issue 37: Butcher lambs A class printed as \$3.00, should have been \$2.75

### BELIZE CHICKEN

Wholesale dressed, per lb (Sp Lkt)	S	2.32	Large Birds 2.20
Wholesale dressed, per lb (Bl Crk)	S	2.36	
Broilers - live per lb (Sp Lkt)	S	1.14	
Broilers - live per lb (Bl Crk)	S	1.19	
Spent hens - per lb (Sp Lkt)	L	1.50	
Spent hens per 4 lb bird (Bl Crk)	H	5.00	

### CITRUS

Oranges per lb solid, est. final	L	2.2383 (\$13.2051 per box)
Grapefruit per lb solid, est. final	H	3.0620 (\$11.9419 per box)

### 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	C
Belize yellow corn, bulk (Spanish Lookout)	L	Grade C; 2016's at .16 & 2017's at .18								
Belize yellow corn, bulk (Blue Creek)	L	.20 cash/.22 payments	N/A							
Yellow corn/local retail (low volume, Sp Lkt)	L	\$22.00/100 lb bag								
Belize white corn, bulk (Spanish Lookout)	L	Grade C; 2016's at .16 & 2017's N/A								
US Corn, #2 yellow	L	US\$3.76/56 lb bushel								
US organic, #2 yellow corn feed grade	-	N/A								
Belize soy beans (Spanish Lookout)	L	contract price pending	.45 non-contract							
Belize soy beans (Blue Creek)	S	.45 cash/.50 payments	N/A							
US soy beans, #2 yellow	L	US\$ 9.855/60 lb bushel								
US organic, #1 feed grade soy	-	N/A								
Belize milo (Spanish Lookout)	L	.18								
Belize milo ( Blue Creek)	L	.18								
Red kidney beans (Spanish Lookout)	H	\$97.00/100 lb bag	N/A	N/A						
Red kidney beans (Blue Creek)	S	\$68.00/100 lb bag	no price							
Black eyed peas (Spanish Lookout)	S	.82	undetermined							
Black eyed peas (Blue Creek)	L	.38-.51 farm price, dried								
Paddy rice per pound (Spanish Lookout)	L	.40 farm price, dried								
Paddy rice per pound (Blue Creek)	S									
SUGAR/HONEY										
Sugar cane, ton, estimate	H	\$61.30								
Bagasse, per ton - payment, not estimate	S	\$0.50 (price still undetermined)								
Honey, 5 gal (approx 60 lbs)	S	\$210.00 (CQHPC)								
Honey, specialty, 5 gal (approx 60 lbs)	S	\$210.00-250.00 (Cayo)								
SPECIAL FARM ITEMS										
Eggs - tray of 30, farm price	S	4.80 (Sp Lkt)	5.40 (Blue Creek)							
WD milk per lb to farmer	S	contract & non-contract .56								
Raw milk (farmer direct sales)	S	5.00 per half gal								
CACAO										
Cacao beans Organic (MMC) /lb	S	3.50 dried fermented								
Cacao beans Organic (MMC) /lb	S	1.10 wet beans								
US Cacao beans, metric ton (ICCO)	H	US\$ 2,122.62								

See Article  
about making Biochar & Spirulina  
pg.15

## Homemade Health Spirulina - Ancient Superfood By Marguerite Fly Bevis RN, BSN

I first learned about Spirulina from Dr. Harold Foster, PhD, who studied medical geography at the University College of London and taught as a professor at University of Victoria for 41 years. I was privileged to hear him speak and in many ways he changed my life that day. He said that his research indicates that by taking spirulina and selenium every day along with a high oxidant diet, the immune system would function properly and many illnesses could be prevented or improved. His work with AIDS and HIV patients in Africa had phenomenal results. Unfortunately, there was little interest in inexpensive treatments so the information was largely ignored. Thankfully today there are people willing to look at alternatives and Dr. Foster's research continues with the foundation created in his name.

Spirulina is a photosynthetic algae that grows in salt and freshwater. It is considered a complete food, consisting of proteins, amino acids, and minerals. One could survive with only spirulina as food. Blue-green in color, it is a single celled organism whose job is to turn sunshine into life-sustaining energy. It has successfully survived for millions of years, providing oxygen to the planet before and more effectively than higher life-forms.

Historically, spirulina has been used by the Aztecs who harvested the blue mud from Lake Texcoco. It was also eaten by the Kanembu people of Central Africa near Chad. It has been used across Southeast Asia in soups and sauces.

*Spirulina grows quickly, and produces twenty times more protein than soybeans and delivers more nutrition per acre than any other food on earth.* It has been called the **Food of the Future**.

### Benefits of Spirulina

Immune support - increases production of antibodies. People who use spirulina regularly are less likely to experience colds, flu and other illnesses.

Cell regeneration - helps wounds heal faster, promotes recovery from illnesses faster.

Protein supplement - 62% amino acids; when used with selenium provides complete amino acids.



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Infection - has activity against herpes, influenza, and HIV and oral cancer.

Allergic reactions - may protect against allergic reactions by stopping the release of histamines.

Antibiotic-related illnesses - helps restore good bacteria such as Lactobacillus acidophilus. In tests spirulina boosted the growth of L. acidophilus and other probiotics.

Liver disorders - may help protect against liver damage in people with chronic hepatitis.

Eye diseases - contains zeaxanthin, a nutrient linked to eye health; may help reduce cataracts and age-related macular degeneration; rich in vitamin A, containing ten times the amount of vitamin A concentration in carrots.

Low energy - improves endurance and reduces fatigue.

Metal exposure - a natural detoxifier, helps cleanse the body of toxins and impurities. Rich in chlorophyll, it is effective as a blood cleansing agent. It contains more than ten times the amount of chlorophyll found in green vegetables. The combination of chlorophyll and magnesium helps to remove toxins from the bloodstream while oxygenating the blood. It binds to heavy metals and radioactive isotopes which can be beneficial for those undergoing radioactive therapy or for those wishing to detox from daily metal exposure.

Overweight - a natural appetite suppressant, can help with weight loss.

Digestive disorders - improves digestive system.

Antioxidant - contains four times the antioxidants of blueberries.

Inflammation - helps balance the body's pH, reducing inflammation throughout the body; contains gamma-linolenic acid (GLA) one of the most powerful anti-inflammatory agents in nature.

PMS - can ease the symptoms of PMS in women; has 26 times the calcium of milk.

Anemia - high in bio-available iron, beneficial for those with anemia without the risk of constipation. (Iron, which is essential for transporting oxygen throughout the body, is the most common mineral deficiency.)

**Mineral and Vitamin Content:** A source of potassium, chromium, copper, magnesium, manganese, phosphorus, selenium and zinc, spirulina is also rich in iron, magnesium and trace minerals. It is much easier to absorb than iron supplements. Spirulina is a good source of vitamins B-1 (thiamine), B-2 (riboflavin), B-3 (nicotinamide), B-6 (pyridoxine), B-9 (folic acid), B-12 (cobalamin), vitamin E and vitamin K1 and K2. Spirulina is one of the only plant sources of vitamin B12.

**Caution:** Spirulina may be contraindicated for those with phenylketonuria. Safety and effectiveness in pregnancy are unknown; so you should consult your physician concerning use during pregnancy. Spirulina may interact with drugs given to suppress the immune system; avoid if you have an autoimmune disease such as multiple sclerosis, rheumatoid arthritis or lupus. Spirulina contains iodine so if you're sensitive to iodine, avoid taking it.

**Side Effects:** There are few reports of adverse reactions. However, some spirulina may be contaminated with heavy metals. It is important to buy a reputable brand of spirulina. But the affinity for heavy metals is why it is useful for detoxification when taken internally

**How to Use:** Available in powder or pill form, take 1 to 10 g/day (4 - 6 tablets). The powder can be added to smoothies, but the tablets are easy to take. Contains no sugar, starch, yeast, corn, soy, egg, milk, artificial colors or other additives.

Documented in the literature, spirulina has been used by men

since the 16th century. It was harvested by natives of the Sahara Desert and made into loaves or chips. It is a complete food and can sustain the body indefinitely. It is inexpensive and easily cultivated, requiring little from the farmer. Although many foods today are labeled "superfoods," spirulina is the King of Superfoods.

**Resources:** [hdfoster.org](http://hdfoster.org); [spirulina.org.uk](http://spirulina.org.uk); <http://www.umm.edu/health/medical/altmed/supplement/spirulina>; **Scientific names:** *Arthrospira platensis* and *Arthrospira maxima*; **Common names:** Spirulina, dihe, tecuitlatl **Efficacy-safety rating:** ...Ethno or other evidence of efficacy. **Safety rating:** ...Little exposure or very minor concerns.

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## BAHA Shares Cattle News: National Herd Increases 25%

**BAHA's Dr. Miguel Depaz shared the following report:**

"The Cattle Industry is seeing its better days as exports for this year have already reached 4,872 heads and cattle farmers are now getting more than the accustomed .95 cents per pound live weight. Prices reached as high as 3.50 per pound live weight for export and have stabilized at approximately 2.50 per pound live weight. Despite the consistent rate of export the national herd has seen a growth of more than 25%. The national cattle census today is at 126,129 heads. Through the hard work of the Government of Belize, Belize Agricultural Health Authority (BAHA) and the private sector, they have scientifically demonstrated that the national cattle herd is free of diseases such as tuberculosis and brucellosis. Also, an animal traceability system has been implemented. These achievements have permitted cattle farmers to access markets in neighboring countries and beyond, having fulfilled importation requirements. This again is expected to contribute to the economy of Belize."

**BAHA Rabies Update:** Species affected and confirmed positive are bovine, equine and ovine, as well as wildlife – a bat. For 2016 there were a total of 195 deaths of animals, with the peak from July to December. In 2017 to date there have been a total of 89 deaths of animals reported to BAHA [to date of report], with the peak in January and February. The confirmed cases by district for 2016: Cayo – 17; Orange Walk – 1; Corozal – 2 and Toledo-6. Confirmed cases for 2017 [to date of report] are Cayo – 22; Orange Walk – 15; Corozal – 2 and Toledo – 2. Note, there are no confirmed cases in Belize or Stann Creek Districts. BAHA recommends vaccinating animals at 3 months of age, repeated

at 6 months and again thereafter at yearly intervals. BLPA and Reimers' Feed Mill have been supplying the rabies vaccine at a lower and affordable price to farmers, at dose cost less than \$2. Note that BAHA and the Ministry of Health work together for post-exposure vaccination of persons who have come into contact with positively confirmed animals.

**BLPA alerts its 254 members that the tentative date for the Annual General Meeting (AGM) is February 24<sup>th</sup> 2018.** Please check with their offices (as per advertisement on following page) for confirmation of date.

Past Chair Abdala Bedran receives award from Min. Hulse at BLPA's 2017 AGM.



**What is 'Fake Meat'?** Looking at the international beef news, many foresee that future ranches will be located mainly in climate regions such as ours, where year-round pasture conditions are possible. Others, such as investors Bill Gates, Richard Branson and Cargill envision a much different future for beef and its production: a *clean-meat movement*, in which meat is grown in stainless steel tanks. No live animals, no slaughter and an agriculture "kinder and less demanding to the environment" is the vision of Memphis Meats, who raise or shall we say, create, "cultured" beef, chicken and duck meat without any livestock.



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**Caribbean Agricultural Research and Development Institute (CARDI)  
 CARDI Day 2017**



CARDI is turning 43 years assisting the region to develop. It was established in 1974 to serve the agricultural research and development needs of the member states of the Caribbean Community (CARICOM). CARDI is positioned to enhance the socio-economic well-being of the Caribbean people through research for development that improves the competitiveness and sustainability of regional agriculture.

**On the 5<sup>th</sup> of December CARDI Day will be celebrated.** This annual event on the institute's calendar is dedicated to building awareness and promoting the work of the institute. A major focus of the day's activities will be the sharing of our research results, impacts and success stories with the general public, partners, collaborators, public sector and other stakeholders.

CARDI offices across the region will be hosting a variety of events including field tours, exhibitions, school tours, public lectures and seminars to commemorate this day.

We invite you to learn more about the research and projects CARDI has in the region, and how we can provide you with sound advice and guidelines for you to optimize your production and profitability using good agronomic practices adapted to the agro-climatic conditions of Belize.

Checkout work at CARDI [www.cardi.org](http://www.cardi.org),  
 Write us at <http://www.cardi.org/contact-us/>  
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# Aerial Application as a Tool for Increased Efficiency For Pest and Disease Control

By Alan McCracken



The application techniques of pesticides has unfortunately not been developed to the same extent as the pesticides themselves. It is well known and recognized that

pyrethroid insecticides work by contact and ingestion action and no vapor effect, which means that for good results they must be delivered to the target insect. The alternative is to obtain poor crop coverage and wait for the insects to find the chemical.

Firstly let us examine the reason for applying agrochemicals. The answer although obvious is not always understood; it is to protect the genetic potential of the crop being grown. For this reason the chemical products may be more correctly termed *plant protection products* and our objective should be to deliver the chemical product to the target insect or disease in the most efficient manner possible.

Modern agricultural aircraft can provide multiple services for the farmer including crop spraying, application of fertilizers and seeding in addition to other less well-known uses.

**Corn and soybeans:** Aircraft application can be of great value in enabling the application of insecticides and fungicides at the right time, unlike ground rigs that can be restricted because of wet soil conditions which means that the product is often applied too late, thereby being in-effective.

**Citrus pests:** Pests such as the Mediterranean fruit fly and the psyllids that transmit huanglongbing (HLB) can also be controlled using aircraft. This technique has been utilized successfully for several years now in Brazil; an initial test was made in Belize in August through a cooperative effort with AIRMAX. The technique was novel in that (1) low spray volume was used and (2) additives were used to enhance distribution of the droplets and protect the spray droplets from evaporation.

**Sugarcane:** Aircraft can be used to fertilize cane, apply ripening agents and to control outbreaks of “froghopper”.

**Bananas:** In most of the banana production areas in the world, growers are using outdated spraying techniques utilizing large quantities of oil as a tool for the control of black sigatoka which can be devastating to the crop if not controlled. We are now at the threshold of new technology utilizing high performance adjuvants with only a minimum of oil that achieves a double objective. These additives protect the spray droplets from evaporation but even more importantly provide excellent redistribution of the spray droplets on the leaves.

**Locust control:** For the control of swarms of locusts in Bolivia and Argentina agricultural aircraft are used to apply low spray volumes to not only kill the flying adults but also to spray a protective barrier ahead of the swarm to cut its progress and to save the crops.

**Mosquito control:** Several hundred aircraft and helicopters are in use every summer in the United States providing control

of mosquitoes that are not only a nuisance for tourists but also transmit various diseases including West Nile virus and ZIKA.

## Spray Volume

In seeking to obtain increased spray coverage it is far more important and more economical to decrease the droplet size than to increase the spray volume. Many entomologists/agriculturalists have always thought that higher volumes mean better coverage; this is erroneous and has led to the following:

- Poorer coverage of crop and pests as large droplets fail to penetrate dense foliage often due to mechanical limitation in atomization.
- A slower rate of work by the equipment often resulting in missing the ideal moment for application and spraying being conducted under adverse weather conditions in order to cover the area.
- Major problems with soil contamination especially when farmers apply very high volumes of 10 gals/acre or even more as in the case of the citrus crop. When using high volumes with ground machines, tests have proven that a very high percentage of the chemical runs off and results in severe soil contamination.
- An increase in application costs, yet a reduction in the quality of the application.

## What are the advantages of lower spray volumes?

- The most important is probably that the chemical ingredient is more concentrated enabling higher efficacy, such that one spray droplet may be adequate to kill a particular insect.

*Continued on pg 34*



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## 2017 World Food Day

Part of the talk given by The Honorable Godwin Hulse, Minister of Agriculture, at World Food Day, held at the Belize High School of Agriculture (BHSA) in San Lorazo, Orange Walk District on October 20th, was the same one his father gave to him when he was young. He said that his dad told him to



Min. Hulse

stop saying that he grew rice because he did not make the sun, the soil, or the rain that grows the rice; he was only the manager of what God

had given him. His dad also told him not to exploit his fellow man and to leave some in the field for the creatures as food. Minister Hulse said such management is the foundation of the Ministry of Agriculture.

Focusing on the theme of World Day, *Change the Future of Migration*, Minister Hulse admonished the young people whose goal is to live and work in the city that they should think about their food security. If the economy collapses and they don't even have the **capacity** of growing their own food they will have no food security. The programs of the BHSA focus



on that capacity and training for their future. He also said, "We are working on our own food seeds for our own food security." A memorandum of understanding between the Ministry of

Agriculture and BHSA was signed there as endorsement and support for the programs of the high school.

### Nick's Picks

One of the younger attendees, Nick Roberson, was given the assignment of choosing his favorite exhibits. Number one, Western Dairies, had an innovative display of recycled containers. Their cow mascot made a hit with all the youngsters.



CARDI

Number two pick by Nick was the Caribbean Agricultural Research and Development Institute (CARDI) display of the seeds they develop: corn, soy beans, blackeye peas, rice, and hot peppers, and third was The Belize Red Cross exhibit, promoting their First Aid and CPR courses, available country-wide.



Western Dairies' recycled boat

The weather was cooperative for the event; although dark clouds menaced, the rains held off. The over-all dedicated agricultural theme made this Belizean World Food Day exceptional. Many opined their wishes that the NATS (National Agricultural and Trade Show) would have similar low background noise, which enabled more personal interaction among attendees.



**"It is important to keep our souls clean and our boots dirty."**

Mrs. Lisbeth Delgado, Principal of Belize High School of Agriculture, San Lázaro, Orange Walk District

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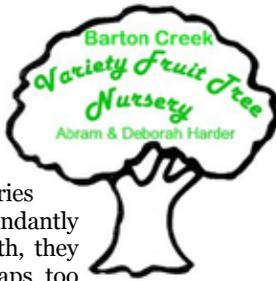


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## Berries of Belize Part 2: Mulberries By Deborah Harder



A good fruit for Northerners, mulberry is reminiscent of northern berries you can't grow here. Mulberries grow on a large bush and can bear abundantly without much care. Actually, up north, they are a neglected fruit, growing perhaps too abundantly and despised in favour of harder-to-grow berries like blueberries. One of life's little ironies, because in my opinion they have a delicious flavour superior to northern blueberries.

Mulberry is started from cuttings but can be purchased from your nursery—rooted and ready to plant. For a small family, several bushes should yield enough to can or freeze some. After a crop is harvested the bushes may be pruned of old growth to keep them low and stimulate new growth.

Use: when ripe enough, they are excellent eaten out of hand or added to breakfast cereal, etc. When cooked with sweetener, you can also use less ripe ones that are sour. Raw mulberry juice is excellent. Just smash very ripe mulberries and squeeze in a cloth. Dilute and sweeten if desired. Or cook the fruit and strain. Add this sweetened juice to milk (not the other way around) to make mulberry milk. Mulberries also yield our favorite pie!

### Mulberry Pie

4 c. mulberries  
1/2 c. sugar  
1/2 c. cassava or arrowroot starch

Cook mulberries with sugar and a little water, then mash.

Dissolve starch in small amount of water and add, stirring until thick.

Pour filling into baked pie crust. Cool.

If desired, drizzle the following mixture on top:

1/2 c. sour cream  
2 tsp. sugar or honey  
Few drops vanilla

Unplanted bounty



## Unplanted Bounty By Sally Thackery

Composting is a must for gardeners, and sometimes provides an unexpected bounty. Although I don't remember ever seeing this type of squash, apparently some seeds made their way to my large compost area, because these vines began to appear almost immediately after careful planting of many varieties of vegetable seeds. If you're looking for a way to feed your entire neighborhood or town, this would be your answer.



When picked young, these squash don't have to be peeled, but they grow a hard outer shell if left to mature. The young ones are quite tasty, firm with lots of flavor. Just cube and sauté in butter, salt and pepper to let the most flavor shine through. You will need a very large area to let these vines run free, some reaching 30 feet. The beautiful yellow blooms are abundant, with vines running up and over the fence, and overtaking everything else that was beginning to grow. That is the biggest drawback, denying any cucumbers, tomatoes or other plants to survive alongside this hearty vine.

It is hard to tell how many plants there are because the entire garden turned into an ocean of squash vines, leaves and blossoms, encasing the entire outside fence into a wall of green and yellow. A new gate had to be built to enter the garden, after the vines



completely covered the original gate, seemingly overnight. If you know the name of this variety, please let us know at [belizeagreport@gmail.com](mailto:belizeagreport@gmail.com)

**Editor's Note:** *Could it have been a bird that dropped the seed? But from where?*



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## Hemp Food By Karin Westdyk

Food from hemp for humans and animals dates back to the beginning of recorded history, and for thousands of years it was the



largest agricultural crop grown worldwide. Hemp was relied on for not only food, but for fuel, fiber, paper, industrial source materials, and medicine.

In 1801 Thomas Jefferson, a hemp farmer and third president of the United States, declared, "Hemp is of first necessity to the wealth and protection of the country -- if people let the government decide what foods they eat and what medicines they take, their bodies will soon be in as sorry a state as are the souls of those who live under tyranny."

Though in the early days, farmers were encouraged to grow hemp to help build the American economy, since 1937 the cultivation of industrial hemp, with its diverse and many resources, has all but ceased. The demonization of hemp, renamed "marijuana" by those who waged war on a plant, used racism as the impetus to gain support, and the campaign was fueled by special interests.

Industrial hemp is not psychoactive. Article 28 of the Single Convention Treaty (the document used to influence drug policies worldwide) clearly states that industrial hemp is exempt from prohibition; however, since 1961, when the treaty was signed by Belize and most other countries, hemp has been perceived as outlawed throughout most of the world. And since 1961, the world's food, fiber, fuel and medicine has shifted from being grown organically by farmers to being produced chemically, benefitting the wealth and growth of the pharmaceutical/petrochemical industrial alliances. We discover that in fewer than 6 decades, this shift has sent the world into a toxic quagmire, bringing ecological catastrophe that worsens with each passing year.

### New Interest in Hemp Nutrition

In recent years there has been a growing interest in hemp, as many have re-assessed its benefits to the environment, our health, and well being -- particularly in the area of medicine and food. Cheese, milk, ice cream, tofu, flour, oils and butters are once again being produced from hemp seed while thousands of other products, from medicine to fuel, to building materials, to plastics, are being explored and produced from the seeds, leaves, stalks and hurds of the hemp plant.

**Hemp seeds** have been identified as a "functional food" providing health benefits beyond basic nutrition. They are high in fiber, contain no cholesterol, are low in sodium and are a good source of vitamins and minerals, including zinc. According to studies published by the National Center for Biotechnology Information, they are 30% oil and contain the perfect 3 to 1 balanced ratio of omega 6 to omega 3 fatty acids.

Hemp seeds are also considered a perfect protein food, containing all 20 amino acids, including the 9 our bodies cannot produce on their own. Hemp seed has exceptionally high levels of the essential amino acid arginine that helps the body get rid of waste and synthesize proteins. The two primary proteins are albumin and edestin (the Greek word for "edible"). Albumin assists in maintaining tissue strength, while edestin, found only in hemp and no other plant, aids digestion, promotes a healthy immune system and is considered the back-bone of human DNA.

Shelled and hulled hemp seeds can be found in most natural food

stores or online. They are known as hemp hearts, shelled hemp, or hemp nuts. They can be eaten raw, added to smoothies, salads, cereals or baked in muffins, breads and cookies. Because they are primarily unsaturated fat, hemp oils (and seeds) should be stored away from light and heat, preferably in the refrigerator. Hemp seed can also be made into a nut butter. Not unlike natural peanut butters, which have no additives, hemp butter needs to be stirred to mix the oils for use, and needs to be kept refrigerated.

**Hemp oil** is used primarily as a supplement and has a stronger and nuttier flavor than the seed. It has a nutritionally higher value than most oils commonly used in blended drinks and salad dressings. It can be used in any recipe calling for cool oil, as it should not be cooked or used for frying and is best kept refrigerated to maintain freshness and balance.

**Hemp protein powder** can be added to blended smoothies or mixed with milk, yogurt, or juice. Unlike the whole hemp seeds and oils, the protein in hemp powder has been isolated, so it is fat-free.

**Hemp tea** made from industrial hemp leaf is rich in antioxidants, having many of the same benefits as white, green, or black teas.

An article in *Hemp Today*, an online voice for hemp industries throughout the world, describes The Stokvel Collective of South Africa as an agricultural system working to bring fresh, quality produce, grown by local farmers, to the community. The collective is also working to develop two new functional food products based on hemp and moringa, a tree that thrives in Belize. Moringa has also been recognized in recent years as a source of highly beneficial phytonutrients that are effective in supporting natural immunity in the prevention and cure for the most common diseases of today, including cancers and diseases of the central nervous system, blood, respiratory system, kidneys, blood sugar disorders, high cholesterol, hypertension, and breathing issues, as well as obesity. There is little doubt that a food blending 2 of the most highly functional foods would go far in the quest to solve problems associated with poor nutrition plaguing millions of people worldwide. Ironically, there is a company already marketing a blended powder made of hemp and moringa. However, the cost is prohibitive for most, as it is being marketed to the public as an artisan food for nearly \$15Bz per ounce.

But this could change. As restrictions are being recognized as archaic, senseless and based on misinformation, more and more farmers are opting to grow industrial hemp ... a plant that requires no expensive, toxic pesticides or herbicides, and provides support and nutrition for their families as well as the soil, a medicine that can cure many diseases, a fiber that can be made into strong durable paper, textiles, rope, plastic and other building composites, as well as fuel to run the farm, and is ready for harvest in only 120 days. The US Government holds 2 patents on hemp and there are many other individuals, companies, and universities that filed for and were granted patents for hemp products and processes, many of which are related to the plant's nutrient value.

The great Greek physician Hippocrates is often quoted, "Let food be thy medicine and medicine be thy food." He also said, "There are in fact two things, science and opinion; the former begets knowledge, the latter ignorance."

If we are to survive, we are faced with the task of shifting once again, but instead of moving backward, moving forward to a place where we can blend our technological creativity with the natural world, with knowledge, balance, respect, appreciation, and grace. The cultivation of industrial hemp could prove a viable long-term solution to not only world hunger, but the need for safe alternative renewable fuel, for addressing the climatic challenges resulting from deforestation, while providing safer natural medicines to cure many diseases, and cleaning compromised soil damaged by toxic agrichemicals, and eliminating the need for using them.

# Bamboos For Belize

## By Marquita Stanko and Taylor Walker

### Tropical Agro-Forestry Ltd.



Bamboos are some of the most useful plant species on earth. There are over 1000 species of bamboo distributed throughout the world that have been used for many practical purposes throughout history such as building shelter, making everyday tools and utensils and even as a food product. Bamboos originate from tropical, subtropical and temperate climates and grow on a wide range of soils. Many of the finest native and non-native bamboo species thrive right here in Belize.

Our bamboo project began in 2005 in Rancho Dolores, Belize District with the formation of Tropical Agro-Forestry, Ltd. Our desire was to introduce new varieties in Belize that exhibit exceptional characteristics for use in furniture making, landscaping and interior construction. We began working with Belize Agricultural Health Authority (BAHA) to conduct a pest risk analysis to confirm that each new bamboo would pose no threat to the ecosystem here in Belize. After twelve years of growth, our bamboo is the largest and most diverse bamboo collection in Belize. We are now focusing on bamboo furniture production, crafts, treated bamboo poles, landscape projects, and bamboo divisions for interested growers, farmers and landscape designers.

We specialize in clumping varieties that do not possess the aggressive, invasive capabilities of their “cousins”, the running bamboos. Clumping bamboos are some of the world’s fastest growing plants, making them an excellent candidate for regenerative production. When a bamboo plant is set in the field, the new canes or “culms” grow thicker and taller each year for the first three to five years until they reach their maximum height, which varies with each type of bamboo variety. Hereafter, the clump continues to spread outward until it grows into its full circumference which is fixed according to individual variety and can range from five to twenty feet in diameter. In contrast, running varieties have no particular set footprint and can spread to overtake acres of land over time. Of the twenty varieties of bamboo growing on our farm, we have selected some of our favorite varieties and highlighted some of their uses in this article.

***Bambusa malingensis***, known commonly as ‘Seabreeze,’ is a very tough and adaptable bamboo. It can reach a mature height of thirty-to-forty feet with a two-to-three inch cane. Research has shown that bamboo is the ultimate windbreak for farms and orchards and Seabreeze excels in this capacity as it is one of



the fastest growing varieties, producing many shoots in a dense and nearly impenetrable clump with a thirty-to-forty foot tall cane. It has many heavily foliated lateral branches along with a very bushy top growth that aids in the diffusion of wind. These qualities also make it an excellent choice for privacy screening and noise reduction and an essential selection when landscaping an ecolodge, resort, estate or housing development. Another excellent and underutilized function is for use as livestock shelter. Several clumps of Seabreeze placed together strategically throughout a pasture is an inexpensive and natural solution for animal protection.



***Dendrocalamus brandisii***, or so-called

‘Vietnam’ variety, is the ultimate specimen bamboo. This landscape giant adds an awe-inspiring, prehistoric feel to your landscape. This is the largest bamboo grown on the farm reaching a colossal height of sixty feet with a culm diameter of four-to-five inches. While all bamboos make their own beautiful music, this variety’s is quite unique. Vietnam is one of the best for use in furniture making, crafts and construction. It has a very majestic appearance with minimal lower branching giving it a more open growth habit exposing the beautiful, towering culms at eye level.



***Dendrocalamus minor***, ‘Amoenus’, also known as ‘Angel Mist’ or

‘Blue Green’ bamboo, is a beautiful variety featuring light yellowish culms with a powdery whitish wax giving rise to its common name Angel Mist. It is a standout in the landscape as it is a very showy variety offering a neat and tidy appearance. Reaching a height of up to thirty-five feet with culms of two-to-three inches it is perfect for a grand entrance, privacy screening or landscape specimen.



**Bambusa textilis gracilis** or 'Graceful' bamboo is one of the most popular landscaping bamboos and is unmatched in its ability to provide a very dense but more compact screening. Reaching a height of twenty-five-to-thirty feet, it is ideal for smaller spaces in comparison to some of our other large varieties. Graceful also has very straight culms making it an excellent source for cane fishing poles!



'Graceful'

**Bambusa tulda** or 'Tulda' is one of the ultimate furniture and construction bamboos on our farm. With a tensile strength just below steel it is used in Asia to reinforce concrete. Its adaptability and usefulness makes this one well worth growing for anyone interested in a fast growing, replenishable timber. It has a thick-walled culm and clean, long internodes with limited side branching.



'Tulda'

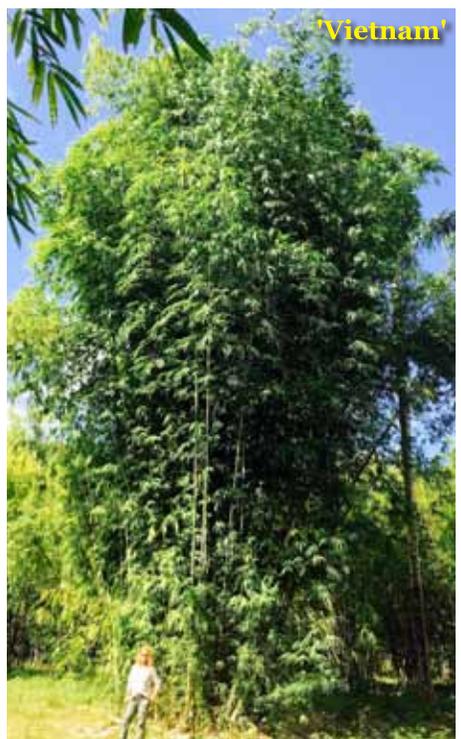
**Bambusa lako**, or 'Timor Black' is one of our beautiful ornamental varieties with distinctive black culms. They can reach heights of 30 feet with a culm diameter of around 2 inches.



'Timor Black'

If you would like more information about these or other bamboo varieties or are interested in our bamboo products please call us at 622-3184. We would love to help you select the right plants for your project or work with you to create unique bamboo furnishings.

**Editor's Note:** Marc Ellenby has been growing tropical fruits and tropical clumping bamboos in Florida since 1980. He is the owner of Belize Bamboo and Tropical Agro-Forestry, Ltd. in Belize. Marc's passion to ensure food security in Belize and throughout the world has led him to launch a new venture with the help of Marquita Stanko and Taylor Walker who are managing a new organic farm in Stann Creek using a multi-species



'Vietnam'

cropping system with the main crop being breadfruit. While introducing several new breadfruit varieties to Belize, their purpose is to create an extended season for Belize and beyond and to trial perennial crops and various tropical fruits as citrus farming alternatives.



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## White Flies - Gardeners' Nightmare by Mary Loan

White flies (*Thialeurodes vaporariorum*) comprise the family Aleyrodidae. They are typically 1/16 inch long, somewhat triangular shaped, soft bodied, flying moth-like white insects which are closely related to aphids and mealy bugs. More than 1550 species of white flies have been identified. By all accounts, they are all considered to be one of the most bothersome, destructive and challenging garden pests to control and, as a result, cost millions of dollars in agricultural losses yearly due to stunted growth and low production of crops and other plant losses world-wide.



An infestation of the dreaded insects can be identified by observing the undersides of plant leaves in the garden, green house and plant nurseries. If you note thick swarms of small white moths when plants are disturbed and the undersides of leaves of the plant are covered with tiny lice like nymphs, eggs and black soot, it is very likely white flies are on the attack. Plants appear to be withered and deformed with yellowing leaves as the nymphs and flies are busy sucking the plant juices and rendering plants unable to carry on photosynthesis. After sucking the juice from plants, white flies produce a nasty sticky substance known as *honeydew* which attracts black mold that makes plants weak and susceptible to disease. By the time honeydew and black mold are discovered it is a sign that white flies have been feasting on the plants for several days. Citrus, squash, poinsettia, potato, cucumber, pepper, sweet potato, okra, cabbage and hibiscus are some of the most commonly affected plants.

Time to take action! The earlier white flies are discovered, the easier it is to try to control them.

Over the years, white flies have developed resistance to many synthetic pesticides, making chemical control difficult; however there are many means of combat. Yellow sticky traps and strips are often placed in greenhouses and gardens to help reduce adult white fly populations. Instead of buying yellow sticky traps, you may try an easy home recipe as follows: Start with yellow poster board, cut poster board in quarters, fold the top over a rope and staple, then cover the front and back of the poster board with a mixture of 1/2 petroleum jelly mixed with 1/2 dish washing liquid. (You might start with 1/2 cup of each). Attach the ropes to posts at, or above plant level around affected plants. White flies mistake the yellow board as flower clusters and get stuck on it. Mulching well ahead of planting is said to help. It is recommended to place crinkled aluminum foil around base of plants, making it difficult for white flies to locate host plants. Some gardeners find spraying plant undersides with a special hose to wash off white flies, nymphs and eggs to be helpful. A good squirt of dish washing or special garden soap may be added to a gallon of water and used with the spray. A small battery operated hand-held vacuum can be used in greenhouses to suck insects from infected plants. Neem oil or a special horticultural oil, can be sprayed on vegetables, fruit trees and flowers to help kill eggs larvae and smother adults. Mix one ounce neem oil with one gallon water and spray all leaf surfaces

until saturated. It is best not to spray plants before the heat of the day; spray later in the day instead. A non-stinging tiny parasitic wasp, lady bugs and lacewing larvae are natural predators of white flies. French and Mexican marigolds help to repel white flies as the scent and taste of the plant are disagreeable to them. It is believed that using worm castings in soil which are absorbed by the plants, also makes them distasteful to white flies.

Look up Plant Natural Research Center – Answers and Advice for Organic Gardeners, for more good advice, ideas and remedies for white fly prevention and treatment and other helpful gardening information.

## Coconut Coir Production in Cayo at Belize Botanic Gardens By Gayle Zentz



In April of 2016, the owner of duPlooy's Jungle Lodge and Belize Botanic Gardens, Judy duPlooy, decided to convert a local waste product, coconut

husks, into something useful – coconut coir. For centuries, many cultures have used coconut fiber for items such as ropes, mats, sacking, upholstery padding and brushes. It's also useful as a mulch and a soil amendment.

DuPlooy's picks up empty coconut husks from coconut water processors in Cayo District where the coconuts have been harvested and drained of their coconut water.



Their Merry Mac commercial chipper can process about 1600 coconut husks per hour. There is no waste as everything is used. The coir from their facility is either used at the resort and gardens grounds or sold at the Belize Botanic Gardens Shop at 37 Far West Street, San Ignacio.

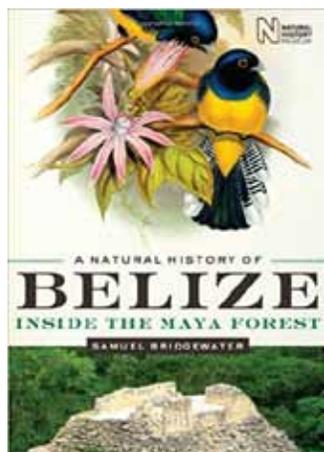


Coconut coir mulch retains moisture and reduces watering requirements. Coir is rich in carbon and is excellent for compost piles and helps to

balance nitrogen-rich materials like grass clippings and kitchen waste. It has a near neutral pH level (5.5-6.8), unlike peat which is highly acidic (3.5-4.5). A 3 to 4 inch layer is adequate to keep weeds down in your garden. Coir is mixed with soil for potting mediums. It can be very useful on clay soils; it prevents compaction, allowing freer movement of nutrients and moisture.

**Editor's Note: Coconut production in Belize is rising steeply as the world learns more about coconut products and their benefits. The EU has invested heavily in regional Caribbean coconut projects, which are overseen in Belize by CARDI and the Ministry of Agriculture.**

## A Natural History of Belize - Inside the Maya Forest By Samuel Bridgewater Reviewed by Chris Harris



Living in Belize, we hear and read much about the living Mesoamerican reef which lies off our shores, and its prolific wildlife. This is rightly a major tourist attraction and occupies most of our attention when thinking of our country's natural beauty and complexity. This is largely because of its easy accessibility. However another world class natural beauty exists in Belize which does not get the same level of publicity. At 177,000 hectares, one can

hardly describe the Chiquibul forest as hidden away, although its lack of accessibility is one of the reasons it has remained relatively undisturbed over the centuries. So it is high time that the Chiquibul take centre stage and be shown for what it is: a world class centre of natural diversity, not matched by many countries around the world.

This then is a book that casts a broad light on a little known area of Belize. The Chiquibul is indeed hard to access, and the scientists who have made it their life's work deserve great credit for their perseverance in what is a pretty hostile environment. It is not for nothing that a member of the British Army (BATSUB) told me that this dense forest full of insects, animals and even plants which do not welcome the casual visitor is the toughest jungle training environment in the world.

This is a reference book with two major differences. Firstly it is extremely readable, and secondly it gives detailed explanations of a multitude of aspects of life in Belize. Because the book was written by a scientist working in a scientific environment one might expect a dry monologue of facts and figures of interest only to fellow scientists. Not a bit of it. This book explains, as well as details, animal and plant life, exposing many aspects of the complex interactions between various aspects of life in the deep forest.

But the story does not start there. The first few chapters deal with the history of the geology of Belize as a landmass, long before man arrived. The development of the country and the genesis of the forests which historically covered much of Central America, in fact how Central America itself even came to be here, are dealt with in a very easy-to-understand way. But for the enquiring mind wanting a more detailed explanation, that is in the book too.

Although the book does focus on the Maya Forest, and upon the Chiquibul itself, one should not see this as any kind of specialization. The Maya Forest is one of the very few areas of dense forest still left in Central America, because of the march of agriculture and expanding populations. As such it offers us the opportunity to study at first hand the huge variety of life of all kinds deep in the forest.

Because Belize famously has one of the lowest population densities, and one of the highest proportions of its land mass under control of national parks and forest reserves in the world, much of the forest area is largely untouched and retains a vast wealth of plants, animals and trees. This has attracted scientists from all over the world and the Royal Botanic Gardens in Edinburgh, Scotland have made the Chiquibul their centre for research.

The book is lavishly illustrated with color photographs of plants, animals, insects, trees, rivers and the natural rock formations which over millions of years have formed the familiar landscape of the Belize we know and love today. Many mysteries of the private lives of animals that make their homes deep in the forest are laid bare. Who knew, for instance, that the famous Xate plant is pollinated exclusively by a tiny insect called a thrip which lives its whole life inside the plants it pollinates because it can barely fly? Or that a bat which lives in the Chiquibul feeds only on fish which it catches by skimming the surface of lakes and rivers?

The author is not afraid to point out the ecological damage caused by illegal logging, hunting and border incursions from Guatemala, affecting many animal and bird species as well as the environment itself. The author also explores the negative effects of the building of the Chalillo Dam on breeding sites for endangered species such as tapirs and scarlet macaws, and even of pollution from wind-born pesticides from southern farms. However it is quite clear that the Chiquibul has the strength and resilience to repair the damage made primarily by man, given time. Even the huge destruction wrought by major hurricanes such as Hurricane Hattie in 1961 is, over time, being repaired by nature.

Yes, this is a reference book, one into which the enquiring reader can dip to seek explanations of what is going on around us day by day. And for the many immersed in a largely metropolitan life, this book is a very welcome spotlight on just one aspect of the beautiful and unique country we live in.

Personally, I really enjoyed reading this book, so much so that I have ordered up my own copy. At US\$ 45 it is quite expensive, but can be found for less on Amazon. For that money however, you are getting a treasure trove of "things you did not know" and explanation of at least some of the puzzles Nature has laid before us. An important book which belongs on the bookshelf of any self-respecting Belizean family: *A Natural History of Belize-Inside the Maya Forest* by Samuel Bridgewater, published by the University of Texas Press, PO Box 7819, Austin, Texas 78713 7819, ISBN 978-0-292-73900-0, US \$45.00

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**Yucatan's state fair, Feria Yucatan, will be held at X'Matkuil from 10 November through 3 December, 2017.** The cattle opening ceremonies will be on 10<sup>th</sup> November. Beefmaster judging starts on 14<sup>th</sup> Nov, followed by Brangus & Suizo Europeo (brown swiss) on 16<sup>th</sup> Nov; Simental and Simbrah on 18<sup>th</sup> Nov; Brahman on 19<sup>th</sup> Nov; Nelore on 21<sup>st</sup> Nov; Guzerat on 22<sup>nd</sup> Nov; Gyr and resena de Sindi on 23<sup>rd</sup> Nov. Horse classes will be 3<sup>rd</sup> Dec. More information contact: [feriayucatan.gob.mx](http://feriayucatan.gob.mx)



**CARDI Day - December 5<sup>th</sup>** at Central Farm - more information page 23.

**Acres USA will host its 42<sup>nd</sup> annual Eco-Ag Conference and Trade Show in Columbus, Ohio, From Dec 5<sup>th</sup>-8<sup>th</sup>, 2017.** More information at <https://www.acresusa.com/events>



**Belize Livestock Producers Association (BLPA) has tentatively announced the date of their AGM,** which will likely take place on Saturday 24<sup>th</sup> February, 2018 at BLPA complex at Mile 47 1/2 George Price Highway, Belmopan. Email [blps@btlnet.net](mailto:blps@btlnet.net) or phone 822-3883 closer to the event for more information.

**Spanish Lookout will hold their Bi-annual Commercial and Industrial Show on March 2 & 3<sup>rd</sup>, 2018** at Countryside Park, Spanish Lookout. Information: [businesschamberspl@gmail.com](mailto:businesschamberspl@gmail.com)



## IICA Celebrates 75 Years of Service to Agriculture in the Americas

On 7 October 2017, the Inter-American Institute for Cooperation on Agriculture



(IICA) celebrated 75 years of working side by side with governments, organizations, and farmers in its member states. With its feet firmly on the ground and a vision toward the future, the institute works to benefit the development of the agricultural sector in the Americas.

“We owe our success to our ability to adapt the actions of the institute to the ever-changing challenges in agriculture, even anticipating future difficulties, by providing tangible results in our three key areas of action - national, regional, and hemispheric”, stated Victor M. Villalobos, Director General of IICA.

The institutional objectives of IICA are to boost the growth of productivity and competitiveness in the sector, contribute to the reduction of poverty and inequality in rural areas, promote adaptation against the effects of climate change, provide integrated management of natural resources, and ensure food security. “To overcome the challenges that this sector faces requires the cooperation of all actors linked to agriculture: producers, public and private sectors, social organizations, and academic and research institutions. A society with a stake in agriculture will be a prosperous society”, stated Villalobos.

The history of IICA is linked to the history of agriculture in the Americas and spans more than seven decades of experience and achievements. The long lifespan of IICA is proof of the value that the member states attach to international cooperation, and the importance they attach to the development of agriculture and well-being in rural areas.

### More information:

Evangelina Beltran, Coordinator of the Office of the Director General. [evangelina.beltran@iica.int](mailto:evangelina.beltran@iica.int) Website: [About IICA](#)

*Continued on pg 33*

### 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



★ Same

	Cayo, Belize	Quintana Roo, Mexico	Peten, Guatemala
REGULAR	↑ \$10.23 Bz/Gal	↓ \$6.60 Bz/Gal	★ \$8.00 Bz/Gal
PREMIUM	↑ \$12.01 Bz/Gal	↓ \$7.29 Bz/Gal	↑ \$8.31 Bz/Gal
DIESEL	↑ \$9.73 Bz/Gal	↓ \$6.96 Bz/Gal	★ \$6.46 Bz/Gal



**SPANISH LOOKOUT RESCUE TEAM**  
6000-911 & 6770-911



It has been our pleasure providing medical transportation since 1999.

Spanish Lookout Rescue Team, a non-profit organization, consists of 2 Ambulances and 1 Rescue truck. The ambulances are fully equipped with lifesaving supplies and 3 Emergency Medical Technicians. The rescue truck has the Jaws of Life (hydraulic scissors) and other tools to open vehicles if people have been trapped.

Spanish Lookout Rescue Team responds to all calls; accidents, house calls and private transfers. We respond to all Road Traffic Accidents FREE of cost, taking the patient to the nearest hospital, but charge for private calls and transfers. Cayo district is our main area but we respond as far as Stann Creek, Guatemalan border, and mile 31 on the Western Highway. We take patients as far as Flores, Guatemala (assist till Guatemala city) and Chetumal, Mexico.

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.

**Life is a Treasure, We CARE!**





### Honduran beef returns to Taiwan:

After several years of interruption of beef sales from Honduras to Taiwan, in August of 2017 the trade resumed with a shipment of two 40-ft containers of beef to the island. Plans are for 4 containers of beef every month from Honduras to Taiwan and for sales of melons, shrimp and coffee to begin shortly.

**The FIRA International Forum of Agricultural Robotics will have its 2<sup>nd</sup> forum on 29<sup>th</sup> & 30<sup>th</sup> of November 2017 in Toulouse, France.** The event is being organized by NAIIO Technologies and will be **livestreamed in English and French on a dedicated YouTube channel.** For more information: Gwendoline Legrand of Naio Technologies [gwendoline@naio-technologies.com](mailto:gwendoline@naio-technologies.com) or phone +33 688 87 1711.



For a depressing article on **our Caribbean Sea being 'choked by plastics'**, go to <http://www.telegraph.co.uk/news/2017/10/26/shocking-photo-shows-caribbean-sea-choked-death-human-waste/> The article focuses on the sea around Roatan, and in summary, "Once the trash is in the ocean it is incredibly difficult and costly to remove. The key is to stop the trash before it enters the ocean." Think on that the next time you get 'take out' in styrofoam with a plastic fork, in a plastic bag. Remember humans will ingest an increasing amount of plastic via seafood. Another fun fact: the average useful lifespan of a plastic bag is 12 minutes.



Trash floating on the sea

The Belize Ag Report regrets the following **errata** in issue 36, page 12 : "Roughly 12,000 (100 lb bags) of corn were harvested by Bel-Car farmers." The sentence should have been: Roughly 12,000 (100 lb bags) of the new variety ADVANTA corn were exported by Bel-Car.

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### Cheese Making... Continued from pg 6

pastures recently and one of them managed to escape under the fence to eat all my dragon fruits! Our herd now numbers over 45 animals and has some of the best looking goats in Belize. Overall, the goat and cheese making businesses have been a lot of fun and I am proud of what our team has accomplished in a very short period of time. So proud in fact that we have now started a herd of sheep for meat but that's another story! Thank you, guys! Come milk the goats with our staff every morning at 7:30 and learn a little bit more about being a goat shepherd!



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### Aerial App... Continued from pg 24

- Higher productivity of the aircraft as less time is wasted refilling with water.
- Higher productivity in terms of acres covered; spraying can often be finished before mid-day when the weather is usually less-favorable.
- A much larger area per hour than ground machines under ideal spraying conditions.

Any questions or comments to: [<mccracken.alan@gmail.com>](mailto:mccracken.alan@gmail.com)

**Editor's Note: During the past 2 years Alan McCracken has been providing technical support to AIRMAX located at Spanish Lookout Airport. The objectives are to obtain better results with the chemical products and to improve the efficiency of operation with more precise control of all aspects of the application.**

## ART COMPETITION: CALL FOR SUBMISSION OF ART WORKS



The Pesticides Control Board, Belize (PCB) is organizing its 3rd annual Pesticides Awareness Week. The week will be observed October 16-20, 2017.

This year the PCB is organizing an art competition for pupils in primary schools across the country of Belize. The theme of this competition is: "Help Conserve Biodiversity, Manage Pesticides Responsibly!"

Biodiversity is of such importance to our communities and our livelihood so use your fantasy, creativity and knowledge to help others understand your views on the importance of biodiversity and pesticide management through your art work. Draw & paint to express your views!



### Entry rules and conditions

Students ages 10-13 are invited to present on the theme using their creativity. Presentations can be through different mediums: pencil crayons, markers, watercolors, pens, pastel, etc. Pupils are to submit the artwork on a Bristol Board 16" X 13".

i. **Names and Contact.** Your full name, age, gender, full address including phone number, name of school and class to be written on the submission envelope (package)

ii. **Description.** Provide a 150-200 word description of your art and enclose with artwork.

iii. **Only original works** should be submitted. It is illegal to submit pirated, plagiarized or copied artwork.

iv. **Deadline. December 1, 2017.** Send to Pesticides Control Board, Central Farm, Cayo District, +501 824 2640, [pcbinfo@btl.net](mailto:pcbinfo@btl.net)

### Prizes:

Prizes will be awarded to: 1st, 2nd and 3rd place.

Winning artwork will be used to raise environmental awareness through exhibitions, websites, posters & publications

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