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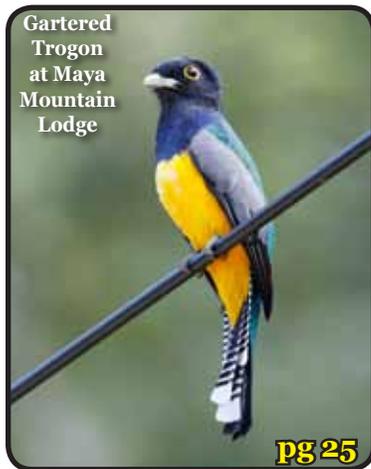
February 2017  
ISSUE 35



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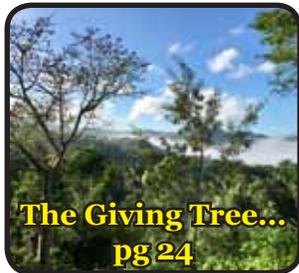
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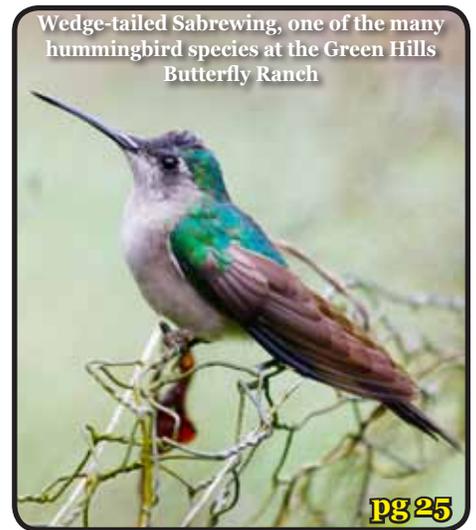
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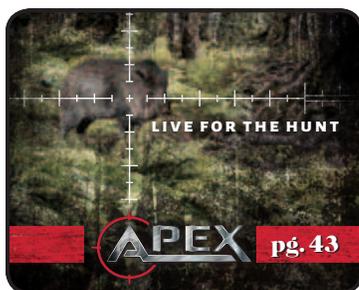


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**AGM - February 25, 2017**



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# Old Crops Become New Under-Utilized Native Crops Ancient Amaranth

By Santiago Juan



Amaranth is one of the most under-utilized native food plants of Belize. The name amaranth comes from the Greek *amarantos* which means *never fading* or *does not wither*. This is an appropriate name as it is a plant that tolerates drought and persists in backyard gardens with very little care. Amaranth, or as we know it in Belize, callaloo, has been cultivated as a grain for thousands of years. For generations, the native people of the Americas used it as a staple; the most extensive use of the plant was probably by the Aztecs as they have left behind many signs of the importance of amaranth in their way of life. Very little data on yield exists for amaranth cultivation in Belize but in Mexico the yields are comparable to rice.

Amaranth has leaves ready to harvest within 30 days of germination and continues growing for approximately four months. The leaves are harvested while the plant continues to grow and produce food for us. The harvesting of the leaves stimulates tillering (plant that shoots up from the base of a plant) so the plant becomes more bush-like. One of the many advantages of this wondrous plant is its ease of handling. It does not have any irritants as it is a very succulent plant so is easily harvested. It is mostly self-seeding; once allowed to seed it seldom requires reseeding as the percentage germination is well above eighty percent. Occasional mulching with grasses or compost keeps the plants growing rapidly and vigorously both in direct sunlight and semi-shaded areas. In true “never-fading” fashion, seeds from the amaranth plant spread around the world and both leaves and grain became important food sources in areas of Africa, India, and Nepal. In the past two decades, amaranth has reached a much larger number of farmers and can now be found in many non-native regions such as China, Russia, Thailand, and Nigeria.

Traditionally in Belize and the Caribbean the leaves are eaten in scrambled eggs for breakfast or in soups or fried up with onions and garlic. Amaranth contains more than three times the average amount of calcium of most edible greens and is also high in iron, magnesium, phosphorus, and potassium. It's also the only grain documented to contain Vitamin C. With protein levels of approximately 13 – 14%, it easily trumps the protein content of most other grains. Sometimes the protein in amaranth is referred to as “complete” because it contains 9 essential and 12 non-essential amino acids. Only raw kale exceeds the protein content of amaranth.

Gluten is the major protein in many grains and is responsible for the elasticity in dough, allowing for leavening and contributing to the chewiness of baked products. More and more people cannot eat products containing gluten, often due to Celiac disease, an autoimmune digestive disease that damages the body's ability to absorb nutrients from food. This makes amaranth an important grain to take note of. In fact, far more whole grains are gluten-free than gluten-containing! It's just that the gluten-containing whole grains and products have been more prevalent in our food supply, but this is slowly changing. (It is important to note that gluten intolerance has lately been proven to be due to the glyphosate that is sprayed on wheat as a desiccant.)

In many South American countries, you can find amaranth seed sold on the streets, most often having been popped like corn. In India, Mexico, Nepal, and Peru, it's a traditional ingredient for breakfast porridge. In Mexico, a favorite treat is *dulce de alegria* (“*alegria*” being the Spanish word for joy), a sweet candy-like confection made from popped amaranth seed mixed with sugar or honey. Amaranth can be eaten straight up. Its flavor runs from light and nutty to lively and peppery, making it a popular ingredient in cereals, breads, muffins, crackers, and pancakes.

Cooking amaranth is very easy: boil 6 cups of water for every cup of seeds, add grains, gently boil with the occasional stirring for 15-20 minutes, then drain, rinse, and enjoy! Yes, it's really that simple. Cooked amaranth behaves a little differently from other whole grains. It never loses its crunch completely, but rather softens on the inside while maintaining enough outer integrity so that the grains seem to pop between your teeth. In fact, there's only one real rule to follow when cooking up a batch of plain amaranth: don't skimp on the water! To say “your cooking liquid will thicken slightly” is putting it delicately.

**Editor's Note: Santiago Juan was born and raised in Cayo District, where his family owns and operates Nabitunich Resort. He began his formal agriculture schooling at UB CF (The College of Agriculture at the University of Belize, Central Farm), which was at the time Belize College of Agriculture; afterward he attended EARTH University in Costa Rica, specializing in humid tropical agriculture. While studying at EARTH U, he was introduced to EM (effective microorganisms), a technology developed in Japan. Santiago was one of the founding partners of the first Belizean business which developed EM products here. His passions include his organic vegetable gardens and his extensive stables (Hanna Stables) which cater to horseback tours and horse racing at San Lorenzo Farm, neighbouring Nabitunich Resort.**

*Pictures courtesy of Phoenix Photo*

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## ADVISORY TO ALL LIVESTOCK PRODUCERS

### RABIES VACCINATION FOR CATTLE, SHEEP AND HORSES STRONGLY RECOMMENDED

Belmopan, 1<sup>st</sup> Feb. 2017

The Belize Agricultural Health Authority (BAHA) in collaboration with the Ministry of Agriculture, Ministry of Health and Belize Livestock Producers Association informs all livestock farmers to vaccinate their livestock against the ongoing Bovine Rabies disease outbreak. The disease is currently being detected in the Corozal, Orange Walk, Cayo and Toledo Districts and is expected to continue affecting unvaccinated herds throughout the entire country. The disease is also being found in sheep and therefore farmers are being advised to vaccinate their cattle, sheep and horses against rabies

Farmers are advised that rabies can be transmitted to humans and to report suspect cases to BAHA. Rabies is a highly fatal disease that affects all mammals. The disease is always fatal but can be prevented through vaccination of animals and post exposure treatment to humans. Affected animals will usually show nervous signs and aggressive behavior. Most animals will show excessive salivation as swallowing becomes impossible. Avoid coming in contact with animals showing these symptoms and immediately call BAHA Officers.

Additional information can be obtained from livestock officers of the Department of Agriculture in the districts, BAHA animal health officers, Belize Livestock Producers Association and Registered Veterinarians.

End

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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.*

See page 14 for details on this new first-time in-Belize Kinsey course, **Soil Fertility Intro 2** starting 27th Feb 2017. Don't confuse this with Neal's previous courses!



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## TO THE EDITOR

Dear Editor,

The article at [www.globalresearch.ca/india-from-the-destabilization-of-agriculture-to-demonetization-made-in-america/5566615](http://www.globalresearch.ca/india-from-the-destabilization-of-agriculture-to-demonetization-made-in-america/5566615)

can be summarized as follows. India has allowed foreign interests, operating through World Bank loans and a public-relations organization (that is, propagandists for hire) to open the doors of India to Monsanto-Bayer (and the Wall St. bankster demonetization, or war on cash, interests) to destroy India's ag industry to the benefit of large-scale toxic farming that profits multinational ag companies. To quote from the article:

The World Bank's 'Enabling the Business of Agriculture' – supported by the Bill and Melinda Gates Foundation and USAID – entails opening up markets to Western agribusiness and their fertilisers, pesticides, weedicides and patented seeds.

Anyone who is aware of the Knowledge Initiative on Agriculture and the links with the Indo-US Nuclear Treaty [will know who](#) will be aware that those two projects form part of an overall plan to subjugate Indian agriculture to the needs of foreign corporations (see [this article](#) from 1999). As the [biggest recipient](#) of loans from the World Bank in the history of that institution, India is proving to be very compliant.

We need to be vigilant that Belize, with a GoB who cannot say *no* to foreign money, not be a foreign target for the destruction of BZ agriculture.

Dennis Feucht

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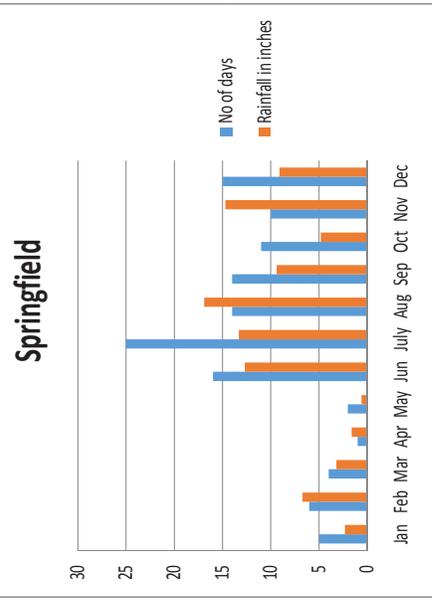
## Rainfall - Springfield Community

Springfield has kept rainfall records since 2005. Their average annual rainfall is 94 inches. 2005 was the lowest year on record with 78.8" and 2006 was the highest year on record with 122.1". We thank, the Springfield Community and Mr. Andrew Beiler for sharing this data.

2016 We see two record breakers of 12 year survey

1. August had 16.9" rainfall (12 year highest).
2. July had 25 days rain out of the 31 days. 12 year highest amount of days in a given month.

Month 2016	No. of days of rain	No. of inches	Accumulative total
January	5	2.3	2.3"
February	6	6.7	9.0"
March	4	3.2	12.2"
April	1	1.6	13.8"
May	2	0.6	14.4"
June	16	12.7	27.1"
July	25	13.3	40.4"
August	14	16.9	57.3"
September	14	9.4	66.7"
October	11	4.8	71.5"
November	10	14.7	86.2"
December	15	9.1	95.3"
<b>Total 2016</b>			<b>7</b>

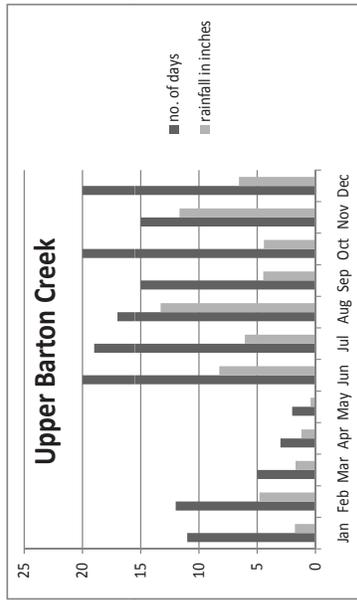


## Rainfall - Upper Barton Creek

Rainfall records have been kept for 23 years. The average annual rainfall is 75.45". The highest annual rainfall, 101.1", was in 2006. The lowest annual rainfall, 52.8" was in 1994.

We thank, Mr. Isaak Harder and Upper Barton Creek Community for sharing this data.

Month 2016	No. of days of rain	No. of inches
January	11	1.77
February	12	4.81
March	5	1.7
April	3	1.21
May	2	0.42
June	20	8.26
July	19	6.06
August	17	13.3
September	15	4.48
October	20	4.43
November	15	11.67
December	20	6.57
<b>2016 Total</b>		<b>64.68</b>



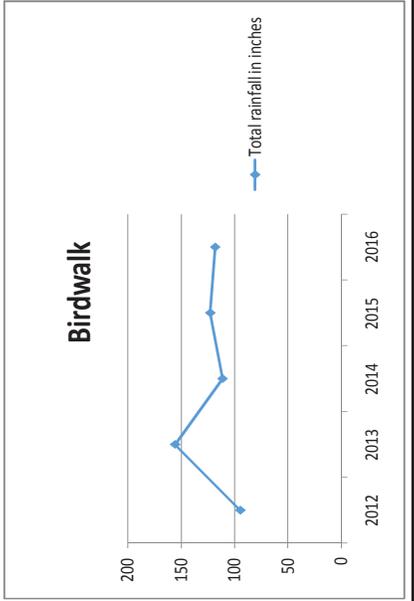
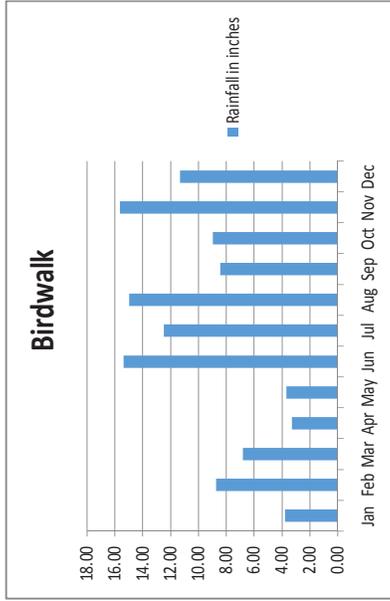
Although the trend of lower rainfall in northern Belize, and higher rainfall in the south still remains generally true, much variation can be seen within each area.

All of the rainfall charts and graphs for this article were created by Dottie Feucht.

## Rainfall - Birdwalk Community

Birdwalk Community has kept rainfall records since 2012. Their average annual rainfall is 119.506". We thank Mr. David Shirik for sharing this data.

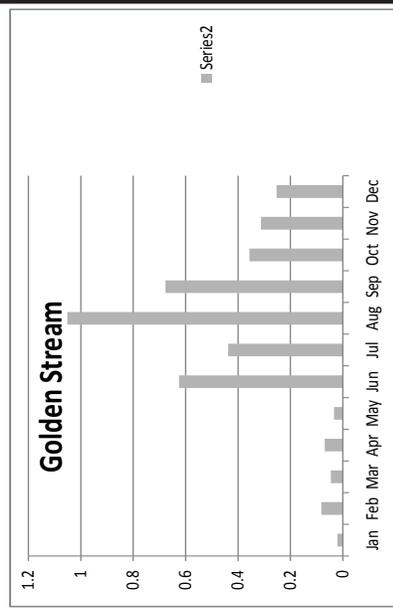
Month 2016	No. of inches	Annual Rainfall in inches
January	3.80	2012 94.65"
February	8.72	2013 155.70"
March	6.81	2014 111.30"
April	3.30	2015 122.78"
May	3.67	2016 118.1"
June	15.36	
July	12.48	
August	14.98	
September	8.44	
October	8.97	
November	15.64	
December	11.33	
<b>2016 Total</b>	<b>118.1</b>	



## Rainfall - Ya'axché Golden Stream Corridor Preserve

Ya'axché Conservation Trust's field office is in Golden Stream, Toledo. They have collected rainfall data since 2009. They sent us rainfall data from two of their research stations. Thank you, Ya'axché Science Director Mr. Said Gutierrez for sharing this data.

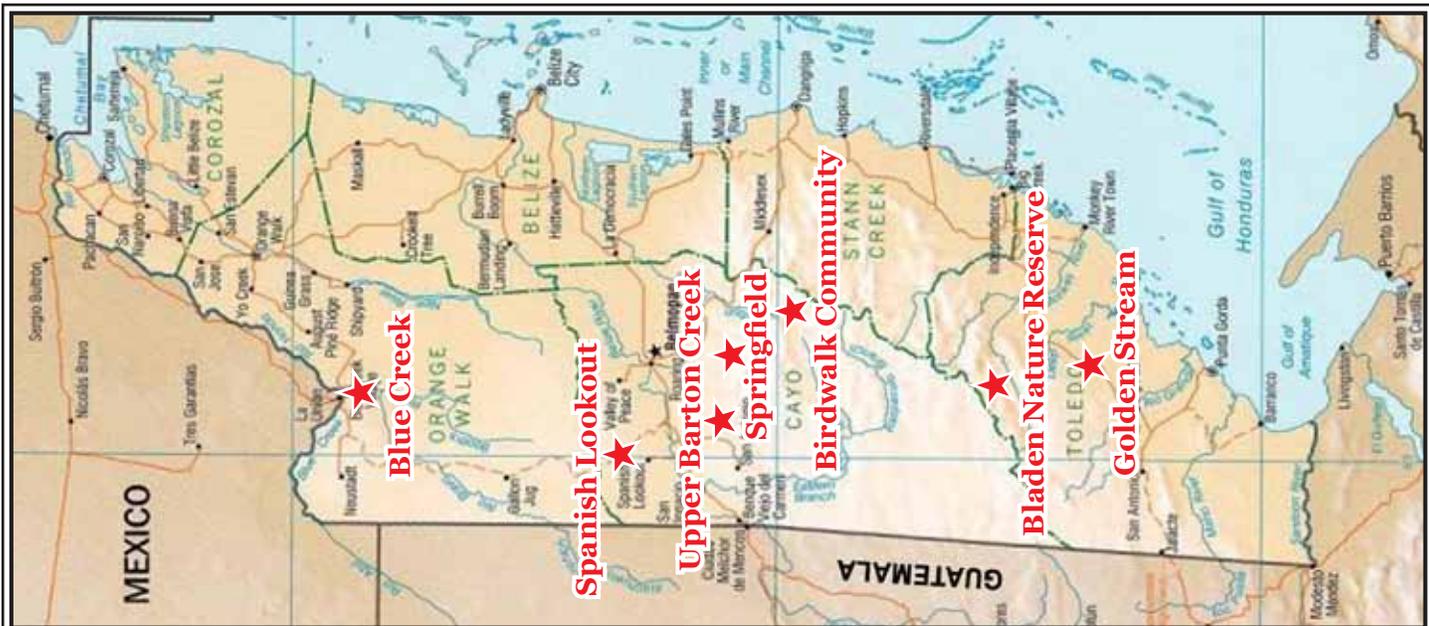
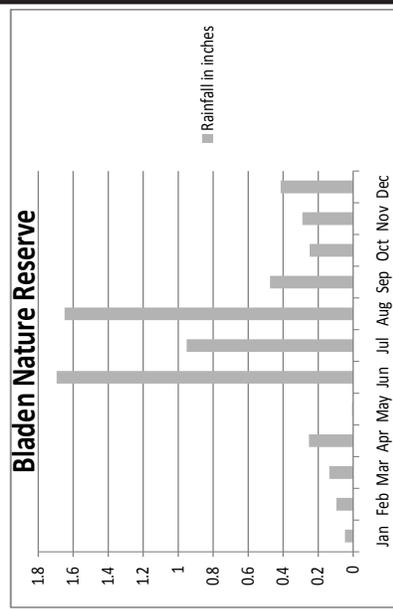
Month 2016	No. of inches
January	0.02
February	0.08
March	0.05
April	0.07
May	0.03
June	0.63
July	0.44
August	1.05
September	0.68
October	0.36
November	0.31
December	0.25
<b>2016 Total</b>	<b>3.97</b>



## Rainfall - Ya'axché Bladen Nature Reserve

Ya'axché Conservation Trust's field office is in Golden Stream, Toledo. They have collected rainfall data since 2009. They sent us rainfall data from two of their research stations. Thank you, Ya'axché Science Director Mr. Said Gutierrez for sharing this data.

Month 2016	No. of inches
January	0.05
February	0.10
March	0.14
April	0.25
May	0.06
June	1.70
July	0.95
August	1.65
September	0.48
October	0.25
November	0.29
December	0.41
<b>2016 Total</b>	<b>6.33</b>



# BEYOND THE BACKYARD

## Such a Delicious Monster

By Jenny Wildman



The members of the very large araceae or arum family are referred to as *aroids*. The family includes many plants which grow abundantly in tropical climates with names familiar to us: philodendron, monstera, dieffenbachia, caladium, calla, taro, dasheen, and coco yam. Some are grown for their edible corms, some for fruit but mostly for their striking foliage. They share certain characteristics such as large leaves containing a milky substance and are all laced with calcium oxalate crystals or raphides which can cause temporary loss of voice and chronic itching. Even the edibles should never be eaten raw and extreme

caution should be taken when handling, so anyone sensitive to oxalic acid should probably stay clear.

The calla lily or arum lily is known for its magnificent beauty and has become a symbol of Easter and a traditional flower for weddings and funerals. The Romans put a lily upon a corpse to signify rebirth or resurrection but this later translated into association with death. It was considered very bad luck and the flowers were refused admittance to hospitals. The revolutionary Mexican artist Diego Rivera created many paintings of peasants embracing large bundles of white lilies in dramatic contrast to shockingly vibrant colours, leveling a sharp message at the capitalistic world. I had thought that this is what I had found at the foot of a Mayan temple down south but upon closer inspection I saw that the foliage was that of the popular ornamental houseplant, the philodendron. The philodendron, the love tree, was known to adventuresome collectors of the 1600's but it took two more centuries before categorizing and naming began.

Many studies produced abundant information for growers to cultivate these exotic plants taken from the wild to start profitable markets for ornamentals. As with all nature, certain conditions and occurrences are necessary for a plant to thrive and achieve optimum results. For instance both genres, Philodendron and Monstera, rely on the cyclocephale beetle for pollination. They are thermogenic plants whose temperature can rise to 45 degrees Celsius emitting a scent that attracts insects. The arum lily sends out a smell of rotting flesh but the sweet smelling pheromones of the philodendron lure the beetle who must be "very happy" not to need a courtship dance as he is quickly followed by the female into the warm cozy spathe. A sticky resin unique to both philodendrons and monstera soon covers the beetles and keeps the pollen adhered to the revelers and after a night of activity they are covered in pollen. The plant then gradually eases the beetles up and out to commence their task of pollinating the species. The plants then create colourful tasty berries and perfume to attract the jungle animals who will later disburse the seeds through feces.

One of the largest flowers in the world is found in the tropical regions of Asia. Sir David Attenborough whilst filming the Private Life of Plants in Sumatra, coined the name *Titan Arum* so as not to offend the public with its real name *Amorphophallus titanum* (giant penis) which it indeed resembles but at an impressive height of ten feet. With a flower only possible every 1000 days and short lived it is rarely seen. However several botanical gardens have succeeded in cultivation which has only occasionally wowed the public. The flower can heat

to 36 degrees C (98F) emitting a disgusting odor of rotting flesh which attracts dung beetles and sweat bees. It has therefore been dubbed the corpse lily or carrion flower. It is indeed a monster.

My garden monster is less scary but has all the typical family characteristics. It looks like a philodendron and is often called a split leaf philodendron as the leaves are similar like ribs, yet it is known as the *Montstera deliciosa*.



A. Copperfield



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Some of the common names aptly describe its appearance: monstera for its monstrous sized leaves, Adam's rib, Swiss cheese plant and hurricane plant due to its fenestrated (holed) leaves, Mexican breadfruit for texture, fruit salad plant for its multiple fruity taste and ceriman. The difference between the monstera and the philodendron is that while the philodendron has a tendency to climb and has both aerial and subterranean roots, it has a distinctive trunk with leaf scars that have created oval plates favouring eye balls and does not need to attach itself for support and its leaves do not have holes. The monstera has darker green leaves and is a climber, clinging to trees, vigorously growing and reaching lofty heights of 60 feet. The holes in the leaves allow sunlight and breeze to nourish the lower levels and the roots reach out for water and nutrients wherever they can.

The flower is called a spadix and it is sheathed with a leaf called a spathe giving it the beautiful arum lily look. It can be propagated by seed, air layering or more rapidly by cuttings pre-rooted or simply dug into warm moist soil. It makes a good house plant but will not bloom or fruit indoors. Choose a good semi-shady, damp, non-saline location where it is able to support itself on a tree, avoiding too much light. It requires water but very little attention. It takes about 3 years before it is able to bear its phallus shaped fruit with a covering of scaly skin which also takes a further twelve months to achieve maturity. When it reaches a point where it sort of looks ready as it has become paler but is still green, you harvest by snapping off the fruit at the stem then putting it in a brown bag to ripen at room temperature. The scales will begin to drop off revealing a wondrously delicious fruit which peels off like corn kernels tasting of bananas, pineapples, mango and plums. The fruit can be eaten just as it is or blended into jam, pudding or ice cream. Do not rush! It is NOT ready until the scales fall off. Remember it contains oxalic acid but when ready an added sprinkle of lime juice helps break that down and add to the fruit salad flavour. The little black specks are remnants of the flower and are edible. Trying to rinse them off will lessen the juice of the fruit. Delicious and well worth the wait.

Other uses for monstera include fusion made from the leaves to relieve arthritic pain. And ropes and baskets made from the long strong aerial roots.

Caution: PET OWNERS note that the lily pollen is nephrotoxic and could cause kidney failure. Oxalic acid is corrosive akin to rust cleaner. So beware and note that this family of plants can be harmful to your pets if ingested.

*Pictures courtesy of Phoenix Photo except where noted.*



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# Mycorrhizae: what are they and can they give me better crops?

By Johnathan Canton



The symbiosis (the living together of two dissimilar organisms with mutual benefit) between plant roots and fungi has substantial agricultural usefulness. They form a compound structure

known as a mycorrhiza or “fungus root”. Plants exchange a fraction of the carbon that they have fixed from the atmosphere for phosphorous and nitrogen scavenged from the soil by the fungi. Since the discovery of the symbiotic nature of mycorrhizae in the late 1800’s, a great deal has been learned about their mechanisms of nutrient scavenging and exchange. Very recent revelations have brought into question whether the tailored application of mycorrhizal fungi in the agricultural setting can enhance crop yields.

Interestingly, some fungal partners cannot complete their life cycle without first associating with a plant partner. For this reason, they are referred to as *obligate biotrophs* (i.e. they need to extract nutrients from or “feed” off of other life forms). At first this sounds like parasitism. Indeed, many fungal parasites like the rust fungi that are known for their ability to negatively affect crops are also obligate biotrophs. The difference with mycorrhizal fungi is that they also deliver some of the resources they scavenge from the soil to the plant, thereby making this association a *bona fide* symbiosis. Mycorrhizal fungi form two major types of associations with plant roots: ecto- and endomycorrhizal associations. Ectomycorrhizal fungi, as the name implies, form a sheath around the roots of plants; whereas in endomycorrhizae, the hyphae (threadlike elements of the vegetative part of the fungus) actually invade the plant root cells. Endomycorrhizae can be further subdivided into three groups: arbuscular mycorrhizae, ericoid mycorrhizae and orchid mycorrhizae. Since ectomycorrhizae are, for the most part, restricted to the trees and saplings of arboreal forests, the discussion here will surround the arbuscular mycorrhizae that associate with most plants, including various agricultural crops.

At a cellular level, the interaction between mycorrhizal fungi and plant roots is striking in its elegance and worth mentioning. Under certain conditions plant roots exude a molecular signal called *strigolactone*. Strigolactone has a very short half-life and its ephemeral presence in the rhizosphere (i.e. root zone) creates a “scent” trail that mycorrhizal spores respond to. Upon receiving the cue from the plant, fungal hyphae extend dynamically and move up the strigolactone gradient in the general direction of the plant root. The mycorrhizal fungi “talk back” through the release of molecular signals called mycotic factors. This language, however, is still somewhat cryptic and there is much to be learned about its nature. On making contact, the plant root cells begin a full-fledged remodeling of their own cellular structure in preparation for invasion by the fungal hyphae. This preparation culminates in the formation of a pre-penetration apparatus, through which plant cells establish the site and nature

of fungal entry. Upon entering plant root cells, the hyphae form specialized structures called *arbuscules* (for their resemblance to little trees), and it is here that resource exchange between the symbiotic partners occurs.

Both plants and fungi need to acquire resources that can often be in short supply. Moreover, each partner is better at acquiring certain resources than the other. Plants, in their photosynthetic endeavors, are so efficient at fixing atmospheric carbon into carbohydrates (i.e. sugars) that they can have an excess. Conversely, mycorrhizal fungi, with their extensive underground hyphal network, readily extract phosphorous and nitrogen from the soil. In poor soils (low phosphorous, low nitrogen), plants can use some help extracting resources from the soil. Thus a trade occurs: the plant’s excess carbon for soil nutrients that are limited and vice versa for the mycorrhizal fungi. In poor soils, plant responsiveness to mycorrhizal fungi is enhanced relative to soils rich in phosphorous and nitrogen. Perhaps this exchange of “goods” has been an important factor in plants successfully colonizing almost every habitat on earth.

The recent advances in our understanding of mycorrhizae have led to the rapid expansion of a niche market for mycorrhizal inoculants. As with all things we choose to add to our soil, it is a good idea to consider exactly what it means to add mycorrhizal inoculants to our agro ecosystem. From a purely microbiological perspective, mycorrhizal inoculation can be at best hit or miss because most commonly, mycorrhizal inoculants are grown in soil with plants under conditions that aren’t sterile. Therefore, the addition of the mycorrhizal inoculants could also lead to the introduction of other soil microbes, including potential pathogens. Also, most plants are already in a symbiosis with native mycorrhizal fungi, so introducing additional mycorrhizal fungi may be redundant. Lastly, one particular mycorrhizal fungi may improve the growth and/or crop yield of one plant species but not another (i.e. it is unlikely that there is a universally applicable inoculant).

Perhaps a more useful approach is to generate conditions in our soil ecosystem that favor native mycorrhizal fungi. Such an approach, referred to as *soil ecological engineering*, is an emerging concept in the area of agricultural sustainability. This movement reflects a larger shift in biology and a switch from reductionism to systems thinking. Soil ecosystem engineering seeks to unlock what is termed as ecosystem services. That is the benefit that humans receive from a given ecosystem (for example, enhanced crop yields). While still young and with a long way to go in terms of practical application, this area of research seems promising. In a country like Belize where almost all of our fertilizers are imported, and with the cost of such inputs rising globally, learning how to foster native mycorrhizal fungi could significantly benefit not only the environment, but also the economy.

Have you a suggestion for an article topic

or have a finished article about Belizean agriculture to share?.....

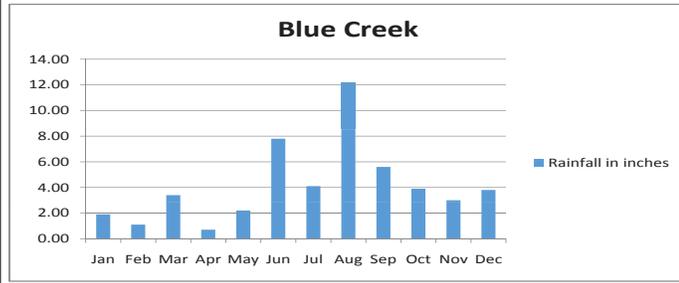
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## Rainfall - Blue Creek

Rainfall records have been kept in Blue Creek for 24 years. The highest annual rainfall of 84.3" was in 2012. The lowest annual rainfall of 42.8" was in 1998. We thank Mr. Peter B. Rempel for sharing this data.

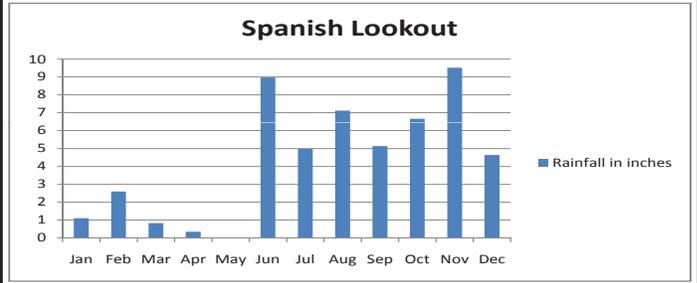
Month 2016	No. of inches
January	1.90
February	1.10
March	3.40
April	0.70
May	2.20
June	7.80
July	4.10
August	12.20
September	5.60
October	3.90
November	3.00
December	3.80
<b>2016 Total</b>	<b>49.70</b>



## Rainfall - Spanish Lookout

Mr. David J. Thiessen and family have been keeping rainfall records in Spanish Lookout for 47 years. The highest year on record was 2006 with 79.72" and the lowest year was 2003 with 41.96". Thank you, Thiessen family.

Month 2016	No. of inches
January	1.11
February	2.60
March	0.83
April	0.35
May	0.00
June	8.97
July	4.98
August	7.12
September	5.14
October	6.66
November	9.52
December	4.64
<b>2016 Total</b>	<b>51.92</b>



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## Spanish Lookout 2016 Crop Production Report By the Spanish Lookout Community Office

Acres corn planted - Summer	27,986 acres
Acres corn planted - Winter	3,291 acres
Acres milo planted - Summer	40 acres
Acres milo planted - Winter	3,647 acres
Acres R.K. beans planted - Winter	4,097 acres
Acres B.E. peas planted - Winter	6,650 acres
Acres soy beans planted - Winter	3,348 acres
Acres soy beans planted - Summer	294 acres
Acres rice planted - Winter	438 acres
Acres rice planted - Summer	1996 acres
Acres other crops planted	951 acres
Corn harvested - Summer	721,858 of 100 lb bags
Corn harvested - Winter	83,274 of 100 lb bags
White corn harvested - Summer	38,932 of 100 lb bags
Milo harvested - Summer	360 of 100 lb bags
Milo harvested - Winter	160,108 of 100 lb bags
R.K. beans harvested - Winter	36,772 of 100 lb bags
B.E. peas harvested - Winter	79,953 of 100 lb bags
Soy beans harvested - Winter	53,770 of 100 lb bags
Soy beans harvested - Summer	3,690 of 100 lb bags
Rice harvested - Summer	55,339 of 100 lb bags
Rice harvested - Winter	27,450 of 100 lb bags
Other crops* harvested	9,224 of 100 lb bags



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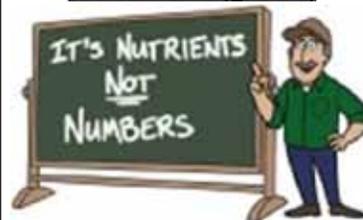
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## National Coconut Stakeholder Platform (NCSP) January Meeting at Tex-Bel Farms By Beth Roberson



On 18<sup>th</sup> January of this year, the National Coconut Stakeholder Platform (NCSP) held one of the largest meetings to date since its formation almost 2 years ago. The

host of this meeting, Lester Muralles (Cabral), manager of Tex-Bel Farms, located on South Stann Creek Highway, graciously opened up the meeting to any coconut farmers in the area. The new approach for the NCSP is to rotate meeting venues. Chairman Manuel Trujillo opened the meeting and welcomed Minister of Agriculture Honorable Godwin Hulse, CARDI country representative Ms. Omaira Avila, members and guests.

Mr. Trujillo began the meeting with disclosure of surveys which showed that Belize now has approximately 4,589 acres of coconuts – 1,919 producing and 2,670 planted. Mr.



Trujillo explained that the focus of the committee at this time is on planting material and nursery stock. Although Central Farm has mainly Maypan (Malay dwarf x Panama tall), they are expecting 8,000 Chactemal seedlings from Mexico. All the GOB coconut nurseries in every district are being re-habilitated.



Reports were made by Mr. Eden Pop and Ms. Donna Dougal Sosa, who both attended regional coconut processing meetings. One surprising fact was that many of the CARICOM buyers do not want their coconut oil to smell like coconuts, unlike Belizean buyers.

In discussing the Belize's roadmap of this industry, Minister Hulse said that he would endeavor to assist NCSP with information keeping of the whole picture in view, rather than the often 'piecemeal' information situation here. CARDI's Ms. Avila encouraged sharing our problems, such as those in monoculture farming, and asked that those not be kept secret, in order to avoid industry-wide problems.

Mr. Lester Muralles made a report about NuCoco, a freshly husked and wrapped coconut with a 30 day shelf life (refrigerated).

**NCSP... Continued on pg 33**

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# Soil Testing and Fertilizer Recommendations

## The Albrecht Program

By Neal Kinsey



The Albrecht program is not just a single approach to soil testing and fertilizer recommendations. There are three different approaches that need to be understood to find the one appropriate to use based on each soil analysis. Consultants are not utilizing the full program as defined and understood by Dr. Albrecht and what he taught and advocated if they do not understand or utilize all three approaches.

The Albrecht model of soil fertility refers to the principles Dr. William A. Albrecht initially used working as a soil microbiologist to develop a dependable system for testing soils and correcting nutrient needs to achieve the ideal biological environment for growing top quality, highly productive crops and plants of all types. This program has to do with how he regarded soil fertility and approached it with measurable, scientific principles that could be applied and proven right out in the field. As outlined by the principles given below, the Albrecht model is a foundational approach for achieving excellent soil fertility for soils in any part of the world.

The Albrecht model is not a single program or approach to soil fertility. It is a system based on the specific program required for correcting fertility by *determining the actual needs of each soil and the economics required to achieve maximum production*. There are three parts to this system. The first and most utilized program is building up medium-to-heavy soils that are lacking in fertility. This approach involves correcting the soil to 65-70 % calcium and 10-12 % magnesium in order to achieve the needed fertility and the correct physical structure. The second is not as well understood by many who profess to use the Albrecht program. It has to do with soils that are so sandy that adjustments have to be made to reduce the calcium and increase the magnesium for the best response in plant health and production. The third program is rarely mentioned by those who work with soil fertility and by far the least understood and utilized. It has to do with supplying sufficient levels of nutrients in soils that are excessive-to-extremely-excessive in one or more of the four major cations, calcium, magnesium, potassium or sodium. For extremely excessive soils, an additional test must be considered to establish the soil's true exchange capacity. It is generally required before the true fertility needs of that soil can be realized.

We utilize and teach all three of these programs to those clients who want to learn any one or even all three parts of the Albrecht system. This is the true Albrecht model for soil fertility.

It is the chemical make-up of each soil that determines its physical structure. When a soil has the correct chemistry, the physics of that soil is also correct. When the chemistry and physics are right, so long as the principles to avoid soil compaction are observed, the environment for the biology will also be right. That is why so much emphasis is placed on achieving the exact level for each nutrient, based on the specific requirements of every different soil.

Soil nutrients are supplied based on deficiencies or excesses. When there is too much of one element in the soil, it generally inhibits the availability of one or more other needed elements. Supplying what is missing in terms of measurable nutrients is the first key to assuring a most productive soil. This is the only way to achieve a truly "balanced" soil and why the Albrecht program emphasizes "feed the soil and let the soil feed the plants."

You cannot manage what you cannot measure. Using the Albrecht system, even the trace element levels in the soil take on measured significance. But micronutrients work properly only when adequately supplied, and only when the needed levels of primary and secondary elements are also present in adequate amounts. The Albrecht system has been developed to accomplish this. Its use includes improved crop production for both small-scale organic and commercial growers of all types. And, as the Albrecht model for soil fertility, those principles are presently being used successfully for growing all types of food and fiber crops in many countries all around the world.

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*Randy Vogeler, Garrison, Iowa*

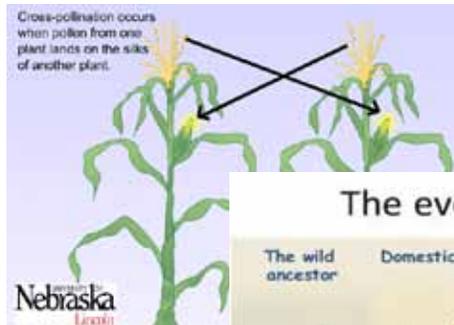
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# Understanding Cross-pollination in Seed Production

By Omaira Avila Rostant  
CARDI Representative  
for Belize



Cross-pollination is the reproductive method used by some plant species, e.g. corn, soya, beans, peppers, coconuts, vegetables, to secure and improve the gene pool and transfer their genetic traits, to increase their diversity and expand the species' survival, to adapt to climatic change, and enhance their capability to withstand pest and diseases. In nature cross-pollination is achieved when pollen



from one plant is transferred to another receptive plant, either by wind, insects or water through

open-pollination. The new offspring carries genetic material from both parents. Depending on how different from its parents its genetic makeup is, the offspring can be considered a new species and/

or cultivar. However, the successful survival and capacity of reproduction of a new species produced from cross-pollination depends on the genetic stability and diversity of its parents. If the parents are not genetically stable and diverse, the new offspring, although showing superior characteristics, will not be capable of transferring those characteristics to its offspring to guarantee the survival of its species.

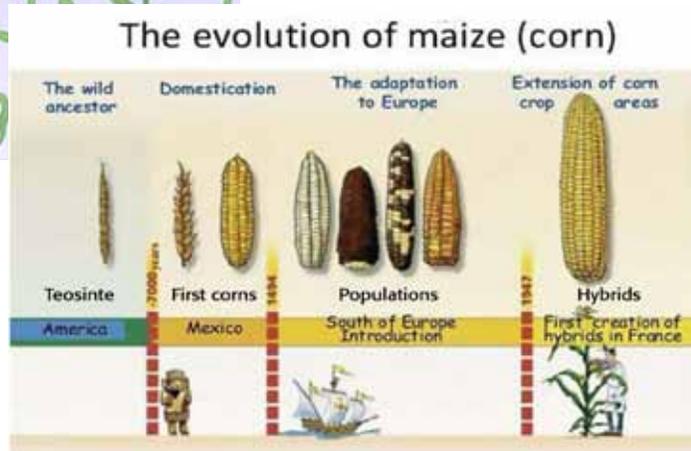
In nature plants cross-pollinate freely as pollen is moved from one plant to another by wind, insects and water; this process is known as open-pollination and has produced most of the new species/cultivars that farmers have selected and cultivated for centuries. Seed produced from open-pollinated plants, have the genetic advantage of being capable of reproducing for many generations without losing or reducing its genetic potential or changing its characteristics. For centuries this allowed farmers to save seeds to replant for many generations and select and re-select seeds with desired characteristics and use them to start reproduction of new varieties. Good examples are corn and grain in Central America; today we can find very diverse colour corn seeds which indigenous communities still plant whereas commercial monocrop production works mainly with white and yellow corn.

In commercial agriculture, cross-pollination is done in a controlled manner through breeding. Controlled cross-pollination is based on selecting crosses not necessarily focusing on specie survival, and traits regeneration, but rather in increasing yields and adaptation to some agronomic practises. In the beginning, breeders were seeking to produce seeds with uniformity in colour,

yield, and production with enhanced characteristics they liked about a plant. However, since large corporate manufacturers have taken over the seed production industry, controlled breeding has added a new genetic objective in plant breeding: to develop high selling, strong seeds which can show those characteristic in the first generation of planting, but not be the same in subsequent generations; such seeds are known as hybrids.

Hybrids, the backbone of modern large-scale agriculture, prevent farmers from saving seeds over generations and create a demand for their product; this together with harsh legal agreements has created a strong seed industry of hybrids. The objectives of this industry are to produce grains for the food, feed and biofuel industries.

This new focus for cross-pollination has led, in many places, to the disappearance of several wild-type species related to most commercial crops, and, therefore, a reduction of the genetic diversity of these species. Also, farmers and commercial breeders, over the years, have been mastering the cross-pollination within cultivated plants which has also reduced the genetic diversity of some species, making them more susceptible to pests and diseases.



Additionally, open-pollinated varieties are being contaminated with pollen from hybrids, which affect their genetic stability. It is important to know that, although open-pollinated seeds and hybrids are created with different purposes, still both groups of seeds if planted too close are capable of cross-pollinating.

## How can small and medium-sized farmers prevent cross-pollination among varieties?

### What To Do Individually:

- Learn about the seed you are planting, i.e., if it is an open-pollinated variety or a hybrid.
- Do not plant hybrids and open-pollinated varieties in the same fields.
- Avoid, as much as possible, planting several varieties of open-pollinated seeds in the same area.
- If more than one open-pollinated variety is being planted close by, learn when each variety flowers, and only combine planting close those that flower in different periods; this will reduce the possibility of cross-pollination. Remember, if pollen is carried by the wind, water or insects, you will have to plant far enough apart to reduce this risk of cross-pollination.

- Schedule planting to prevent the same period of flowering of various varieties planted too close.

- Always collect the seed for replanting from the early fruits as these are the best of the best.

- Collect the seed directly in the field so you can remember what you liked about that particular plant and store



Central Farm Cayo District

them as a separate group. (Don't just separate random seeds from those that are already harvested.)

- In your replanting seed do not include any from plants that look different from what you originally planted.
- Do not plant mixed seeds, as this will produce mixed seeds.

**What To Do As A Community**

- Encourage planting zones per variety to prevent cross-pollination.
- As much as possible work with neighbours that are planting the same crop as you to determine the best variety to plant as a community.

**How To Reduce The Risk Of Losing Traditional Open-Pollinated Varieties**

Reproduce traditional seed under shade-protected houses, a practice that can help communities that are surrounded by the production of hybrids which might prevent difficulties with neighbours and reduce cross-pollination. These seeds can be reproduced over and over in a controlled environment and used to plant your fields.



**Some available ICT tools**

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- ❖ COCONUT INFO: [ccidp.cardi.org/en/](http://ccidp.cardi.org/en/)
- ❖ Seed development in Belize: <https://www.youtube.com/watch?v=Dmjhy-CEuz4>
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# Belize Initiates Antimicrobial Resistance Surveillance in Agriculture

By Dr. Natalie Gibson



In June 2016 Belize and five other Caribbean countries initiated pilot studies in antimicrobial resistance in Salmonella from

poultry under the initiative “Caribbean Integrated Surveillance System for Antimicrobial Resistance in Agriculture” (CISARA). The initiative is part of the sanitary and phytosanitary (SPS) project executed by the International Institute for Cooperation on Agriculture (IICA) under the 10<sup>th</sup> European Development Fund. The pilot studies serve as the region’s first initiatives to gather data on the status of antimicrobial resistance in the agricultural sector.

Antimicrobial resistance (AMR), the resistance of a microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by the microorganism, is a natural phenomenon. However, its development is accelerated by use and misuse of antimicrobials including over-prescription by doctors, patients not completing their treatment, use of antibiotics in livestock and aquaculture, poor infection control in hospitals and clinics, and lack of hygiene in facilities. AMR can result in severe, long-lasting disease and even death for victims of resistant infections because treatments that worked in the past are no longer effective; medical procedures that were once simple can become fraught with complication.

Food-borne diseases caused by antibiotic resistant bacteria have been documented in other countries, but there was no previous data for the Caribbean region. Poultry was the ideal commodity of choice for the studies given its significance to Belize’s food security. The Ministry of Health’s 2013 *Burden Of Illness* study ranked Salmonella as number 4 in leading causes of food-borne illnesses, and the linkages between Salmonella and poultry are well-established.

The two CISARA pilot studies were designed to 1) determine baseline Salmonella levels in pre-slaughter (farm), and retail poultry, and 2) determine the antimicrobial resistance profile of the Salmonella isolated. The Belize Agricultural Health Authority’s (BAHA) food safety and veterinary diagnostic labs executed the project jointly with the support of the public health department. The Ohio State University, one the United States’ leading universities for AMR research in agriculture served as collaborator for the studies.

Preliminary results revealed the prevalence of Salmonella to be relatively low at both farm and retail levels. Most of the Salmonella isolated were resistant to 2 families of antibiotics with a few exceptions. The Salmonella isolated will be submitted for further characterization to determine if they are the same strains that have been previously identified in other countries.

It is the hope that the CISARA studies will be the basis for establishment of a national AMR surveillance system for agriculture and expand to include other livestock and agricultural production systems. Like people, livestock get sick and may require treatment with antibiotics. Good agricultural practices serve to prevent the spread of zoonotic and food-borne disease agents and include the prudent use of antimicrobials for minimizing development of resistance. Survey data collected in the project for the poultry sector will be analysed to identify areas for improvement in agricultural practices and used to define any interventions that may be required.



Good food safety practices are also beneficial in reducing the spread of antimicrobial resistant bacteria. These practices are aimed at preventing the growth and spread of food-borne pathogens that cause illness. When we prevent their spread we also prevent the spread of any resistance they may carry. Good food safety practices range from good manufacturing/hygiene practices in the food processing environment to the World Health Organization’s (WHO) five keys to food safety for the kitchen.

Apart from the current studies, BAHA is continuing its work in AMR through collaboration with the Ministry of Health as they work to develop a national action plan for antimicrobial resistance in compliance with international agreements. Antimicrobial resistance is a serious threat, and we must all do our parts—doctors, farmers, veterinarians, regulators, policy makers, and consumers alike. We must all use antimicrobials prudently to protect the efficacy of this valuable resource.

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**CARDI Day – December 5, 2016**  
**Caribbean Agricultural Research and**  
**Development Institute (CARDI)**

**- 42 years servicing the Caribbean region**  
**By Omaira Avila Rostant**



CARDI day was celebrated on December 5th

with an outreach programme that focused on kids. Entitled **Planting A Seed For The Future Of Agriculture** the programme encouraged kids to learn how to plant and care for traditional Belizean crops.

Students from two schools were selected to take part in a modified farmer field school to produce corn starting with planting the seeds on the 5<sup>th</sup> of December and lasting 120 days. CARDI technical personnel will meet weekly with the kids at school to teach them how to care for their plants during the next four months, allowing them to discover for themselves all the challenges a farmer faces planting corn. Kids were also given open-pollinated seeds of CARDI CY-001 yellow corn to start their own planting at home, and a guide booklet of how to plant corn. A total of 130 students participated in the exercise, and if well-accepted, the programme can expand to communities and agro clubs to encourage our kids to learn and love agriculture.

CARDI also distributed open-pollinated seeds of CARDI CY-001 to farmers in four communities, each with enough seeds to plant one start-up acre. They were also shown how CARDI dries and stores its seeds as a suitable method for small scale farmers.



CARDI Day will be an annual event to build awareness and promote the work of the institute. According to Executive Director Barton Clarke, CARDI Day is “an important outreach mechanism, as it provides a platform for us to account for the work we have done/doing and to promote the institute as a credible research and development partner in the agro-food sector”.

**CARDI contact on pg. 17**

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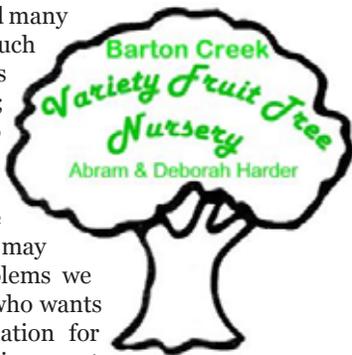
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## Planning and Planting an Orchard By Deborah Harder

Global deforestation has caused many environmental problems, such as reduction in rainfall, loss of ground water and erosion; deforestation is partly due to human greed and carelessness about the beautiful earth our Creator provided for our use and sustenance. While we may not be able to solve the problems we have unleashed, for everyone who wants to show honour and appreciation for creation and help heal the environment in a small way, planting trees is one of the simplest acts to do at home. Planting fruit trees is even better, since fruit trees not only clean the air and hold onto topsoil like other trees, but also provide top quality, nutritious food. Think of the benefits as you enjoy a fresh juicy mango or Malay apple from your own orchard!



In planning your orchard, it is wise to think of planting trees bearing fruit most valued by both humans and birds close to the house, so you have some hope of picking some as you compete with the birds for the fruit. Such fruits include sapodilla, tangelo, and Malay apple. We have productive sapodilla trees growing close to a former house site where no one lives anymore, and most of the fruits are devoured every year by parrots, which break up the green sapodillas in search of the seeds. Experienced orchardist and founder of Variety Nursery, the late Heinrich P. Friesen, to whom we owe thanks for much of the material in this article, recommended planting your orchard "for the birds" in the following way: valuable fruits close to the house, then a buffer zone of trees in which birds have no interest, such as coconut, breadfruit, tamarind, allspice, and velvet apple. Then, past this buffer zone, plant fruits that humans are willing to generously share with the birds: Surinam cherries, and other small berries and plums. In this way you may successfully draw some birds away from the valuable centre of your orchard and keep them busy past the buffer zone. We're not sure how effective this system is, considering the mobility of birds, but you can try it and see how it works for you.

A common mistake in planting an orchard is to plant the trees too close together. Large trees including breadfruit, rose apple, tropical almond and large mango varieties like Tommy Atkins and Keith, should be planted 30 feet apart. For most others, 20 to 25 feet is sufficient. Smaller trees like Surinam cherry, kumquat, fig, Julie Dwarf mango, dwarf soursop and mulberry may be planted every 10 to 15 feet. If you want to use the space between your small fruit trees until the trees are bigger, by all means, plant a crop between the rows, but make sure it is not something like bananas that will compete with the young trees for sunlight, causing them to grow tall and spindly. We have had good success planting cocos between the rows of young soursop trees, especially since cocos do well in untilled soil.

The location you choose for your orchard should have good drainage, or else you should work up mounds. Any standing water should be over 1 foot lower than ground level of most trees. However, Malay apple and manzana de agua will thrive in the lowest and wettest part of your orchard. Cacao trees need shade; so unlike most small trees, these may be planted among very large trees. Most trees do not do well in caliche soil, but avocados thrive in caliche; so plant avocados in that white marl spot where

you can't grow other trees. Of course, a good layer of top soil is still needed. A common mistake in planting trees is to plant them too deep. Dig a hole deep enough, and place the tree in its bag in the hole so the ground level is even with the top soil level of the bag. Never plant trees deeper than 1 inch above top feeding roots. Have enough fine, good topsoil ready. Rotten compost may be mixed in, but no chemical fertilizer or fresh manure. Cut the bottom of the plastic bag to flop it away, set your tree in its hole to the correct depth, then very gently slit the side of the plastic bag and remove it, being careful not to move nor break the soil around the tree roots. Fill the hole in with top soil. It is helpful to mound up the soil in a ring 2 feet around the tree to guide the water toward the trunk. Pour in 1 to 4 gallons of water to settle the soil. Any good mulch, such as grass or corn husks, may be laid 1 foot deep in a ring around the trunk but keep everything a few inches away from the trunk at all times, to prevent rotting and insect damage to the trunk. Water the tree once or twice a week for several weeks if it does not rain. Later, if the tree is kept well-mulched, watering every 2 weeks should be enough even in the dry season.

One month after planting feed your young trees 2 quarts of chicken manure or a larger amount of cow manure and a cup of ashes by applying them in a ring 1 or 2 feet from the trunk. Chicken manure is high in nitrogen and pushes fast growth. Cow manure, containing more potassium, creates more long-term stalk strength for your growing trees. Afterwards, feed trees 3 times yearly, always applying manure or other fertilizer in a ring that follows the outer diameter of the tree's growth. It is best to cover the manure with mulch. Grass and weeds growing near any tree hinders its growth, so it is well to keep your orchard clean.

To prune trees, it is very important to cut off all sprouts below the graft on grafted trees, or your tree may bear some other fruit than what you expect. Thinning branches of dense trees helps light and air combat diseases on branches. Also cut dry, dead branches back to the live joint. Never leave knobs; always prune to the joint. If cuts are severe it is best to paint them over with water-based paint; never use metal paint or motor oil on trees. If the grafting tape was not removed at the nursery, it is very important to remove it, gently, without cutting into the bark, before the young tree begins to strangle.

One final note: buy quality grafted plants. Grafting has two advantages: (1) ensures the variety you want is what the plant will produce and (2) causes most trees to bear more quickly. The cost of the plants will pay for itself many times over, as you enjoy years of fruitfulness during the time it takes for seedling trees to begin bearing.

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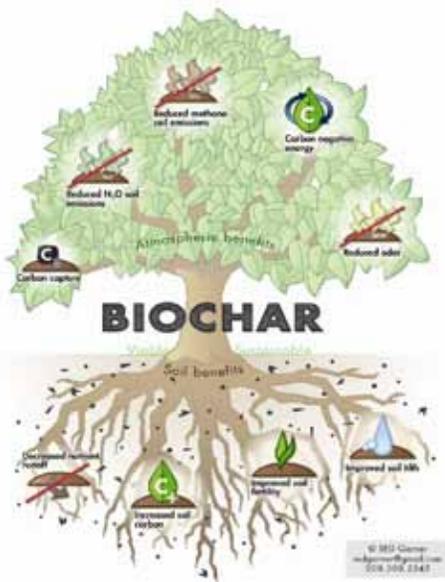
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# Soil Enrichment Using Biochar: Belize's Under-Used By-Product

By Dr. Stephen Zitzer



Biochar, “black carbon”, or “pyrogenic organic matter” are broad terms for various forms of charcoal, which are produced by thermal decomposition of biomass in the absence of oxygen. The chemical term for this process is pyrolysis, and the relative control or regulation of oxygen during the production process is very critical in

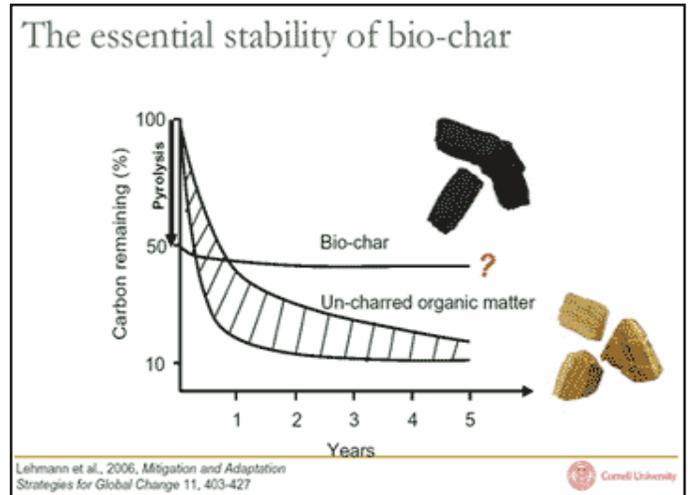
determining the final specific properties each batch of biochar may have.

In Belize, biochar is being produced on a large scale by the Belize sugarcane industry as a by-product of energy production via the pyrolysis/combustion of sugarcane biomass or bagasse. However, stock piles are increasing while use is relatively negligent. Conversely, there has been an effort to locally produce and utilize biochar for the production of cacao in the Toledo district. Those efforts have documented an increase in greenhouse-propagated cacao seedling stem diameter growth. Data on actual increases in commercial yield of cacao seeds have not been reported, but other cost benefits typically include less fertilizer use and reduced irrigation costs. The extremely porous nature of biochar contributes to the retention of water and water-soluble nutrients and creation of a suitable habitat for many beneficial soil microorganisms. Biochars are able to correct undesirable pH similar to lime and can therefore be of value to improve the fertility of acid soils.

Biochar should be mechanically mixed with existing soil with application rates of 2.5–20 tons per hectare (1.0–8.1 t/acre) required to produce significant improvements in plant yields. However, the various predicted and documented effects of biochar depend on the properties of the biochar as well as the amounts and timing of applications, regional conditions including soil type, soil condition (depleted or healthy), land use history, and precipitation and temperature patterns. There is still a lack of knowledge about the important mechanisms and properties capable of increasing plant yields. While some studies have reported positive effects from biochar on crop production in degraded and nutrient-poor soils, biochar use will need to be designed with specific qualities to target distinct properties of soils. Furthermore, because of its high adsorption capacity, biochar may reduce the efficacy of soil-applied chemicals that are used for weed and pest control. Meanwhile, slash-and-burn leaves only 3% of the carbon from the organic material in the soil while the use of slash-and-char could keep up to 50% of the carbon in a highly stable form which could benefit Belize greatly. Additionally, biochar may also improve the soil's ability

to be tilled, especially under highly mechanized agricultural production systems.

The use of biochar is in its beginning stages. While beneficial effects of biochar on both soil microbial functions and soil water availability are reported, neither is yet sufficiently quantified to be effectively incorporated into all farming systems. Coincidentally almost any form of organic matter and especially living organic matter added to soils significantly improves various soil functions involving nutrient recycling and availability. However, much of the carbon in biochar is claimed to be very stable, compared to the carbon in the biomass it was produced from. This stable carbon decomposes or is converted to carbon dioxide more slowly than combusted or burned biomass, so there is the potential to “slow down the carbon cycle” or temporarily sequester carbon, helping to slow climate change.



Modern technologies are able to precisely control oxygen and equally as important the temperature of the process. Consequently, temperatures below 500 °C produce more charcoal and above 700 °C more liquid and gas fuels and at extremely high temperature only gas is produced. The length of the process is also dramatically shortened by increasing temperatures. Of course the quality of the biomass, (woody versus herbaceous or agricultural versus municipal wastes) being decomposed has an impact on the total chemistry and ratio of biochar/bio-oil/gas in the final products in the pyrolysis process. Unlike the commercial scale of developed countries where the biochar portion of the process has been significantly less marketable than the oils and gases produced, here in Belize under-utilization of the biochar produced by the sugar industry is due in part to the separation of production facilities and locations where the incorporation of biochar into degraded soils may show some benefits.

**Editor's Note: See the following links for more information on biochar:**

**International Biochar Initiative:** [www.biochar-international.org](http://www.biochar-international.org), [www.biochar-international.org/images/IBI\\_Biochar\\_Trial\\_Guide1.1.pdf](http://www.biochar-international.org/images/IBI_Biochar_Trial_Guide1.1.pdf)

**Backyard Biochar:** [www.backyardbiochar.net](http://www.backyardbiochar.net)

**New England Biochar:** [www.newenglandbiochar.org](http://www.newenglandbiochar.org)

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# Agriculture Prices at a Glance- \$\$\$\$\$\$ FEBRUARY 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	L/H	Czi	1.60	OW	1.70	Bze 1.75
750-1100 lbs	L	Cy	1.65	SCr	1.50	Tol 1.35
Weaner steers	L	Czi	1.95	OW	1.97	Bze 2.00
"	L	Cy	1.90	SCr	1.90	Tol 1.70
Breeding heifers	L	Czi	N/A	OW	1.75	Bze 1.65
"	L	Cy	1.60	SCr	1.40	Tol 1.50
Cull cows	L/H	Czi	N/A	OW	1.30	Bze 1.25
"	H/L	Cy	1.25	SCr	1.25	Tol 0.80
U.S. CATTLE						
U.S. price - corn fed - 1000-1200 lbs	H	US\$ 1.16850				
U.S. price - feeders 600-800 lbs	H	US\$ 1.23800				
BELIZE HOGS						
Weaner pigs - 25-30 lbs - by the head	S	100.00 80.00				
Butcher pigs 160 - 230 lbs, per lb	S	1.85 1.65				
BELIZE SHEEP						
Butcher lambs - live per lb	S	2.75 2.50				
Mature ewes - live per lb	S	2.00 1.75				
BELIZE CHICKEN						
Wholesale dressed, per lb (Sp Lkt)	L	2.32				
Wholesale dressed, per lb (BI Crk)	S	2.40				
Broilers - live per lb (Sp Lkt)	L	1.18				
Broilers - live per lb (BI Crk)	S	1.24				
Spent hens - per lb (Sp Lkt)	L	1.00				
Spent hens per 4 lb bird (BI Crk)	L	3.00				
CITRUS						
Oranges per lb solid, est. final	S	2.5929				
Grapefruit per lb solid, est. final	S	2.5498				
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				

GRAINS, BEANS & RICE						
	T	A	B	C		
Belize yellow corn, bulk (Spanish Lookout)	S	N/A	N/A	.24		
Belize yellow corn, bulk (Blue Creek)	L	.2750		N/A		
Yellow corn/local retail (low volume, Sp Lkt)	L	.285				
Belize white corn, (Cayo)	S	.45 (low volume)				
US Corn, #2 yellow	H	US\$4.0925 /56 lb bushel				
US organic, #2 yellow corn feed grade	S	US\$7.50-8.50 /56 lb bushel				
Belize soy beans (Spanish Lookout)	S	.50		N/A		
Belize soy beans (Blue Creek)	L	.52		N/A		
US soy beans, #2 yellow	H	US\$10.56 /60 lb bushel				
US organic, #1 feed grade soy	S	US\$17.50-18.00 /60 lb bushel				
Belize milo (Spanish Lookout)	S	.21				
Belize milo ( Blue Creek)	S	.22 (available in 2 weeks)				
Red kidney beans (Spanish Lookout)	H	.95	.75	.60		
Red kidney beans (Blue Creek)	S		N/A			
Black eyed peas (Spanish Lookout)	H	.60		.45		
Black eyed peas (Blue Creek)	H	.60		.40		
Paddy rice per pound (Spanish Lookout)	S	.40-.53 farm price, dried				
Paddy rice per pound (Blue Creek)	H	.40-.50 farm price, dried				
HONEY						
Honey, 5 gal (approx 60 lbs)	S	\$150.00 (CQHPC)				
Honey, speciality, 5 gal (approx 60 lbs)	S	\$150.00-250.00 (Cayo)				
SPECIAL FARM ITEMS						
Eggs - tray of 30, farm price	H/S	4.83 (Sp Lkt)	5.70 (Blue Creek)			
WD milk per lb to farmer	L/H		contract .56			
Raw milk (farmer direct sales)	H		5.00 per half gal			
CACAO						
Cacao beans (TCGA & MMC) /lb	S	3.00 dried fermented				
Cacao beans (TCGA & MMC) /lb	S	1.20 wet beans				
US Cacao beans, metric ton	L	US\$ 2,083.50				

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

## From My Perch The Giving Tree By Marguerite Bevis



*Ceiba Flowers*

There was a tree in our yard that attracted so many birds all year round that we called it "the Giving Tree." I have tried to learn more about this tree so I could recommend that you grow one in your own yard. The scientific name is *Coussapoa oligocephala* of the family: *Crecropiaceae Magnoliophyta*, what we call the trumpet tree, or Cecropia. It's hard to believe since they have very few similarities other than that they both grow quickly. I couldn't find a lot of information so I will share what I know.

The tree is described as "hemi-epiphytic or terrestrial" growing up to 20 meters tall. It produces tiny yellow globular spiky flowers birds love to eat. Once the tree matures enough to bloom, it blooms continuously for months even though birds are constantly feeding off the small round yellow flowers. Every morning as the sun rose the Giving Tree would fill with all three types of toucans, motmots, tanagers, hummingbirds, orioles, woodpeckers and wood creepers, flycatchers and even parrots. During migration we expected and received surprises, like the gorgeous scarlet tanager and other migrants.



*Keel-bill Toucan in the Giving Tree*

On the morning after Hurricane Earl blew his way across Belize, we woke up to find our beloved Giving Tree had blown over. That was the worst news, fortunately. After a day of chain saw work, we had the road open. That storm packed quite a punch for a category 1 hurricane. With the Giving Tree down, we noticed a young one had started near the base of the original and was alive

and well. Within days birds were visiting the young tree which was still flowering.

In the months since the hurricane, we have often missed the giant Giving Tree, but there is always a silver lining. The fallen tree is allowing the young tree air and space to grow, providing extra sturdiness by the trunk at the base of the original. With the huge tree gone, the magnificent ceiba tree was exposed which had been growing behind it.

The ceiba tree, *Ceiba pentandra*, is magnificent to see. The Maya called it the sacred Tree of Life which is depicted as a giant tree upholding the world. It has huge buttresses and sturdy limbs and branches. But it was the *Coussapoa oligocephala* that was capturing all our attention with its apparently delicious flowers almost all year round. Now we began to focus on the ceiba and my respect and admiration for this mighty tree grew. We watched the leaves fall off and enjoyed the stark beauty of the tree's silhouette against a foggy background. For the first time in my memory, the tree started blooming with delicate coral flowers that birds of all kinds seem to adore. I had never noticed the blooms of the ceiba tree. Perhaps because I couldn't see them, mainly because they were hidden by the original Giving Tree. Although ceibas are plentiful, they are too huge and tall to see the flowers unless you have binoculars and are looking specifically for them.

Now I understand why the Maya called it the Tree of Life. Now I see the life cycles and I can observe the abundance of life enjoying the fruits of that mighty tree. Only last night the kinkajous were there. The leaves will come back and will hide the limbs and branches of the beautiful tree. Pods will form and the air will fill with pillowy kapok, or "cotton." We will no longer be able to see what goes on behind all the greenery. But growing in front, the young Giving Tree will flourish and will continue giving nourishment to fowl and creatures and will continue to provide these birdwatchers pure enjoyment.



*Scarlet Tanager*

*Photos of courtesy of M. Bevis.*



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# Exploring the Avian Wonders of Belize

By Joel Such



*A pair of Yellow-winged Tanagers at duPlooy's Jungle Lodge*

On November 2<sup>nd</sup> 2016, a fall migrant from the Colorado Rocky Mountains, 18-year-old field biologist, photographer, and artist, Joel Such takes flight across the Gulf of Mexico and lands on Belizean soil. Unlike the many migrant birds I have followed from North America, I am typically a resident who does not migrate south. This year, I

break the trend and abandon the frosty mountains of Colorado's winter.

I wake up my first morning full of expectation. Still under my sheets, the ambient noise of early morning fills my ears with promise. Shivering with excitement, I roll out of bed and snatch my binoculars off the bed stand. A vast environment completely foreign to my eyes lies beyond the door, and countless birds I have never seen await observation. I open the door to overlook a landscape of lush, green jungle, with topography sloping either up or down. I am in the Maya Mountains of western Belize, and this is where my journey begins.

Amidst an ecosystem of mountainous broadleaf forest, birds flourish. A flock of migrant songbirds forages the surrounding bushes and trees, and I spot a raptor perched atop a dead tree. It is the endangered Orange-breasted Falcon feasting on its prize, a large bat clasped in its talons. During the remainder of the morning, many more resident species present themselves. A few of these birds include Gartered Trogons feeding on a tropical cherry tree, a group of Collared Aracaris foraging through the upper canopy, Blue-black Grassquits displaying, and a Yellow-throated Euphonia pair concealed in tree-top foliage. For thirty more days, I reside in this same location and continue to find new birds. This period of geographic isolation enables me to explore the area in detail and study the flora and fauna in great depth. Even though my time here has been rewarding in many ways, I am ready for a new Belizean scene.



*The rare Orange-breasted Falcon digesting a breakfast of bat*

After getting my thirty-day visa re-stamped in Belmopan, I am prepared to continue my Belizean journey. With new birds and the ocean in mind, I jump on the bus and head east on the scenic Hummingbird Highway. The light quickly fades, and I find myself wandering the streets of Hopkins, a beach town and worthy birding destination. I quickly stumble upon a backpacker's hostel—The Funky Dodo—where I crash for the night. Inexpensive and comfortable, this hostel does the trick and I rise in the morning to a



*The stunning Lesson's Motmot at Maya Mountain Lodge*

landscape of colorful houses, friendly people, and the great blue ocean.

The birds of Hopkins certainly do not disappoint. Before I find my way to the beach, I notice the sky above is teeming with circling Magnificent Frigatebirds. These massive air-dwelling seabirds are truly magnificent, and their numbers are astonishing here. On the oceanfront, Royal Terns cruise the coastline in search of fish, and a group of Willets scavenge for washed up nutrients on the beach. The palm trees host several migrant warbler species that likely just crossed the ocean from North American soil. One of these includes a colorfully plumaged Cape May



*White-necked Jacobin, one of the many hummingbird species at the Green Hills Butterfly Ranch*

Warbler, a tiny songbird of yellow, orange, and black. A saunter up the beach reveals many more birds, including Sanderlings, two Common Black-Hawks, a Cinnamon Hummingbird, Mangrove Vireos, and a Ringed Kingfisher. While the beach has much to offer, I discover a region of wetland outside of town that calls for extra attention. Multitudes of ducks and wading birds—including Jabirus, Wood Storks, and Roseate Spoonbills—inhabit this grassland marsh, and I witness a Peregrine Falcon making several unsuccessful attempts at capturing a Yellow-crowned Night-Heron.

After a weekend in Hopkins walking the beach and counting shorebirds, and joining a Stann Creek birders' club bird walk, I continue down the coast. My time in Belize is coming to a close, and I finish with a magical few days staying with a family on a river completely off the grid. An hour from Punta Gorda via motorboat, the family lives amongst a rugged jungle, mangrove swamps, and a pristine river environment teeming with life. Boat-billed Herons abound, Sungrebes lurk on the river's edge, and a whole variety of forest birds inhabit the jungle.



*Squirrel Cuckoo near San Ignacio*



*The striking Keel-billed Toucan gliding overhead*

In Belize, one incredible experience followed another, and while many birds were seen along the way, I hope to return someday to reconnect with new friends and continue my exploration of the country. I would like to extend my sincere gratitude to all those who welcomed me and made my time in Belize memorable.

**Editor's Note:** *Joel Such is an 18-year-old birder from Lyons, Colorado who is spending several months traveling in Central America. Joel actively participates in avian surveys and research, with a special interest in bird banding. Whether at home or abroad, Joel photographs, draws, and writes about birds. You can follow his ongoing adventures at [www.joelsuch.com](http://www.joelsuch.com).*

*Photos of birds on cover and on this page are courtesy of Joel Such.*



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**“Let’s Get Growing”**

**Expansion at NATS Grounds:  
Moving toward Year-round Use  
By Sally Thackery**



The Government of Belize has been included in a UN Development Program with the Japanese Government called the Japan-Caribbean Climate Change Project. The Japanese government is donating US\$16 billion to 8 CARICOM nations to try to reduce the negative effects that climate change has on agricultural and sustainable development in these countries. The Belize government has decided to use a portion of its funds for sustainable agriculture projects with local produce farmers.

Construction has begun at the National Agriculture & Trade Show (NATS) grounds in Belmopan for two covered pavilions, one with a cold storage room, to provide a wholesale and retail market for local farmers who grow quality produce. This once-a-week market will be administered by the Agriculture Ministry to improve the domestic market for local producers and allow small farmers direct access to the public. Details, such as which day of the week and booth fees, will be announced as decisions are made.

This is a part of the continued expansion of the NATS grounds along with removable fencing at the new livestock pavilion so the pavilion can be used for non-food vendors during events. Also completed is a six-booth food court with more expansion possible for year-round restaurants. The horticulture area, which formerly was planted only for the annual NATS, now has a continuous garden project on site that is used as a demonstration center and a venue for visiting school children.

The other 7 Caribbean countries benefitting from the program include: Dominica, Grenada, Guyana, Jamaica, St. Lucia, St Vincent & the Grenadines, and Suriname.



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# AgScience for Better Crops... Managing the Armyworm in Corn

By: Felix C. Cawich,  
Agronomist, M.Sc., Danaus Consultants



Corn is one of the major crops of Belize; approximately 40,000 acres were grown in 2015. However, year after year, different pests attack the crop, causing huge losses

to the farmers' economy. The main pest in corn is *Spodoptera frugiperda*, commonly known as the armyworm and it can be one of the most difficult insect pests to control in the field (Bessin, 2003). *Spodoptera frugiperda* is known to cause huge crop losses due to its high adaptability to different conditions allowing it to have a wide geographic distribution. In tropical and subtropical regions, losses can exceed 60% (Willink et al., 1993).

**Figure. 1** Life cycle of *Spodoptera frugiperda*.



Image adapted from *Crop Life Latin America*

The complete cycle of the armyworm takes 24-40 days depending on different conditions and has four stages: egg, larva, pupa and adult which are described below and in figure 1 (CABI, 2016; Knutson, 2008).

**Eggs:** spherical, green color at oviposition, turning light brown prior to eclosion. They are laid in masses of 150-200 eggs and mature in 2-3 days (20-30°C), and are usually covered with a protective felt-like layer.

**Larva:** consists of 6 instars (stages) from hatching, where they are green with black lines and as they mature they either remain green or become brown with black dorsal and longitudinal stripes. If a high population density or food shortage is present, the last instar can be almost black in color. A mature larva can be up to 50 mm long (approx. 2 inches). Table 1 shows the different instars and sizes.

**Table 1.** Instars of *Spodoptera frugiperda*

Instar	Size
L1	1 – 3 mm
L2	5 – 7 mm
L3	8 – 10 mm
L4	11 – 15 mm
L5	15 – 20 mm
L6	> 20 mm

**Pupa:** shorter than larva and shiny brown. The full-grown armyworm tunnels into the soil and transforms into an inactive, non-feeding stage.

**Adult:** wings are mottled gray-brown and span up to about 38 mm (1.5 inch). An adult male and female are almost 20 mm (¾ inch) in length.

### Damage

Small larvae typically begin by removing the top leaf layer, giving an appearance of small translucent areas – window pane-like symptom (Figure 2). Upon growing, they eat through the leaf, creating pin-sized holes, giving a ragged and torn appearance when the leaf unfurls. Armyworms can also cause damage by feeding on developing tassels, immature ears and boring into stalks (Tarillo, 2008).

Armyworm infestation may first remain unnoticed, as small larvae prefer feeding on leaves close to the ground. High populations can completely defoliate plants. Once the worms are in the whorl feeding, they are often concealed under their own debris (Figure 3) (Bessin, 2004).



### Integrated Pest Management (IPM)

**Monitoring:** Scouting and monitoring corn plants from emergence should be done in order to find the first laid eggs and recently-hatched larvae. It is recommended to scout the field twice per week during the first 4 weeks of the crop (Intagri). On average 100 plants should be checked for damage. For this, choose 5 field locations and check 20 plants (consecutively) in each and look for egg masses and window-pane damage. Continue scouting and monitoring until silks begin to dry, since larvae may attack young ears. It is important to know that armyworms feed during the day and night, but are most actively in the morning or late afternoon.

Bessin (2007) and Juarez (2010) recommend applying a control when 5% of the inspected plants have egg masses or when 20-25% of the plants show damage symptoms. Early detection of infestation allows more economic and effective control given that the first larva stages are the most susceptible to insecticides. Fully grown larvae are more difficult to control because of their feeding habit and protection with their own debris (Bessin, 2007).

**Cultural control:** In corn production, it is important to have a good weed control program (because weeds are host to this pest), cultural practices and adequate fertilization of the crop.

*Armyworm... Continued on pg 29*

## Growing Hemp for Medicine By Karin Westdyk



Ancient Chinese medical texts ranked cannabis as one of the most important medicines because of its ability to cure so many illnesses and its lack of toxicity. The first recorded use of hemp as medicine was in 2737 BC, and throughout history and the world, it was used for not only medicine, but for fuel, paper, fiber, and food.

Until its prohibition in 1937, cannabis could be found in many medicines easily purchased in pharmacies and shops everywhere. When the U.S. Congress passed the Marijuana Tax Act criminalizing the use of cannabis, a precedence of prohibition was established and was launched around the world through the subsequent United Nations Single Convention Treaty. Objections were raised by Dr. William C. Woodward, who testified to the government on behalf of the American Medical Association stating, "The American Medical Association knows of no evidence that cannabis is a dangerous drug." He warned that a prohibition "loses sight of the fact that future investigation may show that there are substantial medical uses for cannabis." His comments were ignored, due to the concerted efforts to demonize hemp in the eyes of the public and the government. Much of the testimony provided to the US Congress encouraging the passage of the 1937 act was derived from sensationalized false articles in newspapers owned by William Randolph Hearst. Hearst had extensive holdings of timberland and was heavily vested in wood pulp factories producing newsprint paper from trees. His interests were in direct competition with a newly patented and cleaner method for making paper from hemp that eliminated the intensive labor previously required to process the fibers. The Hearst and Dupont corporations cooperated, and both greatly benefitted from hemp prohibition. Most of the sensationalism was touted by the head of the Federal Bureau of Narcotics Henry Anslinger, who was related to Andrew Mellon, who handled the Dupont banking interests. Dupont's petroleum-based nylon fibers and industrial chemicals replaced those previously provided by hemp, and along with the synthetic petroleum-based chemical revolution came "big pharma", replacing plant medicines with patented synthetic petroleum-based coal tar chemical medicines, mostly copied from plants.

The pharmaceutical industries have grown to reap billions in profits each year, while medicinal uses for hemp have been ignored, as predicted by Dr. Woodward.

But, this is changing.

Charlotte Figi was 3 months old when she had her first epileptic seizure. Traditional medicine and special diets did not help her and by the time she was three, she was having on average 300 seizures per week, some lasting for hours. Her heart had stopped many times and she lost her ability to walk. Desperate to find ways to help their child, Charlotte's parents scoured the internet and read a story about a little boy whose epilepsy was greatly alleviated by a medicine made from hemp. The variety was an industrial hemp strain that is **low** in tetrahydrocannabinol (THC), the compound found in cannabis strains that are psychoactive. It was also **high** in cannabidiol (CBD), which has medicinal properties but no psychoactivity. After finding a source of the particular strain needed, and a doctor who believed it was the only option, Charlotte received the medicine. Charlotte, now 9, is thriving. Her seizures happen rarely, almost solely in her sleep. Not only is she walking, she rides a bicycle, and attends school. She feeds herself and is talking more and more each day. Charlotte's parents have been instrumental in spreading the word and consequently many children with epilepsy are now receiving this medicine that scientists say quiets the excessive electrical and chemical activity in the brain that causes seizures.

Now, the US National Institute on Drug Abuse acknowledges that CBD may be useful in reducing pain and inflammation, controlling epileptic seizures, and possibly even treating mental illness and addictions.

Hemp medicine is also generating interest in the multiple sclerosis and other neurodegenerative disease communities. The American Academy of Neurology (AAN), the world's largest association of neurologists and neuroscience professionals, found cannabis-based medicines to be effective in treating multiple sclerosis, greatly lessening spasticity symptoms, and pain.

Cannabis contains at least 85 different types of cannabinoids (CBDs). The impact of these cannabinoids in treating cancer patients has proven favorable to treat not only the nausea and vomiting associated with chemotherapy, but since 1996 studies have shown that cannabinoids kill cancer cells while protecting normal cells. A 2003 study proved that CBD may make traditional therapies more effective in treating brain tumors, and a 2004 study showed that it protects against inflammation of the colon, reducing the risk of colon cancer and aiding in its treatment. The National Institute of Health (NIH) affirmed this in a 2011 study, and showed a decrease in the viability of cancer cells in the

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liver. Also in 2011, the American Association for Cancer Research and the NIH revealed that CBD kills cells associated with breast cancer without harming normal cells, and that it reduces the growth, number, and spread of tumors.

In the growing number of places where medical/industrial hemp is legal, it has been prescribed for many conditions including, but not limited to, acne, ADD and ADHD, addictions, AIDS, ALS, Alzheimer's, anorexia, antibiotic resistance, anxiety, atherosclerosis, asthma, autism, bipolar disorder, cancer, chronic pain, chronic traumatic encephalopathy (CTE), colitis and Crohn's disease, depression, diabetes, endocrine disorders, epilepsy and seizures, fibromyalgia, glaucoma, heart disease, hepatitis C, Huntington's disease, inflammation, irritable bowel syndrome, kidney and liver diseases, mad cow disease, multiple sclerosis, Parkinson's disease, post-traumatic stress, sickle cell anemia, spinal cord injuries, Tourette's syndrome, traumatic brain injury, and ulcerative colitis.

Dr. Ralph Mechoulam of Israel discovered that hemp medicines work efficiently because of a special endocannabinoid (EC) system present in all humans and many animals. This system consists of receptors configured only to accept CBDs. He also found that our bodies not only have these special receptor sites but that we actually produce cannabinoids. Israel has been in the forefront of research and leads the world in using hemp-based medicines for healing.

The fact that there is a special system in human physiology that produces cannabinoids, and is specifically designed to accept just them, has provided the impetus for more research and rethinking regarding lifting the ban and investing in the production of industrial hemp for medicine. In addition to medicine, industrial hemp can greatly contribute to the economy with its strong, durable fiber, biodiesel and cellulosic fuels (see August 2016 issue), plastics, and building materials. It can clean and fertilize soil (see November 2016 issue), keep down weeds wherever it is grown, eliminating the need for toxic expensive herbicides, and provide us with many health care products to keep us healthy.

Hemp seeds and oils sold without restrictions throughout the world provide excellent nutrition including essential omega-3s, vitamin E, phosphorus, potassium, magnesium, sulfur, calcium, iron, and zinc. The seeds contain 20 amino acids including the 9 most essential to health. Hemp is very high in protein and is surpassed only by soybeans, making it one of the most healthy foods in the plant world. In the early 1800's, Australia was saved from two famines by eating virtually nothing but hemp seed for protein and hemp leaves for roughage.

In our next issue, we will further explore more health products along with the many other useful products derived from industrial hemp.

## Armyworm... Continued from pg 27

These factors promote vigorous growth and reduce pest damage (Intagri).

**Biological Control:** Natural predators of the armyworms are present in a balanced ecosystem. The excessive use of insecticides reduces the population of these predators. Some common predators are shown in figures 4 and 5. There are also beneficial microorganisms (entomopathogens) present in corn fields



feeding on larvae (Figure 6). The use of pheromone traps is another tool to be used.

**Chemical control:** This method is the most commonly used by farmers; however, the use of insecticides should be done carefully to control the targeted pest and not beneficial insects. Early applications when larvae are small (L1 and L2 instar) with a fine mist (aerial or terrestrial application) are optimum for a good control (Juarez, 2010). Ineffective treatments may be due to late applications on large larvae and presence of chemical resistance. *Spodoptera frugiperda* has been reported to show resistance to insecticides of the carbamate, organophosphate and pyrethroid chemical family in the region (IRAC, 2016). The use of insect growth regulators (IGR) has shown to be effective on armyworms without severely harming beneficial insects. The following table can be used to help determine which type of insecticide is appropriate for the different crop stages.

**Table 2. Chemical control of armyworm**

Data compiled from INTA; Bessin, 2007; Juarez, 2010

Crop stage	Instar	Threshold	Insecticide
V2 – V6 <i>Prevent loss of plant stand</i>	L1 – L3	20% damage, window-pane symptom	Pyrethroid
	L1 – L3 + eggs		Pyrethroid + IGR
V6 – V10 <i>Break pest life cycle to prevent reach tasseling</i>	L1 – L3	20% damage, window-pane symptom	IGR only
	L4	Present in whorl, without debris	Pyrethroid/carbamate/organophosphate + IGR
V10 - VT	L1 – L3	20% damage, window-pane symptom	Residual insecticides of the Diamide and Spinosyns family

Armyworm... Continued to pg 42



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# Solar Water Heating Systems

By Tom Sagee

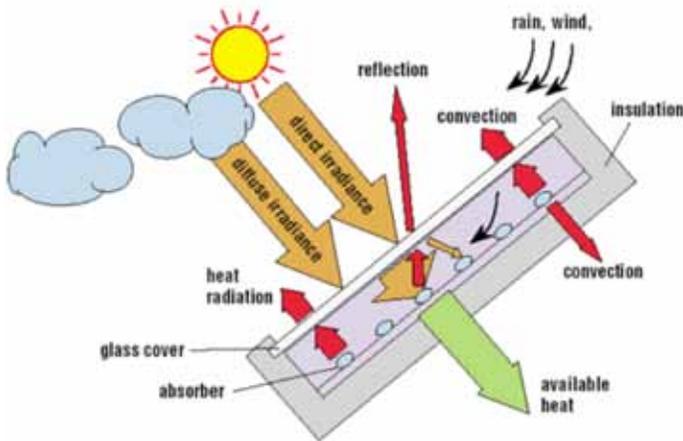


Solar water heating (SWH) goes back a long way; in 214 B.C Archimedes used a concave mirror as a solar collector to heat water. The solar collector is the heart of the system. It absorbs solar radiation, converts it into heat, and transfers useful heat to water in the absorber tubes. The third component of a solar water system is storage.

## Collectors

**Flat-plate glass collectors:** The collector housing can be made of plastic, metal or wood; the glass front cover must be sealed so heat does not escape, and dirt, insects or humidity do not get into the collector. The collector housing is highly insulated at the back and sides, keeping heat losses low. The glass cover faces the sun; this helps prevent convection losses and reduces heat radiation from the absorber into the environment in a similar way as a greenhouse does. However, the glass also reflects a small part of the sunlight, which does not then reach the absorber at all. The figure below shows the processes occurring at a flat-plate collector.

Processes at a flat-plate collector

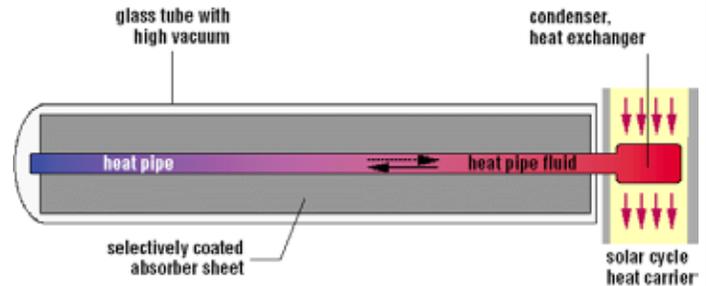


Black materials absorb sunlight very well and heat up; so absorbers are coated with black coatings. However with some coatings only part of the heat is transferred to the water that flows through the absorber tubes; the rest is radiated back into the environment. To maximize heat many absorbers are black chrome, black nickel or TiNOX. Chromagen selective paint absorption plates retain approximately 90% radiation.

**Evacuated-tube collectors:** Convection heat loss due to air movements inside the collector can be significantly reduced by maintaining a vacuum between the front cover and the absorber of a flat plate collector. In evacuated-tube collectors, the high (almost complete) vacuum inside the closed glass tube can be more stable than that of the flat plate. An evacuated-tube collector comprises a closed glass tube, inside which is a metal absorber sheet with a heat pipe in the middle, containing a temperature-sensitive medium such as methanol. The sun heats and vaporizes this heat pipe fluid; the vapour then rises to the condenser and heat exchanger at the end of the pipe where the vapour condenses and transfers heat to the heat carrier of the solar cycle, water. The condensed fluid flows back to the bottom of the heat pipe where the sun begins heating it up again. To work properly, the pipes must have a minimum angle of inclination for the vapour

to rise and the fluid to flow back. A cross section and principle of operation of the evacuated-tube collector are shown in the figure below. (With some evacuated-tube collectors, the heat pipe passes through the end of the glass tube so that the heat transfer medium of the solar cycle can flow directly through it. A heat exchanger is not needed with this type of collector, and the collector does not have to be mounted at the minimum angle of inclination.)

Principle of an evacuated tube collector with heat pipe; view from top



Higher energy can be gained with evacuated-tube collectors than flat-plate, especially during the cooler months of the year. However, over time, depending on the material and constructional quality of the system, the tubes lose some of their vacuum and their efficiency is reduced. On the other hand, the price for high quality evacuated-tube collectors is higher than that for flat-plate systems.

**Collector Efficiency:** Thermal losses increase as temperature difference between collector and ambient air rises. At low solar irradiances, the efficiency decreases at a faster rate. In Belize, the solar radiance is an average of 5kWh/ m<sup>2</sup>/day, keeping the output of a Chromagen collector at over 80%.



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## Hot Water Storage and Installation

**Thermosyphon systems:** For storing water overnight or on cloudy days, a storage tank is needed. A very simple way of doing this, making use of gravity, is the thermosyphon system. The principle of the thermosyphon system is that cold water has a higher specific density than warm water; being heavier it sinks. Therefore, the collector is always mounted below the water storage tank, so that cold water from the tank reaches the collector via a descending water pipe. The collector heats up the water, which rises again and reaches the tank through an ascending water pipe at the upper end of the collector. The cycle of tank–water pipe–collector ensures the water is heated up until it achieves an equilibrium temperature. The consumer can then use the hot water from the top of the tank; water used is replaced by cold water at the bottom. Warm water rises faster at higher solar irradiances than it does at lower irradiances; therefore, the circulation of water adapts itself almost perfectly to the level of solar irradiance.

A thermosyphon system's storage tank must be positioned well above the collector; otherwise the cycle can run backwards during the night and all the water will cool down. Furthermore, the cycle does not work properly at very small height differences.



**Forced-circulation systems:** In contrast to thermosyphon systems, an electrical pump moves water through the solar cycle of a system by forced circulation. Collector and storage tank can then be installed independently, and no height difference between tank and collector is necessary. Two temperature sensors monitor the temperatures in the solar collector and the storage tank. If the collector temperature is above the tank temperature, usually between 5°C and 10°C, the controller starts the pump, which moves the heat transfer fluid in the solar cycle; if the temperature difference decreases below a second threshold, the control switches off the pump.

## Solar Hot Water for Belize

Since 1980, hot water systems in residential, commercial or industrial buildings in Israel have been solar-based, reducing roughly 5% of its energy consumption, reducing its CO2 footprint by 2.7 million tons, and saving 4 billion kWh/year. Australia, Belgium and Brazil have followed this example and many more are in the process: South Africa, Mexico, Spain, Chile, Uruguay, Germany, and USA.

Currently, 47% of the energy consumed in Belize is fossil fuel-based, emitting 605K tons of carbon dioxide. With the ample sun radiation that Belize enjoys (over 5 kWh / m<sup>2</sup> / day), most hot water demands can be supplied harnessing the sun's energy. In the tourism sector, this can account for 27%- 60% of a hotel's energy consumption. In the agricultural or industrial sectors, this can account for 70%; and in the private sector, up to 100% of demand.

Material for this article is taken from *Chromagen Technical Manual, UNEP Solar Water Heating in the Tourism Industry, With a Focus on the Caribbean Region, Oct. 2015.* {[http://www.volker-quaschnig.de/articles/fundamentals4/index\\_e.php](http://www.volker-quaschnig.de/articles/fundamentals4/index_e.php)} Feb.2002; <https://www.cia.gov/library/publications/the-world-factbook/geos/bh.html>

**Editor's Note:** Tom Sagee and Hadas Perry came to Belize in 2014 and for a few years managed an island resort before deciding to dedicate their efforts toward helping to establish renewable energy in Belize. They established Greensun Ltd. which imports Chromagen solar water heaters and Homebiogas, a revolutionary domestic unit that converts everyday food waste into cooking gas and liquid fertilizer. They also dabble in septic tank remediation, energy efficient lighting, and aquaponics. They reside in San Ignacio.



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**NCSP... Continued from pg 13**



Tex-Bel processes these for the NuCoco brand, who then exports them to North America. Muralles stated that one person could husk up to 1,300 nuts in an 8 hour day. However, the committee was asked to keep in mind

Thailand, who uses monkeys for some of their labor. Much discussion followed as to potential of world markets, and how do other processors establish pricing for the coconuts – for coconut water – by the size of the nut, by measuring the water extracted from the nut, by weight, etc. The traceability issue was also discussed as vital to this industry. Minister Hulse commented that we clearly need more science information on processing and on costs. He stated that there is a task force at the ministry to report on the unit price of every commodity. Minister said that to do business without



this data is to practice 'romantic farming'. He emphasized that we need to become 'a link in the chain, not king', as we cannot compete with industry giants. Mr. Jose Trejo of Standards Bureau emphasized that quality will make incentives for both large and small farmers.



Ms. Avila also noted that farmers "are married to their coconut trees, as they will be with them producing from between 35 to 65 years". It was stressed that Belize will need an association of coconut farmers and processors to facilitate many aspects of the industry. She mentioned Costa Rica processes the waste products to go back to the farmers as fertilizer. In Salvador, coconut husk is used for making coffee bags.

Following the very vigorous and amicable discussions, Tex-Bel took everyone around their Global Gap certified farm to see their Chactemal coconut trees, and also intercropped fields (with plantain and cacao; with soursop; and with lime).

The next meeting will be held on 17<sup>th</sup> March, in Blue Creek, Orange Walk District.

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## Low-Impact Tourism The Mayan Sky Canopy Tour

Imagine looking down on birds, zipping over the South Stann Creek River in one of southern Belize's newest low-impact tourism attractions! If you want a unique and safe nature tour, one that offers true panoramic vistas of the rich tropical forests of Belize, go visit Canopy Course and Jungle Tours Ltd. situated behind and between the oceans of banana fields of Maya King Farms at Mile 21 on the South Stann Creek Highway. The owners, Cesar Godinez and Tim Sise recently relocated their former Toledo Blue Creek Zipline to its current location, inaugurating the zipline at its new venue in December 2016.

Cesar is no novice for this specialized type of construction, this zipline being the 5<sup>th</sup> facility that he has created in Belize. Cesar also owns/operates Belize Custom Treehouse Builders; visit to that website (see ad this page) and you will note the overlapping skill sets for these sister businesses.

There are an estimated 9 or 10 ziplines currently scattered around Belize – mainly Cayo, Stann Creek and Toledo Districts, and one in Sand Hill, northern Belize District.

The Mayan Sky Canopy Tour boasts being the highest elevation of all ziplines in Belize and showcases a stunning canyon where many special and endangered birds can be seen – sometimes from above or from a parallel elevation and frequently in flocks. I was shocked to see 2 scarlet macaws (*Ara macao*) fly by the welcome area about 8 A.M. The birds were cruising at approximately our elevation. Harpy eagles, (*Harpia harpyja*) usually sought-after deep in the Pine Ridge in the Las Cuevas area, are also often observed here. The guides state they have seen small birds in flocks chasing a harpy on many occasions. That takes some nerve on the part of the small birds; the harpy eagle is one of the largest birds of prey in the world with a height and wingspan almost equivalent to a 4' x 8' sheet of plywood and, according to the Belize Zoo, "with talons about the same size as a grizzly bear's". Guests are not rushed as they traverse between the 7 lines, of varying lengths between 300 and 1,500 ft. Six of the 7 lines zig-zag across the South Stann Creek River at heights up to 500 feet above the water.

Many of Belize's notable trees can be found and identified onsite. Ancient tree ferns border the drive to the welcome center in the canyon; mahogany, cedar, santa maria, nargusta, gumbo limbo, yemeri, sapodilla, and countless other species abound. (Historically the steep sides of canyons were often left unlogged due to the difficulty of timber extraction.) Animals frequently observed during the tours include gibnut (*Agouti paca*), agouti (*Dasyprocta punctata*), tyra or bush dog (*Eira barbara*, in the weasel family), peccaries (*Tayassu pecari*) and white tailed deer (*Odocoileus virginianus*) and paw prints from mainly nocturnal cats are also seen. As the Cockscomb Basin Wildlife Sanctuary and Jaguar Preserve, which has the highest recorded density of jaguars (*Panthera onca*) in the world, is closeby, that is not surprising.

You will always find at least 4 skilled guides at the site – 2 teams, each comprised of one 'sender' and one 'catcher'. You will be harnessed and attached to the steel cables by 2 independent carabiner systems, and shown the correct

postures and procedures for braking (at the end of each run as you approach the next landing). Don't worry if you apply them too early, as I did; there are techniques to 'reel you in' or worst case, the nimble catcher will go out and haul you to the deck. All Mayan Sky Canopy's zipline equipment is from the world-class Petzl, the premier French climbing equipment manufacturer. Fernand Petzl, a mechanic with a passion for caving, invented many of the gadgets essential for 20<sup>th</sup> and 21<sup>st</sup> century exploration. Petzl's slogan is "Access the inaccessible" ([www.petzl.com](http://www.petzl.com)).

Ziplining is truly low-impact tourism; you literally fly over the environment rather than tromping through it. Cesar and Tim estimate that the total combined acreage of land in use for welcome center, landings, etc. is less than one acre. Zipping is possible singly in your own harness for those over 5 years (please) and with a minimum of 50 lbs. weight. According to the physics of it, 50 lbs is needed to overcome the friction coefficient of the pulleys. (Co-owner Tim is a former chemistry teacher). However, smaller children can ride doubled up with one of the expert guides. There are no maximums on the high end of weight, and the harnesses can girth up to a 48" waist. There is a minimum amount of climbing required – approximately 2 minutes walking between each line. Mayan Sky Canopy appreciates if you call ahead to advise for groups or if you will bring young children who might need assistance.

After you finish the zips, (approximately one hour) you can go tubing on the South Stann Creek River with the same company. Depending on the speed of the river, plan on another one hour+ to traverse the 1 1/4 miles in your tube.

B. Roberson

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## Blogo Bananas in Belize

By Mary Susan Loan



In other parts of the world, the banana variety known as “blojo” banana in Belize, goes by other names. Bluggoe is most common. In Kriol they are called wail plantain or waika banana. Other names are burro, horse, square cooker, chunky or hog banana. By any name used, they are all heliconia plants from the banana family. Blogos are similar to the *Pisang Awak* variety banana.

The official name of this banana variety is *Orinoco* as it is believed to have originated in Venezuela's Orinoco Valley. Orinoco bananas have spread to many tropical countries, especially Burma, East Africa, Grenada, Southern India, the Philippines, Samoa, Thailand and Central America. They are also a popular hardy banana variety suited to South Florida.

Blogo bananas are hardy, pest resistant, and can survive cool or blasting heat. They are easily identified by a chunky, stubby, slightly square shape and grow to about eight to ten inches long and at least two inches across with blunt ends. Blogos are productive and often grow over fifty bananas on each stem. The thick strong peel is a vivid dark green which gradually ripens to a yellowish-brown without splitting.

Blogos are delicious fried, baked or boiled when used green in place of a starchy vegetable. When young, blogos' taste is tart and tangy with citrus undertones. When fully ripe the fruit is creamy white to yellowish with a creamy silky texture and a classic banana flavor with hints of apple and lime. Some blojo varieties have a slightly crisp fibrous core which is distasteful for some who are used to eating the classic most popular Cavendish banana variety. In addition to being versatile and tasty, blojo bananas are low in calories, high in potassium and contain a significant amount of B and C vitamins, fiber, magnesium, iron, zinc, copper and selenium.

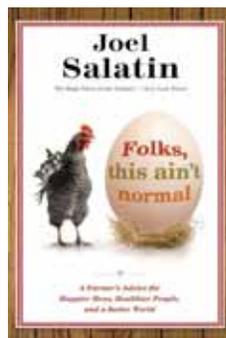
Leaves are used for cooking food as fragrance and flavor of the banana leaves is transferred to the food being prepared. A simple dish known as Karo Karo is prepared from blojo bananas. Here's the recipe: about two cups masa mixed with water (coconut water is best) and 2 teaspoons recado to a raw pie crust consistency, 1 tablespoon minced ginger, 1/2 cup diced onions, 1 teaspoon salt, four ripe blojo bananas. Mash all the ingredients together with a hand potato masher or food processor, let sit for at least one half hour. Form into balls and fry or bake till crispy on the outside. They look attractive served on a fresh, washed and dried blojo leaf.

In Belize blojo bananas may not get the respect they deserve as they are often used as pig feed or composted. They are not easily found at the open air markets. Look around where bananas are growing, ask your friends and neighbors, get a side shoot and start growing your own blogos.

You will be in for a pleasant surprise that keeps growing.

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## Folks, This Ain't Normal: A Farmer's Advice for Happier Hens, Healthier People, and a Better World

By Joel Salatin

Book Review

By Chris Harris

If you ride around on a huge combine harvester, keep thousands of chickens in a mass feeding coop or spray chemicals all over big fields, this book shows alternative methods of farming for you. After all it is written by a man who describes himself as a Christian libertarian environmentalist capitalist lunatic.

Joel Salatin is one of the foremost advocates of ethical and responsible farming. He has traveled widely around the world, lecturing at universities and talking to farming groups. The book uses the American mass farming model to show the failings of corporate farming and food production. Salatin uses a lifetime of experience on his own farm in the Shenandoah Valley in Virginia USA to point out and explain how a better way of raising food is possible without sacrificing ethical treatment of animals or food quality and using environmentally benign treatment of waste.

As he points out, his practices have brought him into conflict with the US Department of Agriculture, the three major food producers in the USA and, of course, the owners of the Concentrated Animal Feeding Operations (CAFOs). He proposes that the conspiracy (for that is what it is) between elements of Big Ag in the USA to provide cheap food via monoculture and heavy use of pesticides is to the detriment of the consumer at large.

Throughout this thoughtful and sometimes confrontational book he analyses aspects of mass food production and shows how this affects what we eat and the nutrition we gain from so doing. He goes on to show the damage such farming practices have done to the landscape over several decades and the effect food processing has had on many aspects of human health.

Salatin goes a step further, however, in examining ethical aspects of this issue. “Because we can, we will” is the mantra he challenges. His conclusion, backed by his own experience and that of thousands of small independent farmers across the USA, is that alternatives do exist. Where cows can graze in fields on grass and are not fed a diet of corn just to boost protein, where chickens can free range producing higher quality meat and eggs, and where pigs can wallow in mud and be, well, pigs.

All of this is backed with strong argument, solid facts and examples of good and bad practice. Salatin talks of his triumphs and failures, in a humorous, honest and entertaining way.

So if you are a small farmer who thinks and cares about his animals as animals, and are not prepared to sacrifice principals of good husbandry for profit at all costs, this inspirational book is most definitely one to read.

“Folks This Ain't Normal” by Joel Salatin, published by Center Street, is available at the book shop in Spanish Lookout

**Editor's Note: A naturalized Belizean, originally from Norfolk, England, Chris now lives in Springfield just south of Belmopan. He holds a degree in chemistry from London University. A sport fisherman since childhood, his main interest now is self-sustaining farming and his passion is cheese making. Together with his wife, Sue, they built and run White Rock Farm which is a 15 acre low-input, mixed farm.**

## How to Grow Vanilla By Dawn Dean



It's easy to grow a vanilla vine. Actually producing vanilla beans on that vine is a bit more complicated, but still not hard. Vanilla just needs different treatment from all other plants.

Here's the short version:

Vanilla is a vine that grows up something usually a tree. It has roots that hold it on to the tree and they gather some nutrients for the plant, but it has more feeder roots along the top of the soil, under the mulch. Vanilla roots don't grow down into the soil much. Vanilla grows better in a fair bit of shade. To get beans (or pods, which is the more accurate word, but most people say beans), you need to do a few more things. Keep the vine growing in an area you can reach it, manage shade, and hand-pollinate the flowers when they come.

See? Nothing difficult.

Here it is with more details:

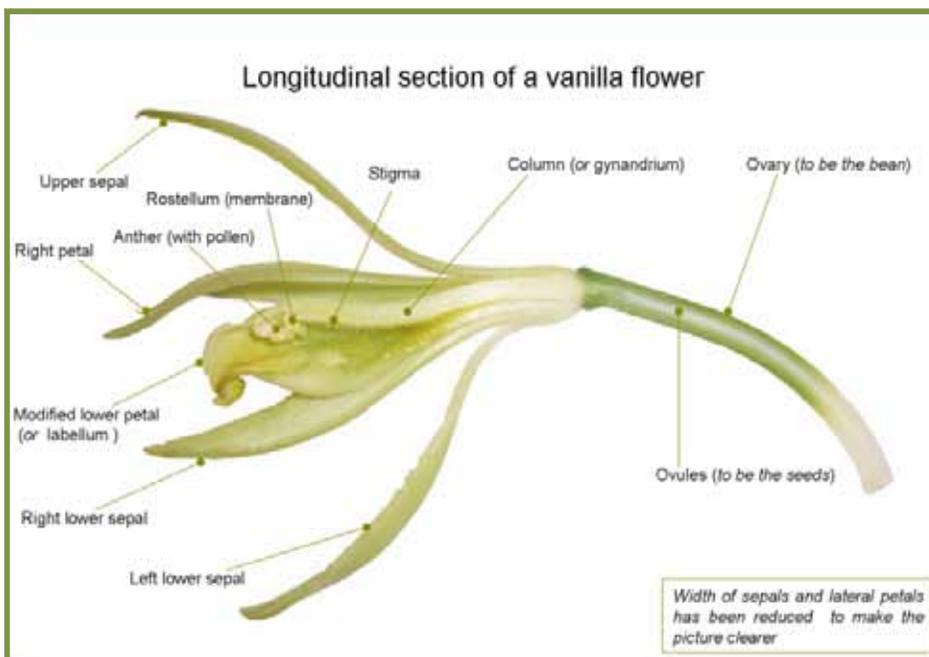
**1. Get a cutting from a healthy vine,** approximately 1 meter long. Cut the leaves off the bottom half of the vine. It's okay if your cutting lays somewhere in the shade for a week or so at this point. In places with fungal problems farmers air-dry cuttings in the shade for a few days before planting.

**2. Choose a tutor.** (There's a bit of special vanilla vocabulary, so let's start here with it.) *Tutor* is the tree up which the vanilla grows. In the vanilla industry, madre de cacao, gumbo limbo and erythras are popular tutors, often planted on a 10X10' grid. My observation on my farm, where I grow most of my vanilla on wild trees, is that trees with thick soft bark help the vanilla plants grow faster. A tree with a crotch at eye level is best. Choose a tree/location that gives the vanilla shade; 50% is good. Much as chocolate and vanilla are a great flavor combo, cacao is a poor

tutor tree choice; eventually the vine will grow so big it will interfere with the cacao flowers.

**3. Plant the cutting.** Chop or rake under the tutor so bare dirt is exposed. Lay the half of the vine without leaves on the dirt, arrange the leafy half so it looks comfortable on the tree, and tie gently with a vine, or a piece of old stretchy t-shirt. Don't use twine; that doesn't rot or stretch. Also, if your tutor tree's girth expands, twine injures the vanilla.

**4. Mulch the plant.** More is better. A lot, lot more is even better. Here's what I do on my farm: I arrange logs in a roughly 5' square, 1' deep box around the tutor. Then I put soft mulch directly on the vine that's lying on the soil: brown tree leaves, twigs, a few handfuls of humus you gather nearby. Not sawdust. Not banana trunks. Not green leaves. Create a soft, moisture-holding environment, not a heavy, soggy environment. Once you have covered the vine itself with at least 4" of fluffy mulch, you can move on to bigger mulch; small branches, coconut husks, more logs. The same banana trunks and sawdust that would smother the vine if placed directly on it are great in the box. Just place them in such a way that they will decompose before the vanilla roots reach them. And pile this box high; 2' deep is a good goal. Green plant material heats up as it rots, so never add green material in such a way that it will touch any part of the vanilla plant.



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### 5. Care for the plant while it grows.

Keep an eye out that your vine grows up the tree, not across the mulch. Don't let weeds grow in the mulch box. As the years pass, add more and more decomposable things on top of the mulch box. I haven't seen any unhealthy vanilla vines in the wild, but once I had a fungus develop in some overcrowded vines that I had in a very shady, fairly damp place. I cut off and burned the affected portions of vine, trimmed back the shade, and the fungus didn't reappear.



**6. Loop the vines.** *Loop* is another official vanilla term. It means your vine grew up, then back down to the ground then looped back up. This is a trigger that encourages vanilla to flower. Vanilla flowers need hand pollination, so it's best to keep the vine where you can reach all the flowers, and looping helps with this. There are several ways to do this, all with pros and cons. **Choice A.** When the vine gets higher than eye level, gently detach the roots and let the vine hang, preferably through a crotch on the tree. This is the easiest way to detach them, but the vine can redirect itself immediately back up the tree, creating a tangle if you're not watchful. It's ideal if the vine goes all the way back to the ground, where it can easily form more roots, to get more nutrients, to grow bigger, fatter vanilla beans. **Choice B.** Wait till the vine has grown far enough above your eye level that when you detach it, you can loop the vine under some mulch, and re-direct the vine up the tree. Done well, this is the best plan, but it's kind of tricky to not break the vine in the process. But if you do break the vine, give thanks for a new cutting and see #2 above. **Choice C.** For the more "adventurous of pruning heart", wait till your vine grows 5' or more above eye level then use the tool of your choice and cut the branch to which vine is attached and set the branch upside down or propped on another tree, without detaching or breaking the vine, and loop the vine under mulch and redirect it up the tutor tree, a feat of farming finesse.

**7. Manage shade.** So far, 50-70% shade has been good. But now, to encourage flowering, you need to give the plant more sun. Wait till your vine has looped, and wait till after Christmas, so you can work along with the plant's internal cycle. Then, between Christmas and Valentine's Day, cut back the shade. Aim to increase sun by 20-25%. Cut back the over-story trees, or *coppice* the tutor. Naturally your trimmings should go on top the mulch piles. Do it in a couple of stages so you don't give

the vines a blast of sun that toasts them. Recently my vanilla plantation got hit by lightening. Plants that weren't touched by the lightening died subsequently because the lightening took out all the shade. Shade and looping are managed so precisely in some Mexican plantations that 90% of flowering happens in a 2 week timeframe in March. In my 4-year old, nearly wild plantation and vanilla gene bank near Barranco Village, most of the flowering happens between December and July.

**8. Hand-pollinate the flowers.** Pretty straightforward, and can be done with any reasonably clean and strong twig you find nearby. Check out the diagram. Or you could be like some serious vanilla pollinators and grow a long thin pointy fingernail for the purpose. It's all up to you.



*This photo shows how the side of the flower is ripped to access the parts inside that pollinate.*

Pull the bottom lip of the flower out of the way, probably ripping it in the process, so you can see the column and anther. Lift the rostellum with your little stick. Push it under the pollen coated anther. Then gently pinch them together for a couple seconds. You are making the pollen and stigma connect. The flower will look mangled when your done, but that's ok. It should definitely remain attached to the plant though. If the flower falls off in the next couple days, that means you were an unsuccessful pollinator.

On a properly pollinated flower the bean will start to grow within a couple days, and on *V. planifolia* the flower will stay attached to the bean for a long time. Possibly until harvest. By the way, vanilla flowers are viable for one morning only, pollination is most successful between 7am and 10am. If you miss a flower, don't worry. Ideally, only half of the flowers on a raceme should be pollinated so each bean gets enough nutrients to grow big and thick. If you want straight beans, pollinate the flowers on the bottom of the raceme.

**9. Wait.** For a *Vanilla planifolia*, the main species of commerce, wait till the bottom tip of the vanilla bean is starting to turn yellow, then harvest. Takes approximately 9 months. If your flowers came in March, the beans will be ready in December.

A curing process creates the wonderful vanilla aroma. The process works better with large amounts of beans, but you can modify it with decent results at home.

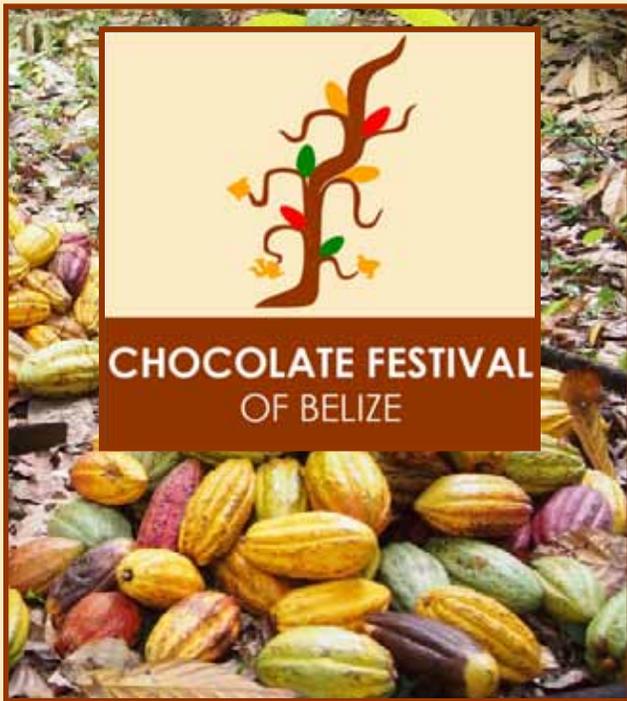
Vanilla is a very forgiving plant. What I described above is based on my experience observing and growing vanilla in the Toledo District, and differs a bit from standard industry practice. But vanilla can handle a lot of different treatments. I've seen it survive without mulch, or in 90% sun, and I've seen pieces that have broken off the main vine and started crawling up a nearby tree before I ever noticed them. I've seen the bottom half of a freshly-planted cutting die, so no part of the cutting had mulch, and the vine tied to the tree still threw roots down to the ground. Once your vanilla cutting has started its first roots, you're pretty much set.

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**Pro-Organic Belize** meets on the first Thursday of every month at Maya Mountain Lodge, Cristo Rey Rd, Cayo District. Our business meeting begins at 11am, followed by lunch at 12 noon, off the Nature's Kitchen Restaurant menu. The highlights of these gatherings is the speaker who begins at 1:15.

January's speaker was Mr. Gary Ramirez of MAFFESD's Research and Development Center at Central Farm. February's was Dr. Thomas Mathew, owner of the Belize Spice Farm in Golden Stream, Toledo District. Scheduled for our March 2<sup>nd</sup> meeting is Mr. Tom Sagee of Green Sun Ltd, who will speak on hydroponics/aquaponics.

All are welcome to attend.



**Pro-Organic Belize** also is the parent organization for a **Pesticide-Free Produce Co-op (PPC)**, which has been operating in San Ignacio since October of 2016. Registrants pay a one-time fee of \$25 to belong, then pay \$25 per week for produce. Produce is pre-paid by the month. Tuesdays are produce days – all produce is freshly picked early the same day, then transported to San Ignacio where it is gently sorted and put into units. Pick up site for now is at the Belize Botanic Shop on West Street, between 1:30 and 3:30 pm.

Recently the group of Belmopan PPC buyers has grown, and a pick up site in Belmopan is being established.

**Why are people joining our non-profit Pesticide-free Produce Co-op?**

- Because pesticides don't only poison bugs, weeds and fungi- they poison the food we eat, the soil it grows in, and the water we drink.
- Unlike many other countries, Belize has not yet implemented a regular testing program for toxic residues left in and on fruits & vegetables, locally grown or imported.
- Wouldn't you like to know you are eating foods grown without poisons?

For more information, email [proorganicbelize@gmail.com](mailto:proorganicbelize@gmail.com) or phone 677-9658



**Belize Organic Family Farming, Pro-Organic Belize, Belize Wellness Institute, Belize Botanical Gardens, Plenty Belize, Sustainable Harvest International of Belize, and Southeast Watershed Alliance Group**

have invited expert **Dr. Stephanie Seneff**, globally recognized MIT researcher to speak in Belize during week of April 3<sup>rd</sup>, 2017. She will meet with the Pesticide Control Board and various GOB ministries, speak with farmers and make a public presentation(s) about the dangers of toxic poisons on agricultural crops and soil.

**Please contribute towards this effort** (airfare and expenses, no charges for her time), by going to [www.generosity.com/education-fundraising/help-us-ban-glyphosate-in-belize](http://www.generosity.com/education-fundraising/help-us-ban-glyphosate-in-belize) or [proorganicbelize@gmail.com](mailto:proorganicbelize@gmail.com) See [www.ban-glyphosate.com](http://www.ban-glyphosate.com) for more info on glyphosate and alternatives. Listen to Dr. Seneff here [www.youtube.com/watch?v=qYC6oyBglZI](http://www.youtube.com/watch?v=qYC6oyBglZI)



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# AG BRIEFS



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



## The Key Biodiversity Areas (KBA)

Project handing-over ceremony of February 8 included tangible assistance to fire fighters who play a significant role in **Forest Wildland Fire Prevention and Management**: safety gear and fire-fighting equipment that was procured under the project. Since the dry season is here, this timely distribution of the much-needed equipment will assist the beneficiaries to control fires and mitigate the damages to our forest systems.



**BLPA's AGM will be held on Saturday February 25<sup>th</sup>. See Ad pg 41**



**On March 4<sup>th</sup>, 2017, there will be a cattle auction** featuring cattle from several leading ranches, held at Joe Friesen Jr's corral in Iguana Creek. Please see ad on pg 22 for details.



**The Chocolate Festival of Belize** will be held on Commonwealth Day weekend, May 19<sup>th</sup>, 20<sup>th</sup> & 21<sup>st</sup>, 2017. For information on sponsorships, booths and tickets see page 38.



**The National Agriculture & Trade Show** of 2017 will be held on April 28<sup>th</sup>, 29<sup>th</sup> & 30<sup>th</sup> with the theme, “Let's Get Growing”. Kindly see the ad on pg 26 for details to reserve your booth.

**The 13<sup>th</sup> Senator, elected to represent the non-governmental organizations (NGOs) was sworn in on 30<sup>th</sup> January. He is Mr. Osmany Salas,** who serves currently as the Belize Tourism Industry Association's (BTIA) national president. Many in the agriculture sector are very pleased and wish Mr. Salas hearty congratulations and good wishes in this endeavor.



**New CARDI Representative Appointed for Belize.** Omaira Avila Rostant is the new CARDI representative for Belize replacing Mr Anil Sinha who passed away suddenly in February 2016, after serving for 27 years. Omaira's extensive training and experience in biotechnology, specifically plant tissue culture development with a focus on the management and conservation of *in vitro* planting material will be a great asset as she oversees operations of the Belize CARDI office working closely with the Ministry of Agriculture and other partners to implement the institute's work programme: production of cereals, grains and legumes, commercial production of seeds and maintenance of seed banks.

Prior to joining CARDI, Omaira coordinated the implementation of several roots and tubers projects in Trinidad and Tobago, Guyana and Grenada. She was coordinator for the AgriNeTT project that created ICTs for the agricultural sector. She was also the manager for research and development at the Trinidad and Tobago Agribusiness Association (TTABA) from 2008 to 2010, where she was responsible for the introduction, production and post-harvest management of several cassava, sweet potato and coconut varieties to meet industry needs.

Fluent in Spanish and English, Amaira obtained an M.Phil in plant sciences from the University of the West Indies, St Augustine and a B.Sc in agricultural engineering (specialisation in plant science) from Central University, Venezuela.

She can be contacted at: Central Farm, Cayo District, Belize, Tel: (501) 824-2934, Fax:(501) 824-2936, Email: [oavila@cardi.org](mailto:oavila@cardi.org)

## 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.**

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## IICA Supports the Institutional Strengthening of the Pesticide Control Board

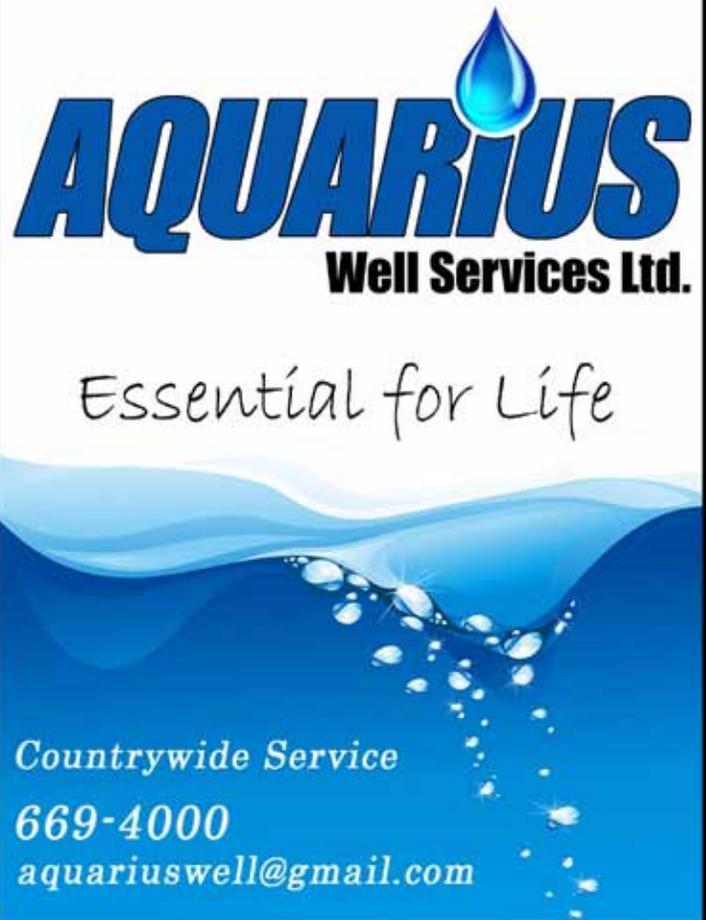
The Pesticide Control Board (PCB) is the main statutory body responsible for regulating the use and management of pesticides in Belize. There are currently 565 pesticide formulations registered for use in Belize and listed in the official register of pesticides, containing some 193+ active ingredients. Registration, surveillance, monitoring and enforcement of the responsible use and management of so many pesticides is no small task for the staff at PCB. Its importance is underscored considering that agriculture plays an important role in Belize's economy, contributing almost 13% to GDP, and employing about 10% of the population at the end of 2015. Belize has increased its use of pesticides and other agro-chemicals over the years due to more intensification and commercial development of agricultural production systems, the need to increase productivity and deal with pests and disease problems, and to become more competitive in both internal and external markets.

The Inter-American Institute for Cooperation on Agriculture (IICA) and PCB are implementing a technical cooperation project to strengthen the PCB by improving its capacity and capabilities in the areas of management, administration and operations of the organization to improve its services and outreach to the agricultural sector. The intended products of this collaboration effort will include the development of PCB's

- First strategic plan 2017-2021
- Two year action plan to guide the implementation of the strategic plan
- Annual work plan 2017/2018
- Planning, Monitoring, Reporting and Evaluation System
- Board and Executive Committee Operations Manual
- Human Resource Manual

The practical implementation of PCB's responsibilities includes monitoring and inspection of pesticide businesses, the major industries and farmers. The core activities are supported by training of and outreach to farmers, pesticide applicators, importers and retailers on (1) the dangers that pesticides can pose depending on the product's toxicity, application method, and type and length of exposure; (2) the proper use and management of pesticides including the appropriate dosage, calibration of equipment, rate conversions, proper storage and the responsible disposal of unused products and empty containers.

The technical cooperation between IICA and the PCB will contribute to making the PCB stronger carrying out its mandate and achieving its mission which is "To safeguard the health of the Belizean people and the environment, through pesticide regulation and capacity building, thus promoting the availability of wholesome food through rational pesticide management".



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### Armyworm... Continued from pg 29



For an effective chemical control in an IPM program, it is important to rotate between chemical families of insecticides in order to avoid resistance. Treatments are recommended to be done when larvae are most active. When larvae are in the L4 instar and located inside the plant whorl without debris, they have low mobility and may be partially controlled with an insecticide. Once the larvae are covered with debris, insecticides are ineffective (Bessin, 2007). Applications late in the evening may be more effective by reaching where the pest is feeding (Juarez, 2010). For more detailed information on IPM of armyworms, please consult your nearest agronomist.

Note: bibliography of this report can be obtained upon request at [info@danausconsultants.com](mailto:info@danausconsultants.com).

**Editor's Note:** Felix Cawich is a Belizean from Orange Walk District with a first degree in Agriculture Engineering from Universidad Agraria de la Habana, Cuba and two master's degrees in environmental science and natural resources management from Universidad Autónoma de San Luis Potosí, México and TH Köln, Germany. He is experienced in grain and legume production and currently provides technical assistance to farmers in various aspects of agriculture, thereby contributing to a safer and healthier crop production and protection of natural resources.



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