

The Belize Ag Report

Belize's most complete independent agricultural publication



August 2020
ISSUE 43



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Hemp in Belize Update By Karin Westdyk



Photo courtesy of www.hempfarmingsystems.com

Having recognized the potential for hemp, the benefits it can bring to farmers and consumers, while providing desperately needed new employment opportunities, the government established a committee comprised of the managing director and other directors on the Belize Agricultural Health Authority (BAHA) representing the ministries responsible for agriculture, health, and trade and a member of the police department. BAHA is responsible for coordinating the approval and authorization process and monitoring hemp production areas to ensure compliance with The 2019 Belize Misuse of Drugs Regulations. These regulations govern the cultivation, processing, manufacture and movement of industrial hemp and hemp products in Belize.

On May 31st 2020, it was reported in Breaking Belize News that Prime Minister Dean Barrow referred to hemp as something very big that could help Belize recover from the economic upheaval caused by the covid-19 virus. It is estimated that over 25,000 products can be made from hemp — products currently being made from fossil fuel chemicals that have profoundly compromised our soil, water, air, and health. So, in addition to its potential to build the economy of Belize with predictions of 2 to 3 possible harvests each year, many believe that hemp can play a huge role in cleaning and protecting the environment. It is interesting to note that, in colonial America, hemp was one of the earliest and most profitable crops, cultivated for its fiber, and exported to Europe. Farmers were actually ordered to grow hemp to keep up with the demand, and it was largely responsible for helping to build the US/American economy toward what it is today.*

Another practical use for hemp in Belize is building material in the form of hempcrete, though it does require the availability of decorticators to separate the hurd from the bast. The price point of these machines are prohibitive to profit in the short term, but in the long term, hempcrete could be key to a successful hemp program in Belize as there are many environmental and health benefits. Deforestation for building could be eliminated (a key culprit in climate-change) and people could live in houses that are airtight, yet flexible and breathable, and totally free of toxins and mold. Hempcrete is diffusive, meaning it has the natural and dynamic characteristic to control interior humidity levels, absorbing moisture when humidity rises and releasing it when levels fall. Hempcrete is also insect and fire resistant, and with a high R-value it could eliminate the need for air conditioning. Hemp is strong and vapor permeable, while impermeable to water.

The regulating committee meets monthly and is charged with approving or denying requests for production and processing,

and establishing the criteria and regulations for growing, processing, and exporting hemp. The regulations as well as applications to apply for a license to grow, process, research, import seeds, or move hemp, can be downloaded from the BAHA website. As of July 2020, 6 applications have been approved by the committee, 12 are awaiting a decision and one was denied due to a growing space requirement issue, that is, a 50 yard buffer must be surrounding a minimum of 1 acre for growing the hemp.

Some trials have already begun but there are no results yet. If the hemp program is to be a success in Belize, it is important that participants share their experiences, expert contacts and information, especially regarding seed, as *the right seed is key to the success of a hemp crop*. Furthermore, the choice of seed also depends on what use the hemp is being grown -- for seed, oil, fiber, building material, paper, fuel, or medicine. Melanie Heidel, Research Associate of the Hemp Seed Development Project at the University of Hawaii has served as the lead grower, overseeing data collection, harvesting and report preparation. Heidel claims the project is having the best success with Chinese derived subtropical strains. John Wightman PhD (plant health scientist), whose report follows this article, works with Hemp Farming Systems, a consultancy partnership and has 8 years' experience working with John Muir (hemp agronomist), who served as the development consultant for the sustainable irrigated agriculture and industrial hemp industry in Australia and Southeast Asia. Hemp Farming Systems is dedicated to helping hemp farmers throughout the world grow industrial hemp as a component of sustainable and productive farming systems. Wightman advises, "hemp farmers in the tropics need to have access to the seed of varieties that are 1) day-length insensitive, and 2) have male and female flowers on one plant."

Continues on page 6

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To the Editor

Dear Editor,

Corona Virus is devastating to us on all levels. As humans, we don't always learn from history as is evidenced by the fact that we continue to repeat our mistakes. Wouldn't this be a good time to reflect on, not only the effects of this current affliction, but on how we have been living, what our priorities are and how we can make this planet a better place when we emerge.;

Belize has put all of its eggs into one basket – tourism. And it has been pretty good to us on the whole as it affects all of us from the wealthy “ex-patriot” hotel owner to the stevedores unloading on the docks. We are now paying the price of not diversifying our economy with most businesses shutdown, a large part of the population now jobless, crops rotting in the fields etc., etc.

The cost of doing business here makes it hard for us to compete in a world economy. So what can we do to survive?

To my mind, feeding ourselves would be a good start. Right now we have a chance to do it right. Let's re-build as a healthy population. That means no more GMO, no more Round-up, more pesticide-free farming. We have seen how much in demand pesticide-free produce is here and read about the rise in popularity of organic food in other countries. Doesn't this tell us anything? For instance, that maybe we should hop on that train before it leaves the station!

Our “new” tourism product could be agri-tourism where visitors have farm tours and see where their food comes from. Let's not worry about exporting fresh produce, rather, embark on a plan to fill all of our Belizean bellies with home-grown, fresh foods. And supply restaurants 100% with locally grown pesticide-free food and make value-added food products for visitors to take home.

We destroy more and more land by continuing to use “old-fashioned” farming methods. And contaminate our water supply. And attract more pests with large mono-crops. Time to join the 21st Century!

Judy duPlooy
Director, Belize Botanic Gardens



The painting on our cover of the Red-legged Honeycreeper, acrylic on canvas, was created by 14 yr old Lizeth Cunil, who enjoys painting the birds of Cayo. She is a student at Victorious Nazarene School in San Jose Succotz, and she hopes to become a veterinarian. Sales of her art will be used to fund her education. To see artwork by her and other aspiring young artists, contact Gayle at zentgz@gmail.com.

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Dear Editor,

Did you know that Palm Beach, Florida and Mar a Lago are exempt from 5G?

Florida Governor Rick Scott approved, in June 2017, a bill (HB 687), that allows Palm Beach, Florida to be a 5G free area. Palm Beach is the city where Mar a Lago is located in Florida and Mar a Lago is a President Trump property. President Trump has played golf at his properties 92 times since becoming President. Is it a coincidence that President Trump and his family prefer to be at Mar a Lago than Washington DC?

Several studies have found that cell tower radiation is harmful to humans, animals and plant life. Reported symptoms included: cancer, headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido. With all these studies that have found issues with increased use of wireless radiation why are we moving forward with the implementation? It makes no sense to install technology that we know will harm the people and the land of Belize. I believe, like Palm Beach, Florida, the country of Belize should be 5G free.

6G is coming and it is more dangerous than 5G. We need to stop the blind pursuit of faster internet speed without the evaluation of the human and environmental impacts.

How nice would it be to declare Belize a 5G free country. 5G free, could be a great marketing tool for the tourism industry. We don't need any mass bird die offs like that occurring in other countries.

Here are some excerpts from scientific research on 5G, 4G small cells, wireless radiation and health (references listed below)

- Cancer epidemiology update, following the 2011 IARC evaluation of radio frequency electromagnetic fields is a comprehensive research review of RF effects in human and animal research. The review concludes that scientific evidence is now adequate to conclude radio frequency radiation is carcinogenic to humans (Miller 2018). Several previously published studies also concluded that RF can “cause” cancer, for example, Hardell 2017, Atzman 2016 and Peleg 2018.
- “A review of the ecological effects of RF-EMF” reviewed 113 studies finding RF-EMF had a significant effect on birds, insects, other vertebrates, other organisms and plants in 70% of the studies (Cucurachi 2013). Development and reproduction in birds and insects were the most strongly affected. As an example of the several studies on wildlife impacts, a study focusing on RF from antennas found increased sperm abnormalities in mice exposed to RF from GSM antennas (Otitoloju 2010).

<https://www.palmbeachdailynews.com/news/20170503/official-palm-beach-exempt-from-5g-wireless-law>
<https://www.activistpost.com/2018/12/are-palm-beach-and-trumps-estate-exempt-from-legislation-forcing-5g-small-cell-tower-installation-everywhere-else.html>

<https://floridapolitics.com/archives/240655-5g-wireless-bill-approved>

<https://ehtrust.org/scientific-research-on-5g-and-health/>

<https://www.healthline.com/health/emf#research>

Cruz Dominguez

Cayo District

Dear Editor,

The Financial Times is reporting:

“Bayer is facing a surge in US lawsuits alleging a link between its Roundup pesticide and cancer, as legal risks arising from last year’s takeover of Monsanto mount. The German chemicals and pharmaceuticals company said on Wednesday that “lawsuits from approximately 42,700 plaintiffs had been served in the United States in connection with the crop protection product glyphosate” as of October 11, up from 18,400 three months earlier.”

It was recently announced that Bayer’s upcoming trial in Missouri over its Roundup herbicide was postponed. With the trial on hold, focus has shifted to talks of a master settlement in response to over 18,400 cases alleging that its glyphosate-based weedkiller causes cancer.

Settling all the Roundup cases could cost about \$9 billion, Bloomberg Intelligence analyst Mustaq Rahaman said in a note, while other estimates have ranged from \$2.5 billion to \$20 billion.

For Bayer, there appears to be more bad news. Reuters recently reported, “Analysts at JP Morgan, citing an analysis of Missouri court data, said in an Oct. 9 research note that the total number of glyphosate cases could rise to more than 45,000.”

For contrast, in July Bayer reported the number of U.S. plaintiffs in the litigation had risen to 18,400.

Bayer made its bid to acquire Monsanto in June 2018 for \$63 billion – a deal the Wall Street Journal recently called “one of the worst corporate deals in recent memory.” It was last August when a California jury heard the first lawsuit against Bayer in which it found Monsanto should have warned of the alleged cancer risks. Since that time, **Bayer’s shares have lost around 30% of their value.**

On the science side of things, two new studies have linked glyphosate to aggressive breast cancer and concerning generational changes in offspring. These studies suggest glyphosate is affecting human chemistry at the genetic level to turn on negative, disease-causing traits – even into future generations.

The results indicate glyphosate progressively weakens the genome of living systems exposed to the chemical. It increases susceptibility to health problems and increased infertility.

As the scientific evidence mounts against the safety of glyphosate, Bayer has signaled publicly that it will defend its product and appeal any legal losses. In April 2019, The Environmental Protection Agency reaffirmed the safety of glyphosate finding that it posed “no risks of concern” for people exposed to it by any means.

Why then is Roundup still not banned in Belize?

Pastor Tom McKinney
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Hemp...Continued from page 3

In order to grow hemp in Belize, the plant must be auto-flowering (as its maturation is dependent on the hours of sunlight), with very low tetrahydrocannabinol or THC levels (no more than 1%), as required by law, and for plants that will be grown in the rainy season -- mildew resistant. Ensuring THC levels no greater than 1% can be tricky; some growers have reported that harvests just a few days late result in increased THC levels.



It is obvious that growing industrial hemp in Belize is a formidable challenge with many obstacles: not only seed selection and acquisition but also a lack of expertise to call on. There are many experts on industrial hemp in countries where it is cultivated, but few who understand or have experience in growing industrial hemp in the tropics. Though recreational cannabis has thrived in tropical countries, industrial hemp is quite different in how it is grown, its chemistry, and needs. The BAHA committee, though comprised of well-educated and committed individuals, has no experience, history or expertise regarding growing hemp in the tropics or sub-tropics.

Hempbelize.org is a website providing information on growing, processing and using industrial hemp. So far, hundreds of people have contacted the website and joined an online e-group to share ideas and intentions for establishing hemp crops, processing hemp, as well as sharing contacts for export potential. Many are from outside Belize with equipment and know-how, many with a willingness to teach and employ, bringing investment dollars to buy or build the appropriate equipment. Many more are Belizeans wishing to diversify and use their land in the most cost-effective and sustainable way, while growing a useful crop that will clean their soil and provide natural protection from unwanted weeds.

It is important to identify obstacles and problems if they are to be overcome and resolved. An Analysis Report on the State of the Hemp Industry in Belize, written by a hemp consultant who has studied the situation, provides a good analysis of obstacles that must be overcome if Belize is to gain economically and environmentally with a viable program. The report cites four main products that can be derived from industrial hemp: cannabidiol (CBD), cannabigerol (CBG), hempcrete and flowers. In September 2019, when the Belize government legalized the production of hemp, values on CBD, CBG, and flowers were very high. Consequently, the US stepped up their production and flooded the market with all three products, effectively driving the price down to below profitable margins. Currently, CBD seeds are at a price point where the only viable method of growing is in a greenhouse setting with fewer plants and with much higher yields and quality — requiring specialty equipment and a much higher level of quality control. The report explains that CBG

(the parent compound of CBD) seeds are all being directed to the US at this time, but might become available to Belize later this year. However, the problem is the same as with CBD seeds. The report claims that the only profitable way to grow them is in a greenhouse with specialty equipment. But both CBD and CBG isolates require high end extraction machines that are cost prohibitive at this time.

The report further claims that the most profitable market for Belize could be the production of a pre-rolled high CBD/low THC product that would be smoked, but would not get anyone “high”. Hemp with little to no THC would not be psychoactive. CBD and CBG are considered medicinal and therapeutic. Putting them in a smokeable form is just another way of delivering the medicine. (Traditionally, there are many herbal remedies where a recommended delivery method is smoking.) These would be inexpensive to produce, as it’s a simple case of grinding the dried flower, packing it in pre-rolled cones and packaging it. According to the report, such a product could be very profitable and estimates that a 200 square foot greenhouse could produce about 27,240 to 36,320 grams of high quality crop per year. Using a half gram per each pre-rolled cigarette would translate into between 54,480 to 72,640 pre-rolls. A retail value of \$5 BZ each could mean a gross profit of between \$27,400 to \$363,200 BZ a year.

In addition, an herbalist and farmer we interviewed in North Carolina suggested that a high CBD/CBG, low THC tobacco-less non-addicting hemp cigarette could well serve as a far safer alternative to tobacco smoking, and help with nicotine addiction issues when people are trying to quit. It appears however, that local churches condemned this avenue in their vote to legalize hemp. Though the churches are well meaning in their reluctance to agree, as many still likely associate hemp cigarettes with marijuana smoking, there are many in the church who now recognize the difference. Some biblical scholars believe that Ezekiel 34:29 refers to hemp as “the plant of renown”, and that in Revelations 22:1–2, “The leaves of the tree were for the healing of the nations” is a description of the hemp plant.

Another hurdle is the requirement of a 50 yard perimeter around the hemp field, which means a farmer would need a minimum of nearly 6 acres to grow one acre of hemp. Even growing in greenhouses requires the 50 yard perimeter and the minimum one acre plot is still a requirement.

Though grown since ancient times, little is known about growing industrial hemp in a tropical climate, and the farmers who want to be involved are reluctant, or cannot afford to pay the costs necessary to ensure they have the proper knowledge for success. Success in any endeavor comes from knowledge. If Belize is serious about supporting a successful industrial hemp program, it would seem logical to acquire the expertise and knowledge essential toward success in support of the farmers who want to grow it.

* Hemp was the largest export crop of the early colonies, grown and processed on the backs of slave labor. After slavery was abolished in 1833, farmers could not afford the intense labor costs involved in growing and processing hemp. Cotton was already a growing fiber commodity since Eli Whitney’s cotton gin had simplified harvesting, and commercial tobacco was increasing in demand. In the 1930’s, a German patent provided the machinery that could have created a revival in hemp farming, calling it the next billion dollar crop. Those who benefited from hemp remaining un-cultivated led a massive campaign to disseminate misinformation, lumping it together with recreational marijuana and rendering it illegal to grow.

Industrial Hemp: A Product With Many Applications

By John Wightman of Hemp Farming Systems



Industrial Hemp

Industrial hemp is a multipurpose crop. The fibres in the stem are long and strong and were the mainstay (literally and figuratively) of the world's rope industry until synthetic fibres took their place mid last century. The thousands of kilometers of ropes that held together the masts and spars and moved the sails of the naval and commercial fleets of Europe and North America were made of hemp. The fabric of the sails was canvas which is a cloth made from woven hemp fibres.

These fibres now strengthen and fire-proof the bodies of motor vehicles and are woven into high quality fabrics for the fashion industry. The softer material inside the stem (hurd) is the major constituent of top quality building materials. All in all, the hemp plant – the biomass - has hundreds, perhaps thousands of applications.

Hemp seeds are highly nutritious and enhance a top quality salad; they are also made into cosmetic oil. The Canadians have led the world by developing a viable hemp food industry during the last 20 years. It is based on whole grains and flour and the 'cake' left after oil is removed from the seeds.

Most recently, attention has turned to the medicinal properties of the constituents of some hemp varieties. The best known is cannabidiol or CBD. This has provided relief to people with epilepsy, multiple sclerosis, and other illnesses of the nervous system, pain relief to cancer patients, and many other disorders. Understanding the benefits and risks of CBD and the many other such compounds is a work in progress. Research and product development in this field of research will undoubtedly lead to both a functional branch of the pharmaceutical industry, and a better life for many people suffering from a life of pain and hardship.

Developing an industry based on hemp

This introduction is provided because hemp is not too difficult to grow, but it is a reminder that farmers must know that they are part of a value chain and have a market to sell into. Otherwise they will not invest time and other resources into a new crop. But they should also know that they have a number of options in terms of the products they can produce. At the same time entrepreneurs and the industrialists that need hemp must know that there is a supply of raw material; otherwise they will not invest into the equipment needed for post-harvest treatment and processing. This is the bind that Australia, for instance, is still working through more than ten years after the industry got underway. There is a case for seeking planning and leadership involving a long term investor, or a philanthropic development agency (in particular the Vihara Foundation) that can engage experienced consultants. Even though the long term rewards for all can be significant, the pioneers will need technical and financial backing to support the first steps of their journey.

Growing hemp

There are some basic facts about hemp that farmers and their advisors need to be clear about. By way of background about the hemp plant: it needs to be stated that plant breeders and others have provided a plant that is different from the one that was grown in Europe for thousands of years. The standard hemp plant, then and now, is either a male or female (1:1). The males provided pollen to pollinate the seeds of the female plants. The time of flowering is controlled by the sun's annual cycle, meaning that once the nights start lengthening – about 2 months after the summer solstice - the flowers develop, males first then the females. The trigger is a 14/10 h light/dark period. This is never the case in the equatorial regions. So there are two issues, especially if farmers close to the equator want to grow hemp: 1) half the field is occupied by plants (the males) that do not produce seeds – a serious matter for grain producers and 2) the plants never experience the period of lengthening darkness that triggers flowering in the late summer/autumn. Fortunately for those farmers who want to grow hemp in the tropics, extensive research has been carried out to find hemp varieties that are insensitive to the day length and start to flower after a few months irrespective of the month they were sown. Also there are now varieties that have both male and female flowers on the same plant. These are the ones that need to be planted in the tropics.

Whilst discussing characteristics of the hemp plant, it should be mentioned that the female plants do not produce all their flowers at the same time. They keep on putting out flower buds at the stem tip for as long as the stem keeps growing. After a while, there are hard ripe seeds, lower down the stem and soft green developing seeds near the tip. The farmers' problem is to know when to harvest; if they delay harvest too long to try to maximize the size of the harvest they risk losing ripe seeds because ripe seeds tend to fall off the plant, for instance, on windy days.

Bottom line: hemp farmers in the tropics need to have access to the seed of varieties that are 1) day-length insensitive, and 2) have male and female flowers on one plant.

A few more things hemp farmers should know:

Water - Hemp needs a regular supply of water. Seed should be sown into moist soil but will not grow in saturated soil, especially if water is standing in puddles on the surface. It is best to sow into raised beds that drain water down a slope. Tropical rainy season with intermittent rain over a period of three to four months should be manageable, provided dryish soil can be anticipated at harvest time. Dry season production is possible where irrigation has been installed and the water is not salty.

Fertilizer - Biomass crops can be very productive, but they need a lot of fertilizer to reach their potential. All organic matter is good – whether it is derived from animals or plants. Large quantities well-worked are called for. An approximation of the amount of inorganic fertilizer that might be added per hectare in soil of low-to-medium fertility:

Phosphate 50 -100 kg
Nitrogen 40 kg
Potassium 20 kg
Sulphur 10 kg
Plant available silica 20 kg
Mixed micronutrients

Grain crops need less.

Seed for each crop should be purchased from seed suppliers with a good reputation because it does not breed true unless special precautions are taken.

There is much more information in the hemp farmers' ebook (Hemp Farmers Grower Guide) produced by Hemp Farming Systems; see www.hempfarmingsystems.com

BEYOND THE BACKYARD

Bounty of the Beach – Purslane

By Jenny Wildman

I began the beautiful morning with a little foraging along the nearby beach side. Within minutes I had a basket filled with local almonds (*Terminalia cattappa*), sea grapes (*Coccoloba unifera*), a yellow coconut and a few handfuls of sea purslane (*Sesuvium portulacastrum*) from a wonderful carpet growing abundantly along the tide line. All typical coastal vegetation native to this region. I planned to create a gourmet dinner with these plus limes from the garden and a freshly caught red snapper. You may be familiar with common purslane (*Portulaca oleracea*) which grows readily in scrubland; it is readily identified by its small single yellow flowers and sprawling vines. This relative looks very similar but has a pinkish purple five petal bloom which flowers early in the morning, fleshy obviate leaves and stalks with a slight red tinge. Its large low lying mats have caused it to be described as a noxious weed but I prefer to call it a creeping herb. Not only does it help prevent erosion but it has numerous medicinal uses and tasty culinary potential and



is low in fat and calories. It contains vitamins A, C and E, more omega 3 than a salmon and ecysterone a naturally occurring steroid used to improve athletic performance.

This plant actually grows all over the world and there are many other similar edible varieties. It was the perfect forage food for many indigenous peoples, giving free nutrition and valuable medicine. It is widely known for its antibacterial and anti-fungal properties, taken orally for insomnia, fever, kidney, urinary and digestive problems. Topically it is used for skin disorders, sunburn and mashed as a poultice for curing wounds from venomous fish. Thought to neutralize poisons, dispel evil and preserve youthful appearance, is more the reason to add to your menu. It has many uses and many names: Akulikuli in Hawaii, Cencilla, Dampalit in the Philippines, Verdo Largo in the Caribbean to name but a few.

Originally this plant belonged to the same classification as portulaca but in 1759 the eminent Swedish botanist Carl Linnaeus moved it into the succulent ice plant family Aizoaceae often referred to as carpet weeds. It then gained a new genus, *Sesuvium portulacastrum*. It is, indeed, an interesting plant, as it is capable of growing in areas where nothing else can. It is fast growing from cuttings or seed and thrives in full sun. The roots and cells have evolved to retain air, allowing it to be submerged for long periods and adapt to a high concentration of salt. The leaves have a tough waxy outer layer which make them hardy and resistant to tropical storms. The stems get woody with age and unite to trap sand into banks along the shoreline. As the stems thicken the leaves turn yellow and the stems reddish which is a signature of salt tolerant plants that grow in the habitats of beaches and marshes. The stems, leaves and flowers are all edible with a slightly sour, salty taste being much stronger in the mornings. For the best taste pick the newest green shoots and stalks from the top. Older shoots can be picked and blanched twice, throwing sourness out with the water. Pickle it in vinegar and spices as in India and Asia where it is a ready companion to lamb, pork or fish. Allow your pickles to develop for at least a week before tucking in.

How to cook? Well hardly at all. It makes a salty nibble just as it is or in salads but is delicious slightly steamed; add a knob of butter, a squeeze of lime and a sprinkle of black pepper..perfect.

Sea purslane can be used as a condiment, a garnish, an herb, blended into salsa, sauces, pesto and added to chow chows, humus, stews and soups. Blended then dehydrated, it can be kept to use as a soothing tea.

Does anyone actually sell this as a product? Well I did see it bottled as Atsarang Dampalit “Home Pickled Fishpond Weed”think “Beach Pickles” sounds more appetizing...great item for markets or as gifts for foodies. Enjoy.



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Coconut (*Cocos nucifera* L.)

By Lester Muralles



The coconut palm is one of the most fully utilized plants of the tropical and subtropical regions. It has become the most potential industry crop in Belize and the region over the past few years. The potentials include: production of planting material, water, oil, copra, confectioneries, lumber, by-products, and arts and crafts. There are many old producing farms with various cultivars and there are many new farms with new cultivars. If you are thinking about establishing a plantation there are several things to consider, such as the choice of cultivars to plant, which, in turn, depend on your marketing aim.

The different cultivars have different characteristics which I will attempt to explain in this short article. The cultivars can generally be divided into three groups. The dwarf types, the tall and the hybrids.

Dwarfs - can be either yellow or green; the most popular name is Yellow Malayan dwarf, but even within that Yellow Malayan dwarf there are several variations of yellows to bronze to gold. The green dwarf has several types as well, including the most recent popular Brazilian green dwarf. But generally all dwarfs have the same characteristic as early producers, abundant producers, bunches of 18 to 25 nuts but these nuts are usually small with a range of 200 to 400 mL of water, early maturity. The trunk is straight (bole absent) from base to top, fronds are smaller in length compared to other varieties. These varieties are tolerant to lethal yellowing disease, but susceptible to other diseases such as phytophthora spp.

Figure 1. *The absence of bole, based on the test guidelines, International Union For The Protection Of New Varieties Of Plants, Coconut UPOV.*

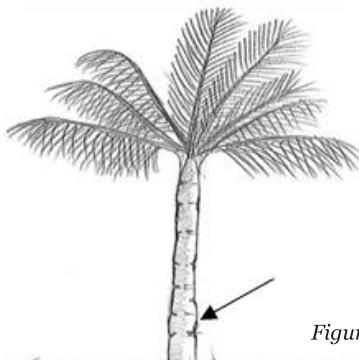


Figure 1

Talls - are very much desirable due to their large nut size and high quantity of water per nut averaging around 1000 mL. However, the number of nuts per bunch averages around 8 nuts. Most of the tall cultivars are susceptible to lethal yellowing and most were wiped out in the 90's; very few survived. There are a few new importations of several cultivars such as Michoacan tall and Colima tall. The problem encountered with this cultivar is the height of the trees; they grow very tall and therefore the harvesting gets complicated. Tall cultivars have a wide base or bole which is the "coca cola" bottle shape to support the height of trees. Fronds are longer than dwarf and that is why the planting distance has to be wider apart.

Figure 2. *The presence of bole, based on the test guidelines, International Union For The Protection Of New Varieties Of Plants, Coconut UPOV.*

Hybrids - are a combination of a dwarf (usually Malayan dwarf as the female) and tall variety (as the male via pollination) to acquire the tolerance from the Yellow Malayan dwarf to lethal yellowing and the productivity of larger nuts from the tall varieties. Thus the hybrids make a super productive tree with higher water content and higher oil content. Considering the average 12 nuts per bunch and the average 850 mL water per nut, the amount of water produced per tree is much higher than the tall varieties or the dwarfs. The stem is wide and has a bole at base similar as the tall cultivars.

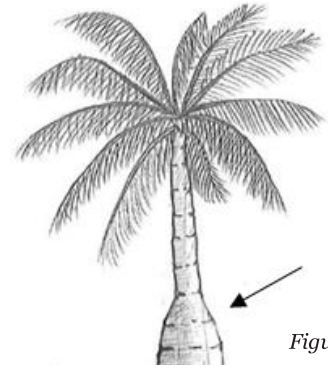


Figure 2

Chart 1. Summary of water production per bunch.

Cultivar	Average		
	nuts / bunch	water / nut (mL)	water / bunch (L)
Dwarf	20	300	6
Tall	8	1000	8
Hybrid	12	900	10.8

Based on the chart above we can recommend the use of various cultivars depending on the intended market. Yellow Malayan dwarf is a proper option if the intended market is water production for the local market. For the international water market, a hybrid is the best option to satisfy international standards. Also for oil production the hybrids have a better productivity in terms of nuts per liter of oil. The factor to consider for water quality is the maturity of the nut. Maturity is quicker in dwarf cultivars and slower in hybrids; so to be fair we should consider comparing a 7 month old Yellow Malayan dwarf with a 9-month old hybrid.



More coconut information: <https://www.cardi.org/commodities-themes-2/coconuts7>

Westrac Ltd. 50 years of Business: A Look Back at Its Formation

By Mrs. Irene Thiessen and Ms. Julissa Rodriguez

September 25th, 2019 was a special day at Westrac; to mark the 50th anniversary of the company, an award was given by Westrac Ltd.'s Chief Executive Officer, Peter Thiessen, to an exceptionally important guest, Daniel Plett, considered the original founder of Westrac Ltd.



As Mr. Plett sat down with Peter Thiessen, and his wife Irene, along with fellow directors, Allan Reimer, and Erwin Thiessen, he began to reminisce on how it all started in 1968. This was the year Mr. Plett decided to buy the parts section of a multiple-section operation owned by Martin C Penner, who also held another local business called Koop Sheet Metal. Mr. Plett remembered the details clearly and even noted the fact that repair of alternators and batteries was not included in this sale, since Mr. Penner's son was educated in fixing alternators. In the year of 1969 Mr. Plett officially opened his business to sell tractor parts. His business was located in the humble corner of a wooden garage, right across the street from the current headquarters of Westrac today. He sold filters, transmission bearings, fuel bars, pistons, sleeves and other items. Mr. Plett named the business Western Tractor Supply, a small company that would become Westrac Ltd..



A few years later Mr. Plett bought a Shell Oil business from Johan Barkman and began selling fuel, mainly diesel. Actually, this fuel side of the business accounted for such a small amount that he simply bought it in drums from a gentleman named Klass Reimer.



An inspiration was soon to come to Mr. Plett. In 1973, while on a trip to Canada, he saw a flyer in Winnipeg, Manitoba with an advertisement for Vapormatic tractor parts. He saw an opportunity to import parts into Belize himself. He sent a handwritten letter by postal service to this company. Despite the relatively small size of his business, the company was willing to sell parts to him.



This would make Vapormatic the first international vendor to sell directly to Western Tractor Supply. At this time, the ordering was all done by letter and the paying had to be done by money draft at the bank, a process that took altogether a month to complete. By around 1978 Mr. Plett was also buying parts from Guatemala, including the once very well-known Vogue bearings. These items were transported into the Spanish Lookout Community by trucks that brought feed for the feed mills.



By 1988, the company had 8 investors. In order from left to right: Henry Dueck, Peter Barkman, Erwin Thiessen, Elmer Kornelsen, Eldon Plett, Peter Thiessen, Leo Barkman. Daniel Plett, not pictured, remained a shareholder until January 1st, 2004.

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especially true for adequate parking space. He made a land deal with George Dueck who lived across the road at the time. The terms of the deal were actually to simply trade places. Once the deal was completed, Mr. Plett built a new concrete building at the location where the main branch still stands today. To keep the expansion reasonable, Mr. Plett recalls that the construction costs were kept to a minimum by borrowing the forms used to build the walls from Abram P. Dyck. The cost of the new building is estimated to be around \$4,500.00. In 1980 the business was officially moved out of the garage to the new building.

A monumental change for Western Tractor Supply happened in March of 1985. Several young and ambitious investors made a deal to purchase 90% of the business. These investors were Elmer Kornelsen, Peter Thiessen, Eldon Plett and Henry Dueck. At this time Mr. Plett kept 10% and the rest was handed over to these young men. At that time the land was already divided from Mr. Plett's personal yard where he lived and the business location. Mr. Plett remembers his thoughts as he sold his business "I hope they will make it."

At the time the business was bought from Mr. Plett the company sold tractor and electrical wiring parts for houses. The new owners kept the tractor parts section but soon sold the electrical wiring section of the business to Levi Kornelsen, a relative to several of the investors and current owner of Reimer's Service Center.

Most tractor parts for Western Tractor Supply were still bought primarily in Belize City. Every week someone went with a pickup truck to Belize City to shop for parts. Some of their preferred supplies were from Hofius, Santos Diaz, United Service (for bearings and seals) owned by Percy Dyer close to the Karl Heusner Memorial Hospital, and the Mick Miller brothers (primarily for gaskets).

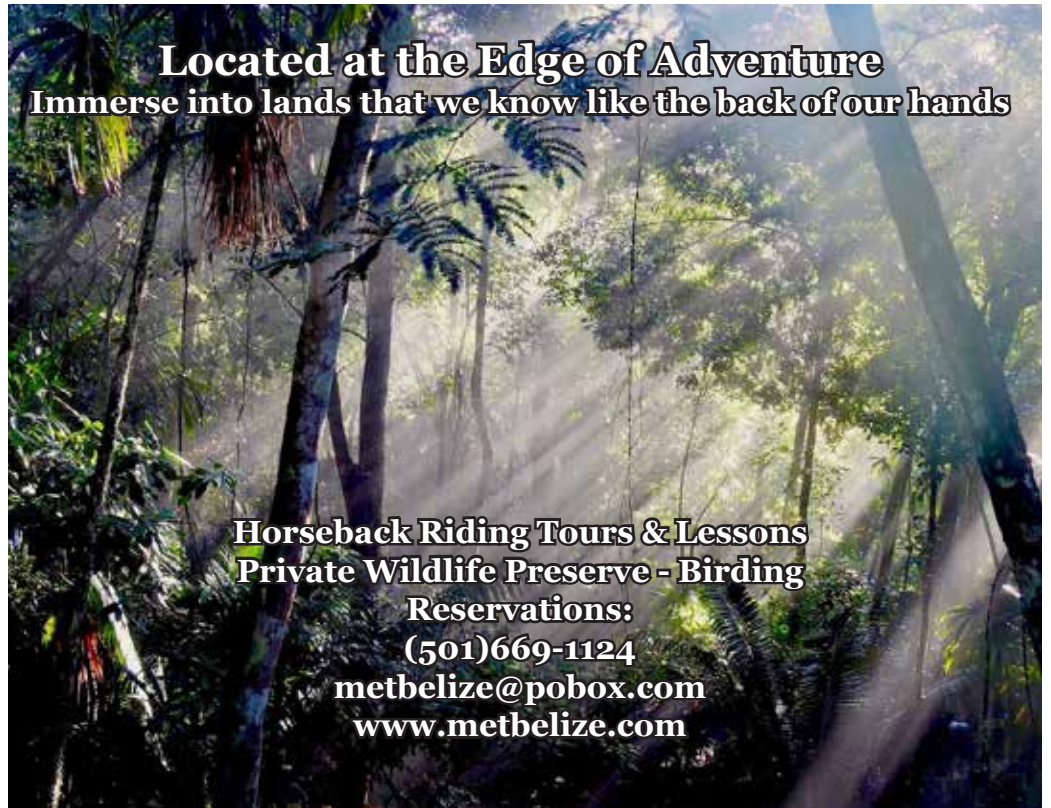
Around 1986, when telegrams were made from Belize City as a form of communication, Western Tractor Supply's young new owners decided to order parts from an international company, Bepco. The reason for this move was that they preferred Bepco's better numbering system. All correspondence with this international vendor in those days, though unimaginable in today's fast means of communication, was handwritten letters. Through this connection and small beginnings, a strong business tie was formed as both companies shared similar goals. The company Bepco, though they themselves went through highs and lows, is loyally held as a supplier for tractor parts by Westrac Ltd. to this day. Although they were established for selling tractor parts the investors saw the need to add automotive parts into the business. Peter Thiessen vividly recalls the first trip made to Corozal: he and his wife along with Elmer and his wife travelled in Mr. Kornelsen's car and purchased \$3,800 worth of automotive parts from Vildo Marins and Maya Auto. This type of desire to grab opportunity would lead to them continuing to expand product lines, and eventually take on the bold task of adding locations. Today the company has four branches and four service shops and has over two hundred and fifty employees.



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REGENERATION BELIZE

Hosts Farmers Meeting

New Name/Old Concept

By Dottie Feucht



Santiago Juan

Regenerative farming, known also as carbon farming because the practice sequesters carbon into the soil, is not new – at least to Santiago Juan whose family farms San Lorenzo Farm in Succotz, Cayo District. His family has never used toxic chemicals on their farm. That’s why he could speak from experience to the 35 or so farmers of 7-Mile village who gathered together on July 18th

to hear him. As a graduate of Earth University in Costa Rica, Santiago also knows the science behind regenerative farming.



Regeneration Belize (RB) had to cancel its 3rd annual Tropical Agriculture Conference scheduled for November 11 – 13 so RB had one of its speakers go to the farmers instead. Santiago’s dynamic talk was well-received with lively dialog and requests to go see his farm first hand and an invitation to return to talk about more specifics of the practice.



Eynar Melgar

Santiago was followed by Eynar Melgar, owner of NPK Plus Ag Supplies, Distributors of Omex, who gave an overview of his organic products that help farmers solve specific problems with organic alternatives to toxic chemicals.

RB plans to schedule more local meetings of farmers to help educate them about the benefits and specific techniques of regenerative farming to raise the quality of crops being grown and help the farmers earn more money doing so.



REGENERATION BELIZE

Regeneration Belize (RB) was founded in 2018 with a vision to transform Belize into a leading producer of nutrient-rich agricultural products and a showcase for carbon sequestration through soil regenerative practices.

See **Regeneration Belize Facebook page** and learn about the activities and opportunities available to RB members

Visit **Regeneration Belize YouTube** channel to see videos of 2018 and 2019 Tropical Agriculture Conference speakers

<https://www.youtube.com/channel/UCJQe8wAgaC-lsRY8h2HiYgQ/videos>



REGENERATION INTERNATIONAL



Key Techniques of Carbon Farming

Extracted from Grassroots Rising

by Ronnie Cummins

1. Feeding the soil and increasing soil organic matter with compost, compost tea (a liquid extract of compost), and “green manure” (cover crops).
2. Keeping the soil covered at all times with vegetation, cover crops (especially multispecies cover crops), or mulch and eliminating or reducing plowing and tillage.
3. Adding trace minerals or nutrients (from materials such as kelp seaweed or rock dust) that are deficient in specific soils.
4. Utilizing biochar (a special type of charcoal) as a soil or compost amendment to enhance the soil’s water retention, microbial biodiversity, and fertility.
5. Diversifying or rotating crops, rather than growing the same crop on the same land every year (mono-cropping).
6. Restoring deep- rooted perennial native plants and grasses on croplands and pasturelands, and sowing multiple species of grasses in pasturelands.
7. “Alley cropping” – that is, combining the cultivation of rows of annual crops (ideally rotated annually) with rows of perennial.
8. Constructing raised beds, terraced rows, berms and swales that follow the natural contours and water flow of the landscape, and following these natural contours to sow crops (especially perennials) along these contoured rows.
9. Capturing and storing rainwater in ponds and cisterns and slowing down (though not completely damming) stream flow with constructed barriers.
10. Using agroforestry and silvopastures (integrating trees, woody perennials, and succulents into cropland and pastureland.
11. Practicing planned rotational grazing – avoiding either overgrazing or under grazing by moving livestock in a planned manner across paddocks or pastures.
12. Practicing multispecies grazing- grazing different species of livestock on the same pasture, either simultaneously or in succession.

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Grassroots Rising By Ronnie Cummins A Review by Dottie Feucht



Ronnie Cummins' book covers not only the problems brought about by factory farms, GMO crops, overuse of toxic chemicals, deforestation and disregard for the environment, but gives details on how to draw down massive amounts of carbon dioxide (CO₂) from the atmosphere to enrich the soil. Actually it is a "how-to" book; it contains a list of specific techniques to drawdown carbon and regenerate soil (see previews page 12 for the list extracted from the book). Drawing down carbon is doable; he cites

farmers who have increased carbon content from 1% to 10% with resulting increases in yield and nutrition of the crop. Ronnie emphasizes that carbon farming is not new; many of its practices go back for millennia. Practices today build on that foundation and add qualitative improvement of soil health, pasture health, animal health, food quality, rainfall retention, water quality and availability and other ecosystem services.

Another "how-to" discussion focuses on Ronnie's expertise as an activist. He encourages the reader to get involved and provides the steps in becoming a grassroots mobilizer. The "how-to" focus on government contains a discussion of the policies that should be put into place to bring about Earth repair, biodiversity restoration, carbon sequestration, climate restabilization, peace, and social justice. He cites Russia, Western Europe, and the regional governments of the Himalayan region moving to make organic farming the norm; China's example of ecosystem restoration; and India and African nations' push on reforestation. It is interesting to note the citation from Eric Toensmeier's book *The Carbon Farming Solution* that "The tropics have stronger carbon farming options than colder climates; many of the agroforestry techniques that have the highest sequestration rates... and the best perennial crops available today are also native to, or grown best, in the tropics." That is a good reason for investors, another "how-to" stakeholder category, to help finance a massive scaling up of regenerative farming and support for the preservation of tropical forests, wetlands, and marine ecosystems; many of these are located in indigenous communities. Another reason for investing is the consideration that the "conventional" global food system, artificially propped up by hundreds of billions of dollars in annual government subsidies, sustaining energy-intensive, chemical-

intensive, GMO-driven agriculture and food processing, has *hidden costs* related to degeneration of the environment, public health, and food system. Once investors realize that factory farms and industrial monocultures are profoundly dangerous in terms of climate change, Cummins says, they will start to divest from industrial agriculture, factory farms, and nutrition-deficient, processed food and reinvest in organic and regenerative food and farming. Globally there are approximately 570 million farms, of which 2.7 million are certified organic, while a much greater number, approximately 25 to 50 million farms, are using agroecological (organic but not certified organic) practices. These are the farmers that need support. Global organic sales have grown from US\$1 billion in 1990 to over US\$100 billion today with small agroecological farmers likely producing 10 times as much for local consumption and market. Investment in land restoration, improvements in infrastructures and market development will pay off for investors as this market continues to increase.

Cummins says that the problem of reversing severe climate change is, indeed, a global issue; restoring the balance in the carbon and water cycles between the atmosphere and terrestrial ecosystems should become a priority for all nations. He gives compelling arguments that the broken climate, supersaturated atmosphere, depleted soils, and degraded landscapes is a security threat for all nations. Accomplishing the monumental task of bringing about the systemic change will result in stabilizing the climate; improving public health; revitalizing rural and urban economies; alleviating poverty, hunger and malnutrition; and rekindling a common sense of hope and mission in the global body politic. The centerpiece of this massive effort, Ronnie says, is the decarbonization of the atmosphere and the recarbonization and refertilization of the soil and biota. And the stakeholders include farmers, consumers, workers, business people, politicians, investors, religious communities, students and activists. He says everyone should become aware of not only the problem but the ways of becoming involved in bringing about environmental restoration.

Editor's note: Ronnie Cummins is founder and director of the Organic Consumers Association (OCA), a nonprofit, US-based network of over 2 million consumers, dedicated to safeguarding organic standards and promoting a healthy, just, and regenerative system of food, farming, and commerce. Ronnie serves on the steering committee of Regeneration International and OCA's Mexico affiliate, Via Orgánica. He was an active participant of the 2018 Tropical Agriculture Conference sponsored by Regeneration Belize, an affiliate of Regeneration International, that was held in Belmopan.

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Building Healthy Soils with Cover Crops & No-till Farming

By Henry Anton Peller, Soil Scientist



henryantonpeller@gmail.com

Principles of soil health

Have you ever ventured into the rainforest of Belize, got down on your hands and knees, and had a good look at the soil? Picking it up in our hands, we feel it *cool* and *moist* on our fingers, and it *crumbles* like fine chocolate



Beautiful and healthy soil under long-term no-till and cover cropping. Left: milpa in eastern coastal Honduras, 4-5 thousand lbs / acre corn yield. Right: 1000 acre corn farm in Ohio, US, 10-14 thousands lbs / acre corn yield.

cake. Bringing it closer to our noses, we smell the distinctive smell of *earth*: rich, sweet, and pungent. And with our eyes, looking closely, we see that the soil is *alive*, full of roots and organisms.

But when we return to our farms, our senses tell us that something is not right. Where did the dark topsoil go? Grass weeds grow all about the place! We buy more herbicide and fertilizer to get a decent crop. Then drought comes, like in 2019, and our crop fails. Suddenly a tropical storm rolls in, washing away more topsoil—and contamination—into the rivers and sea.

Why are these problems happening? What should we do about them? How will we continue to grow corn, beans, vegetables, and other staple foods that we Belizeans eat every day, especially as the environment becomes more difficult to farm in? Fortunately, we can begin to understand and repair this situation by studying some basic principles of soil health.

(1) COVER THE SOIL. As much as possible, keep the soil protected and covered. Bare soil will quickly dry out or wash away. Grass weeds will cover it for us. **Cover crops** are the cheapest and most effective way to keep the soil covered and weeds out of the farm.

(2) DO NOT DISTURB SOIL. Use tillage, plowing, or burning as little as possible. These destroy soil structure, invite weeds to grow, and kill fungi & worms. Using **no-till planting methods**, we can minimize these disturbances. Maya people have practiced no-till for millennia with dibble sticks. Modern planting equipment is readily available that allows any horse or tractor to plant no-till. Transplanting crops like tomato or sweet potato can also be done no-till.

(3) FEED THE SOIL WITH PLANTS. Plants combine sunlight, air, and water to make energy in the form of sugar (carbohydrates). This process is called **photosynthesis**. Plants use the sugar to grow. They send some of it down through their roots to feed special micro-organisms—tiny, living creatures in

the soil—in exchange for nutrients. Eventually, the plant dies. Then other micro-organisms ‘decompose’ or eat the plant and release its nutrients back into the soil. So, there are two ways that plants feed the soil: when they are alive, and when they are dead. By feeding the soil with plants, we improve the soil fertility and the availability of nutrients.

(4) PROMOTE DIVERSITY. How many kinds of plants do we find in the forest? We want to imitate this diversity in our farms. Practice crop rotations and grow compatible crops together to reduce pests and disease. Plant a mixture of cover crops for better weed control and healthier soil. Grow trees in and around crop fields to protect the farm from drought and storms. Once we understand the principles of soil health, we can let our imaginations go to work.

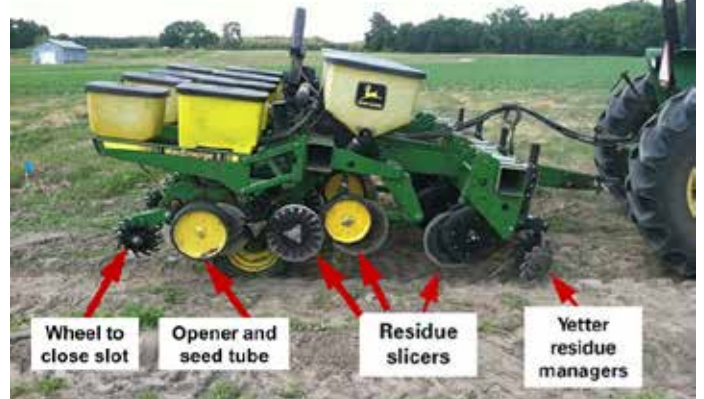
Cover crops

Cover crops are one of our most powerful tools in soil health. We can define them as fast-growing plants that cover the soil and out-compete weeds. But different from weeds, cover crops are easy to manage and kill. One of the most common examples in Mesoamerica is to plant mucuna bean (*Mucuna utilis*) in the corn field. This requires no special equipment: just a machete and a dibble stick.

How to plant mucuna on a small farm

1. When corn is about 8 weeks old, plant mucuna beans after cleaning the weeds and a good rain. Using a dibble stick, plant 2 or 3 seeds in 2” deep holes. Space holes 3 feet apart.
2. Harvest corn. Let mucuna climb up corn stalks. It will take over the field and shade out weeds within 2 months.
3. When it is time to plant the next crop, kill the mucuna with a sickle mower or machete. Mucuna is *easy* to chop! And it dies quickly.
4. Keep the leaves and stems as *mulch* on top of the soil. The mulch keeps weeds down, protects the soil, and feeds micro-organisms.
5. Using the end of a dibble stick, make a small opening through the mulch. Plant corn seed, vegetables transplants, or any crop through the mulch and into the soil.
6. Replant mucuna and repeat the cycle.

Modified John Deere 7100 planter for no-till cover crops on large-scale farms.



Cover crops and no-till on the farm

Remember, mucuna thrives in the wet season, not in extended dry periods. The common variety in Belize has big seeds ‘speckled’ with black, grey, and brown colors. It’s a climbing plant, and it



No-till planter for horse, by Knapik in Brazil. Notice the thick mulch on top of the soil.

will *always* bear seed in December/January (when days are shortest). Plant mucuna next to a lone cohune or dead tree to grow seed.

Another good cover crop is jackbean (*Canavalia ensiformis*). It grows well rain or dry, stays low to ground, and bears large white seeds after 6 months. Jackbean is



Rhodale roller-crimper up front to kill cover crop. No-till planter on back to plant corn, beans, vegetables.



The 'Morrison CA-1000' no-till planter for two-wheel tractor <http://whtfound.org/>



Backside of planter. Notice how the planter has opened up a seed slot through the cover crop mulch.

useful under vegetables and trees because it will not climb up and hurt them. Both mucuna and jackbean have large seeds that are easy to harvest, shell, and plant by hand. And both seeds contain toxins or poisons. So do not eat them unless they are boiled and rinsed 3 times, in which case they make high-protein animal feed.

There are many other useful cover crops for small farms including lablab bean (*Dolichos lablab*), 100-day cowpea varieties (*Vigna unguiculata*), pigeon pea (*Cajanus cajan*), inga tree (*Inga edulis*),



Crimping sunn hemp with a two-wheel tractor. Horse drawn crimpers also exist.



100% weed suppression from mucuna bean cover crop on a milpa farm.

and madre cacao tree (*Gliricidia sepium*), and many more. The first three produce delicious food and are solid cover crops. Many Belizeans are familiar with the inga ('bribri') alleycropping system, promoted with excellent results by Ya'axché in the Toledo district. Pigeon pea, inga, and madre cacao can also be planted one-one in the farm and pruned. The idea is to create partial shade for crops below, while feeding the soil with mulch. Did you know that in the tropics, most crops grow best in a little bit

Corn planted with a dibble stick, an inga alleycropping system, Honduras. Note the thick mulch from inga trees, and zero weeds!



(15-30%) of shade to keep them cool? Sun di lick!

On large farms, cover crops with smaller seeds work better with mechanized equipment. These include cowpea and lablab, sunnhemp

Jackbean planted underneath a cassava crop, controlling weeds and fertilizing the soil.



A three-way mix of jackbean, mucuna bean, and lines of young madre cacao trees in Belize. The farm is ready to chop and plant!



(*Crotalaria juncea*), rice bean (*Vigna umbellata*), daikon radish (*Raphanus sativus*), pearl millet (*Pennisetum glaucum*), Ethiopian cabbage (*Brassica carinata*) and many more. **It is very important to understand the equipment needed to plant no-till and manage cover crops with horses or tractors. (See images and additional resources, below.)**

For example, you will need to **modify an existing planter** (or purchase a new planter) with extra down-pressure, coulter blades, and residue managers. These cut through the cover crop residue and open a seed slot in the soil. The **roller-crimper** is a useful tool that efficiently kills the cover crop and flattens it into a carpet that keeps down weeds. Another useful piece of tractor equipment is the **no-till seed drill**, which plants rows of seed very close together (7.5" between-row spacing, similar to a rice planter) for dense fields of cover crop.

Small amounts of seed for many cover crops listed here are available in Belize. Check with Central Farm or Barton Creek Mennonites. Seed can also be imported from US or Brazil with a BAHA permit.

Continues on page 34

Question: Is it possible to increase drought resistance for crops grown on my land by increasing soil fertility?

By Neal Kinsey



Answer: Yes it is. There are several possibilities that could help contribute to drought resistance for whatever crop you may decide to grow on your land. For example, increasing the soil's ability to capture and retain water by correctly incorporating crop residues, compost, etc. will help to increase soil moisture content as it also helps to maintain or increase nutrient levels.

It is also recognized and emphasized in course materials on soil fertility that adequate amounts of potassium and phosphate increase water use efficiency for plant growth. And although there are still soils which lack a sufficient amount of one or both of these major elements, most extremely productive soils have sufficient levels to accomplish water use efficiency in that way. If not, applying either or both as needed would be the most efficient way to increase water use for crops grown on that land.

Sulfur can also contribute to root growth of plants. Increases of as much as 50%, in terms of extra root growth, can be measured when adequate sulfur is applied. To the extent that the root system is expanded, the efficiency of the crop to find and utilize soil moisture will be increased. Most soils are low to deficient in sulfur, and thus lacking when it comes to enough for optimum root growth. And for maximum efficiency, sulfur works best when calcium is present in adequate amounts.

Once the phosphate, potassium and sulfur are supplied, then consider the calcium levels of the soil to help aid in drought resistance. Calcium must be present in the soil for root elongation. Without sufficient calcium roots will stop growing. So the grower must assure that adequate calcium is supplied to the soil for optimum root development. This would generally be accomplished by applying a sufficient amount of the proper type of lime.

After calcium is considered, care should be taken, especially in lighter, sandier soils, to assure that sufficient magnesium is present. Studies have shown that magnesium in the soil actually helps to attract and hold water there. So soils that are low in magnesium will dry out more quickly. Again, using a soil test designed to measure both the actual and the needed saturation of magnesium will most accurately identify and reflect how to correct this situation.

Once the major and secondary elements are supplied, there is yet another nutrient that is absolutely necessary in specific amounts for optimum moisture utilization. Without it, plants will not use water, whatever the source, most efficiently. That nutrient is the trace element zinc. Too often the effects of zinc, if admitted to be needed at all, is discounted in its importance to drought resistance because the farmer or grower is told the soil already has enough, when it is not actually the case. Even after all the aforementioned nutrients are supplied, zinc is often overlooked or not correctly recognized as needed, because the level necessary for proper utilization is set too low on the soil test being used. Just keep in mind that if the soil is lacking in sufficient phosphate, potassium, sulfur, calcium, or magnesium, zinc will still not do the best possible job until they have been properly supplied.

When adequate nutrients are not present, plants lack the ability to fully develop the optimum root system. This restricts uptake of optimum amounts of water. Any of these situations, left unresolved, results in less water use efficiency.



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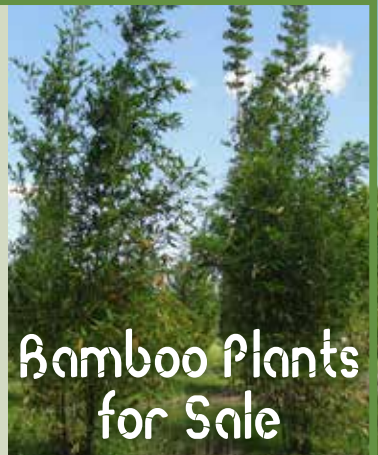
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SPANISH LOOKOUT COMMUNITY CROP STATISTICS for the year 2019

	Acres	Bags
Yellow Corn, Summer	25,511	676,448
Yellow Corn, Winter	3,232	115,448
Corn for Silage	334	
White Corn, Summer	971	29,187
White Corn, Winter	1,267	52,082
Milo, Summer	40	762
Milo, Winter	2,093	72,602
Red Kidney Beans	5,075	52,411
Blackeye Peas	3,747	42,637
Soy Beans	5,873	72,420
Rice	1,737	92,403
Other Crops	1,182	7,148



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Agriculture Prices at a Glance- \$\$\$\$\$\$ AUGUST 2020

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. A blank symbol (-) denotes that the item is either not available now or at the time of the last issue.
 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/L	Czl	1.40	OW	1.25	Bze 1.20
750-1100 lbs	L/L	Cy	1.45	SCr	1.30	Toi 1.30
Weaner steers	S/L	Czl	1.45	OW	1.25	Bze 1.25
"	H/S	Cy	1.20	SCr	N/A	Toi N/A
Breeding heifers	L/S	Czl	1.25	OW	1.50	Bze 1.30
"	H/L	Cy	1.35	SCr	1.20	Toi 1.20
Cull cows	L/L	Czl	0.90-1.05	OW	0.90	Bze 0.90-1.10
"	L/S	Cy	1.15	SCr	0.90-1.00	Toi 0.90-1.00
U.S. CATTLE						
U.S. price - corn fed - 1000-1200 lbs	L	US\$ 1.03				
U.S. price - feeders 600-800 lbs	H	US\$ 1.4086-1.4523				
BELIZE HOGS - Provided by Belize Pig Council						
Weaner pigs - 25-30 lbs - by the head	L	80.00				
Butcher pigs 160 - 230 lbs, per lb	L	1.60				
Butcher lambs - live per lb	S	2.50				
Mature ewes - live per lb	S/L	1.75				
BELIZE CHICKEN						
Wholesale dressed, per lb (Sp Lkt)	H	2.36				
Wholesale dressed, per lb (Bl Crk)	H	2.40				
Broilers - live per lb (Sp Lkt)	S	1.10				
Broilers - live per lb (Bl Crk)	H	1.20				
Spent hens (Sp Lkt)	L	0.75 / lb				
Spent hens per 4 lb bird (Bl Crk)	L	4.50				
CITRUS						
Oranges per lb solid, est. final	-	Prices unavailable				
Grapefruit per lb solid, est. final	-	Prices unavailable				
COCONUTS						
Green Coconuts, bulk	S	Dwarf 0.35; sm 0.40; med 0.45; Maypan / lg 0.50				
Dry Coconuts, bulk	S	0.25 - 0.35				

GRAINS, BEANS & RICE						
Belize yellow corn, bulk (Spanish Lookout)	L	0.225				
Belize yellow corn, bulk (Blue Creek)	H	0.28				
Belize white corn, bulk (Cayo District)	-	N/A				
US Corn, #2 yellow	L	US\$3.1600 / 56 lb bushel				
US organic, #2 yellow corn feed grade	L	US\$6.70 / bushel				
Belize soy beans (Spanish Lookout)	L	0.46 set price				
Belize soy beans (Blue Creek)	S	0.48				
US soy beans	L	US \$8.9170 / 60 lb bushel				
US organic, #1 feed grade soy	-	N/A				
Belize milo (Spanish Lookout)	L	0.215				
Belize milo (Blue Creek)	S	0.21				
Red kidney beans (Spanish Lookout)	H	1.35				
Red kidney beans (Blue Creek)	-	N/A				
Black eyed peas (Spanish Lookout)	L	0.80				
Black eyed peas (Blue Creek)	-	Price unavailable				
Paddy rice per pound (Spanish Lookout)	S	0.40-0.50 farm price, dried				
Paddy rice per pound (Blue Creek)	S	0.40-0.48 farm price, dried				
SUGAR/HONEY						
Sugar cane, ton, estimate ONLY	H	\$47.74				
Bagasse, per ton	-	Price undetermined				
Honey, 5 gal (approx 60 lbs)	H	\$240.00 (CQHPC)				
Honey, speciality, 5 gal (approx 60 lbs)	H	\$250.00 (Cayo)				
SPECIAL FARM ITEMS						
Eggs - tray of 30, farm price	H/H	5.17 (Sp Lkt)	5.55 (Blue Creek)			
WD milk/lb farmer base price (varies by fat%)	H	approx 0.51-0.54 contract only				
Raw milk (farmer direct sales)	S	6.00 per half gal				
CACAO						
Cacao beans Organic /lb *	H	4.75 dried fermented				
Cacao beans Organic /lb	L	0.75 wet beans				
US Cacao beans, metric ton (ICCO)	L	US\$ 2,335.39				

*Cacao exports have for the most part, ceased. Local processors use approx. 10% of local fermented beans.
 These prices are the best estimates only from our best sources and simply provide a range to assist buyers and sellers in negotiations.



BLPA's Successful AGM By Beth Roberson



A record-setting 504 ranchers and farmers filled the Belize Livestock Producers' (BLPA) grounds as they met for their 42nd Annual General Meeting on 29th February 2019, under the theme "Positioning the Belize Livestock Industry for New Global Opportunities".

Ministry of Food and Agriculture's (MFA) Mr. Belarmino Esquivel served as the MC. BLPA General Manager Ms. Mindy Garcia gave the opening address, re-iterating the overall theme of new global opportunities. She announced that Belize was in the final process of being declared free of both brucellosis and bovine TB through efforts of the national cattle sweep. She touched on the recently signed BSE (Bovine Spongiform Encephalopathy, aka 'mad cow disease') surveillance project, in collaboration with Belize Agricultural Health Authority (BAHA), International Regional Organization for Agricultural Health (OIRSA) and the MFA. These actions are necessary in order to improve and expand export access. BLPA has contracted vets for disease surveillance; the vets will be at the disposal of all farmers countrywide. She encouraged all farmers to register with the Belize Livestock Registry (BLR), and to officially join BLPA. BLPA's annual dues of \$25 entitle members to discounts at several businesses, duty exemption on selected items, assistance with procuring loans, and voting rights to select board members.



Mr. Elston Wade Jr, BLPA chair, opened his remarks by congratulating the former Ministry of Agriculture on its new name, Ministry of Food and Agriculture. He stated that the association is in a secure financial position and he thanked all the farmers and ranchers for their willing cooperation with the ongoing surveillance programs (BSE, bovine TB and brucellosis), which safeguard the livestock industry. According to BLR's records, the national herd has reached 168,591 head. Mr. Wade was proud to say that Belize is free of BSE, although we are in the documentation process to prove that to international partners. The full-time vet working on the BSE process now will continue with BLPA after the project ends, as regular BLPA staff, available to BLPA members at little or no cost to them. He repeated Ms. Garcia's comments that the association is continuing to seek new

markets, and still working to further formalize and improve cattle sales to Mexico.



CEO Jose Alpuche spoke to the association on behalf of MFA; he described Belize's livestock industry as one in transition. He compared the industry to "building a house on an uncertain foundation, allowing domestic sales for cattle we know will be leaving Belize". He continued that this has been happening for the last 3 decades, and acknowledged that "the informal trade has served the country so we will not criticize the past; however, we all realized that this would change with the sweep". Work on legal export from Blue Creek and focus on new sanitary regulations with Guatemala are ongoing. He stressed that "in these changing times, with the rapid shift in the regulatory environment, neither GOB nor BLPA knows how or where this will end up". He complimented Belize's stellar record of TB and brucellosis testing, saying that our industry's high marks lead the entire region, surpassing Mexico's. Now, he believes, we need to examine the profit side of the cattle industry, recognizing our high status. He commented that although "it appears that this may evolve as a trade specifically with Blue Creek as a conduit, this is an issue which neither Ministry or BLPA has full control, so all must work closely together to get the best possible solution for the country".



CEO Alpuche also mentioned the development of sylvopastoral systems to mitigate climate change. With considerable international funding coming in over the next 6 years from various sources, these can assist both communities and medium-to-large scale farmers. Much has to be worked out and hopefully by September 2020 there will be more clarity. His closing comments included "markets are changing and we need to work together going into uncharted waters; none of us has the full solution, and we can only find the full solutions working with each other".

Questions to the CEO included ranchers from Crooked Tree asking why there had been no small rancher assistance with last year's [2018] drought. The reply included that there had been delays in terms of disbursement and that there were funds from CBD (Caribbean Development Bank) earmarked for cattle

ranchers with 10 to 250 head. GOB was still searching for funding to help farmers with less than 10 head. Another topic was increasing export cattle to include breeding and young animals, in addition to slaughter animals that are currently allowed, and again, question on the very onerous 15% import tax applied by neighboring purchasers. Also, it was raised that Mexico is concerned that they take a risk importing informally. Regarding sanitary risks, banking and money transfer risks, there are many large and fine points to be addressed. Orange Walk's G & B Ranch owners opined that we need to look beyond the immediate needs and traditional markets, and establish a strategy to get fair value and add value to our products, including exploring CARICOM and other new markets. CEO Alpuche commented that chicken exports to the CARICOM are possible due to the private investment of many millions of dollars spent upgrading to Hazard Analysis Critical Control Point (HACCP) standards. He complimented those in Spanish Lookout for their vision in investments in development facilities. CEO Alpuche agrees this would be possible for cattle, and stressed that "we need to pool resources to achieve vertical integration".

The guest speaker, former BAHA veterinarian and now international consultant, Dr. Victor Gongora, shared stories and encouraged BLPA to continue promoting education and farmers to be pro-active in forming visions and setting goals.



Dr. Eduardo Tesecum of BAHA presented a detailed powerpoint, in which he introduced attendees to the basics about BSE and information about BAHA's BSE surveillance project. BSE was first recognized in 1986 in the UK, and is considered zoonotic because there is a human variant of the malady: Creutzfeldt-Jacob disease. BSE affects the nervous system with an accumulation of abnormal proteins called prions in nervous system tissue. More prevalent in dairy animals than beef animals, it is presumed to be caused by eating infected material. Strategies include safeguarding importations, removal of risk materials such as the brain and spinal column during slaughter, prohibition of SRMs (specific risk materials) in animal feed, banning use of MBM (meat and bone-meal) in ruminant feed, and putting down all suspected animals. Clinical symptoms include: nervousness, depression, hypersensitivity to sound and touch, twitching, abnormal grazing, lack of coordination, difficulty rising from lying down, weight loss and decrease in milk production. All of these are similar to symptoms for rabies. Dr. Tesecum noted that since 2016 BAHA's labs have the capacity to do in-house testing for both BSE and rabies.

Now that Belize is free of BSE, we must get certifications extolling that, to expand international markets. Belize is in year 2 (of maximum 7 years allowed) to reach Organization Internationale de Epizooties (OIE) certification via accumulating points from testing suspected animals. All ranchers are asked to be aware, and to ask BAHA or BLPA for help if any animal shows BSE signs. There is no cost for testing and BLPA offers compensation for

animals euthanized in order to do lab testing. Mr. Maximilian Ortega, Project Coordinator for the Inter-American Development Bank (IDB)'s project, *Improving Livestock Sector Productivity and Climate Resilience in Belize*, reported on this endeavor. BLPA and Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) are working alongside IDB. The La Imaculada Credit Union is assisting small and medium size farmer participants. Total funding, including IDB and International Monetary Fund (IMF) is \$875,000. USD. To date, the project has selected 4 farms in Cayo District, 3 in Orange Walk District and 3 in Belize District, which are evaluated for soil, land use and productivity, animal nutrition and animal health. Model farms, which will serve as training venues, have been identified, one being Running W's Tiger Run Farm. Sylvopastoral systems are promoted as the direction forward to achieve health and nutrition of animals and the soil. Look for updates on BLPA's website, www.belizelivestock.org

Treasurer of the Belize Pig Council, Mr. Ernie Thiessen, presented members with an overview of the local pig industry. Pig farmers are concentrated in the Mennonite communities of Shipyard, Little Belize, Indian Creek and Spanish Lookout but there are many other smaller pig producers spread throughout the country. In January 2019, the Pig Council invested \$36,000Bz\$ importing 6 Dalan breeding boars from Costa Rica. Approximately 28,000 pigs were sold in 2019, with sales in excess of \$10M Bz\$.

At the conclusion of addresses CEO Jose Alpuche was presented with a well-deserved recognition award from BLPA. General Manager Ms. Mindy Garcia, with BLPA since 2016, also received an award of recognition.

BLPA Treasurer/Secretary Ralph Moody reported on financials (full 2019 BakerTilly report online), noting that as of Dec 31, 2019, BLPA's net assets/balance totaled \$3,537,436, up about \$.5M from 2018, with property and equipment estimated at \$1,898,991. Gross Income increased to \$885,402, up from 2018's \$701,504. After expenses and depreciations, net income for 2019 was \$463,695, up from 2018's \$306,591.

Following lunch, Ramon Galvez, Abe Froese and Jacob Petkou were elected as directors. Current officers and board of directors are: Ramon Galvez, Chair; Jeffery Reimer, Vice-Chair; Ralph Moody, Sec/Treasurer, and Peter Penner, Jacob Petkau, Abram Froese, Gustavo Vasquez and Arden Edwards as directors.

For livestock news: <http://www.belizelivestock.org/Portals/0/PDF/BLPA%20NEWSLETTER.pdf>

All photos courtesy of Dr. Andre DePaz

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Fusarium Wilt of Bananas A Threat to Banana and Plantain Production in Belize

By Francisco Gutierrez,
BAHA



The banana and plantain industries constitute important economic activities in Belize and the Latin-American and Caribbean region, first as income generators from exports as well as for food security. More than 33 million tons of fruit are produced in this region valued at US\$3,000,000,000 and employing tens of thousands of workers. In Belize the formal industry consists of 7000 acres grown with Cavendish type bananas with an export value of US\$45,000,000. Beyond the formal export banana industry,

farmers across the country grow plantains and bananas for local consumption; these crops constitute a part of our diets and significantly contribute to food security.

The disease known as “Panama Disease” caused by the fungal pathogen *Fusarium oxysporum* f.sp. *cubense* (Tropical Race 1) decimated banana plantations in the 1950’s and 1960’s, which were then mostly planted with the Gros Michel cultivar. This susceptible variety was replaced by cultivars of the Cavendish subgroup which are resistant to the strain of the disease and this constituted the main strategy to save the industries at the time. With the appearance of *Fusarium oxysporum* f.sp. *cubense* (Tropical Race 4) (FocTR4) in the Asia Pacific region in the early 90’s, which severely affects Cavendish type cultivars as well as the majority of other plantain and bananas, the industries around the world now face an even greater threat than FocTR1. Recently the disease has been detected in other parts of the world besides Asia including Jordan, Israel and Mozambique. In the Guajira region of Colombia two hundred acres have been destroyed in an effort to contain the disease from further spread and internal quarantine control points have been established. This is the first official report of the strain of the disease in the Americas.

It is believed that Foc TR4 may be endemic to Indonesia, Malaysia and possibly The Philippines. Its recent presence in South China may be a case of introduction. The case of RT4 in northern Australia was also an introduction as is the case in Israel, Jordan and Mozambique (fig 1).

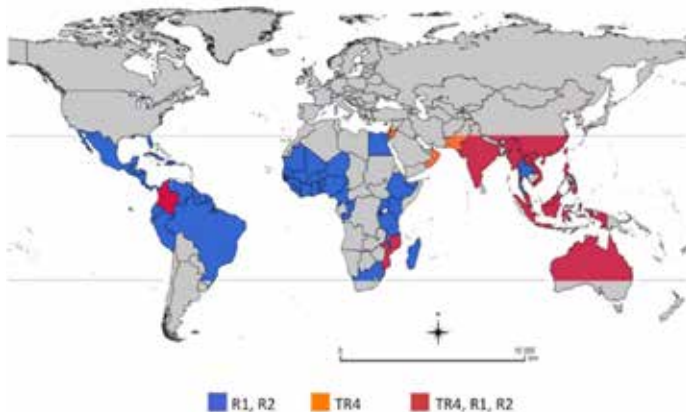


Fig 1. Global distribution of races of *Fusarium oxysporum* f. sp. *cubense* (Foc) (Ditts et al., 2018).

Symptoms of the disease (fig 2)

Initial external symptoms of the disease include yellowing leaf margins in older leaves.



Infected trees eventually wilt. Tree to tree infections result in the eventual spread throughout the plantation.



Internal browning of stems and corms is the key diagnostic symptom of Panama disease.



Splitting of the pseudostem is a common occurrence associated to the disease.



Impact of the disease - Because the pathogen that causes the disease is soil-borne, there is currently no effective cure for the disease. There are no fungicides or fumigants that can eliminate the pathogen from infected soil. Furthermore, the pathogen forms hardy spore structures known as chlamydospores that can survive in the soil and be infective for up to 30 or more years. Infected plants die rapidly resulting in the decline of plantations and heavy losses in investments. The disease is considered to be in the top ten most destructive plant pathogens in the world.

Currently, some countries have been conducting research to find cultivars within the Cavendish group that exhibit high levels of tolerance to the disease. The research is promising in that some cultivars have been exhibiting high tolerance, but under certain conditions can succumb to FocTR4. In any case, access to this genetic resource may not be straightforward and more investigations are needed in this regard. Likewise, even with the access to tolerant genetic material, the initial costs associated to the loss of our industry in case of introduction, and eventual replanting with new varieties, will result in an extremely heavy loss to the industry and our food security and will endanger the economic stability of the country.

Regional Actions- Joint efforts are required between and within countries to prevent the entry of this devastating pathogen into the important industries of our region. The International Regional Organization for Agricultural Health (OIRSA), through its member countries, took note of this situation in 2009 and took the initiative to organize regional workshops to garner regional support to put in place measures to prevent the introduction of this devastating pest into the Americas. Out of this, a contingency plan was produced as guidance material for the countries in case of accidental introduction. Further work brought together the other sub regions (the Andean and Caribbean regions) in the discussions and an Inter-American plan was formulated.

National Actions - With the current case in Colombia, the countries in the region have been activating their work plans in response to the elevated threat level. In Belize we have initiated some activities in response to the threats by FocTR4. We have now developed a national plan which was discussed with industry and other stakeholders such as the Ministry of Agriculture, Customs and Immigration, the latter two viewed as partners in supporting quarantine initiatives at the points of entry. This entails a profiling approach for visitors from affected regions. Industry is being asked to implement biosecurity measures and to limit foreign visitors to their fields. A working group has been established to specifically deal with mitigating the threats posed by the disease. The group has started to implement the plan with the Quarantine Department taking the lead at the points of entry. Travelers arriving on certain airlines are required to dip their footwear in impregnated pads upon disembarking at the Philip Goldson International Airport. We have also been conducting awareness activities through the posters at the points of entry and the production of awareness materials. A few workshops for farmers and technicians in the industry as well as technical officers of various ministries and institutions have been conducted and more are to be carried out.

The work plan also includes the following elements:

- import regulation of pathways
- development of diagnostic capacity
- surveillance and monitoring in the formal industry and other production areas
- biosecurity on the farms
- simulation exercises
- public awareness
- regulations
- sourcing of tolerant/resistant varieties

There is no doubt of the destructive capacity of FocTR4 as experienced by many Asian countries. Likewise, we know that the threat of introduction and spread is exacerbated by the ever-increasing levels of trade and the movement of people across the globe and that it is a matter of time before the pathogen spreads all over the industries of the world as was the case with FocTR1. The current variant of Foc is far more destructive than its predecessor since it also affects other musaceas such as plantains and other bananas. It is only through collective efforts and cooperation that we will be able to retard the introduction and consequent devastating effects of this disease.

Grasshoppers, Grasshoppers, Grasshoppers

By Mary Susan Loan



Grasshoppers live everywhere on the planet except the Antarctic and North Pole. According to one encyclopedia, they are one of the oldest living groups of herbivorous insects, hopping and eating since the Triassic era, probably 250 million years ago. Insects of the suborder *caclifera* within the order *Orthoptera* include grasshoppers, crickets and locusts. You may be surprised to know that more than 11,000 species of grasshoppers world-wide have been identified in many sizes from a fraction of an inch to 5-6 inches long, and many colors, although most are green or brown. More species are being 'discovered', and some believe there may be at least 20,000 species in existence.

In Belize and Guatemala and other tropical climates, the giant red-winged grasshopper (*Tropidacris cristata*) lives up to its name. These brightly colored grasshoppers are yellow and black striped with red highlights in their juvenile stage. The colors are to warn predators, like birds and small mammals, that they taste horrible and are toxic. Another defense mechanism shared by all grasshoppers is their powerful spiny legs which help them kick away predators or hop long distances when threatened.

They tend to congregate in groups to devour plants and trees, especially bananas, jack fruit and bri-bri in our orchard. At adult stage, the Red-winged grasshopper loses its spectacular colors; they change to tan, yellow and green for camouflage. When the colors change they grow wings and can fly.

Male grasshoppers create sounds with their legs to attract mates. Female grasshoppers lay eggs in grass or in the earth. It takes about two months for the eggs to grow from nymph to adult when they develop wings and live for about four months. Females are larger than males. Grasshoppers thrive in warm sunny climates and droughts serve to increase their populations. They prefer sun in open habitats and fields to shady damp areas.

Locust plagues are mentioned in the Bible and in the Koran. They are close relatives to grasshoppers and both swarm and cause enormous losses to farmers every year, especially in Africa, where they have created devastating famines. They do not sleep; they eat grasses, weeds and crops day and night, but are noted to be slower moving in the early morning and at dusk.

Grasshoppers are resistant to agro-chemical pesticides but may be controlled by other methods. For example, perches and other structures placed around the garden allow birds to watch for grasshoppers for their food; a fungus known as Nolo Bait, or Semaspri helps keep the population down; Metarhizium, a genus of fungi is another promising environmentally friendly pest control. Species of the protozoan parasite, *Nosema locustae*, are effective when mixed with bait to help prevent nymphs and immature insects from developing. Neem, soap, and garlic pepper sprays have also been used with some success. Another remedy, Ecobran which uses 2% carbyl, an organophosphate is considered safe to plants. Planting cilantro, calendula and horehound strategically around your garden helps deter grasshoppers from attacking your edible plants. A simple remedy involves dusting the plants with flour which gums up their mouths and helps prevent them from chewing up crops.

Lubilosa is a research program dedicated to discovery of biologic control of destructive insects.

Continues on page 27

**"SAFEGUARDING BELIZE'S AGRICULTURAL
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BELIZE AGRICULTURAL HEALTH AUTHORITY

A CALL TO PHASE OUT CHLORPYRIFOS AND ADAPT AGROECOLOGY

By Ginnel Ozaeta

EXECUTIVE SUMMARY

Chlorpyrifos, an organophosphate insecticide, can cause serious health effects ranging from birth defects to lung cancer within the farming communities of Belize. Exposure to it can occur through pesticide residue, drinking and recreational water from its surface runoff, and drift through unintended and unapproved application methods. The citrus and banana industries are at present phasing out the use of chlorpyrifos due to the reduction of the maximum residue limit (MRL) by the European market because of its health effects. Yet, chlorpyrifos still remains readily accessible to small farmers in Belize regardless of its effect on human health. Additionally, the physio-chemical properties of this insecticide indicate that it is moderately persistent in soils and can accumulate in the fatty tissue of fishes³. The Pesticide Control Board (PCB) with the collaboration of the Ministry of Agriculture (MoA), the Ministry of Health (MoH), and the Department of the Environment (DOE) need to urgently phase out the use of chlorpyrifos by actively transitioning small farmers to adopt and adapt agroecological strategies in order to stop the negative externalities being caused by this insecticide.

INTRODUCTION

The PCB instituted an administrative control¹ to reduce the risk of pesticides to end users in 2016 by updating the Restricted-Use Pesticides (RUP) criteria for Belize to that of the eight criteria of the Highly Hazardous Pesticides (HHPs) of the Joint (Food and Agriculture Organization (FAO) and the World Health Organization (WHO)) Meeting of the Pesticide Management (JMPM)^{2&3}. In addition, PCB agreed on a ninth criterion based on the precautionary principle³. Subsequently, in December 2019 chlorpyrifos was added to the list of RUPs³ under criterion 4: “PESTICIDE ACTIVE INGREDIENTS AND THEIR FORMULATIONS THAT MEET THE CRITERIA FOR CATEGORY 1A AND 1B REPRODUCTIVE TOXICITY AS USED BY THE GLOBALLY HARMONIZED SYSTEM (GHS) ON CHEMICALS CLASSIFICATION AND LABELLING”³.

Chlorpyrifos is an organophosphate insecticide that is commonly used in agriculture⁴. It has a high acute toxicity to humans at low concentrations⁵ and very toxic to the human nervous system especially that of children. Exposure to this insecticide has been linked to reduced birth size of foetus and drops in children’s IQ^{6,7&8}. Chlorpyrifos has also shown evidence of being an endocrine disruptor⁹ and a causative factor to lung and prostate cancer^{10&11}. Notwithstanding all these health effects, a Knowledge, Attitude and Practice (KAP) study conducted with farmers of Vietnam proves that regardless of the health effects associated with this pesticide, farmers do not see any other viable solution to their pest problems¹².

The hazard classification of chlorpyrifos in context of the environment is that it is “Very toxic to aquatic life with long lasting effects”¹³. This means that minimal concentrations are lethal to aquatic organisms that are highly sensitive to this insecticide. The physio-chemical properties of this insecticide indicate that it is moderately persistent in soils and can accumulate in the fatty tissue of fishes¹⁴. These properties suggest that it may be a surface water contaminant and bioaccumulant. In addition, the article has reported the presence of this insecticide in “high volume air samples and in snow from the ice caps and lake catchments”^{15 p.1}.

Farmers are consumed by the pesticide treadmill approach¹⁶ and believe that their pest problems will be alleviated through the constant substitution of one pesticide for another causing them to increase their demand for RUPs. The PCB is urged to institute higher tiers of control¹ with the help of its partners to eliminate, altogether, the risks associated with the use of this insecticide over the span of five years.

RECOMMENDATIONS

1. To substitute the use of chlorpyrifos with agroecological inputs^{16&17} and push-pull integrated pest management (IPM)²⁰ techniques taught through farmer field schools (FFS) to achieve a three-year paradigm shift from the pesticide treadmill approach. The PCB along the collaboration of the extension and research department of the MoA would be responsible for the design and implementation of the FFS following the following points^{16,17&18}:

Agroecological Inputs ¹⁷	Push-pull Strategy ¹⁸
<ol style="list-style-type: none"> 1. Act to prevent problems: <ol style="list-style-type: none"> a. Reduce excessive chemical fertilizer with <i>minimal soil disturbance and minimal mechanical tillage</i>” to “<i>enhance and maintain a protective organic cover</i>”; <i>Composting and vermicomposting</i>; and, <i>vermiliquid (worm tea)</i>^{16&17} b. Select resistant/tolerant varieties^{16&17}; c. Plan crop rotation^{16&17}; 2. Use better watering practices^{16&17} 3. Use mechanical/manual weeding^{16&17}; 4. Use biopesticides^{16&17} <ol style="list-style-type: none"> a. <i>Azadiracthin can control caterpillars, leaf-feeding beetle larve, aphids, leafhoppers, leaf miners and cutworms</i>; b. <i>Neem-oil based products control aphids, whiteflies, scale crawlers, spider mites</i> 	<p>“Behavioural manipulation of insect pests and their natural enemies via the integration of stimuli that act to make the protected resource unattractive or unsuitable to the pests (push) while luring them toward an attractive source (pull) from where the pests are subsequently removed”^{19p.375}.</p> <p>Example: <i>Indian mustard (Brassica juncea) is the most effective trap crop for diamond back moths (DBM) (Putella xylostella):</i> (1) first plant Indian mustard in a bed or field where cabbage cultivation occurs; (2) DBM will be confused and won’t be laying eggs on the cabbage (DBM are pushed away); (3) plant natural repellents (eucalyptus/citronella) in between the cabbage rows to keep the DBM away^{20, 21 &22}.</p>

2. The PCB has communication material developed for information exchange, 'Protecting Children from Pesticides' and 'Help Conserve Biodiversity from pesticides'. These two sessions can be enriched and imparted by the public health department of the MoH and DOE, respectively. These sessions can be running parallel to the FFS in the community centre¹⁷.
3. At the three-year juncture, a KAP survey will need to be conducted in order to know how much change the FFS and information exchange sessions have imparted. The information gathered from the survey will steer the direction for the regulatory bodies involved to identify the legislative gaps that will help propel the phase out and the paradigm shift¹⁷.
4. Documentation of the successful experiences from the farmers and communities will aid national decision makers to have the confidence that phasing out an HHP will not cause economic harm to farmers and the community¹⁷.

If all goes according to plan, by year 2025 the use of chlorpyrifos will no longer be used, achieving goal #2 of the sustainable development goals (SDGs): "zero hunger: End hunger, achieve food security and improved nutrition and promote sustainable agriculture"; goal #3: "good health and well-being: Ensure healthy lives and promote well-being for all at all ages; goal #13: "climate action: Take urgent action to combat climate change and its impacts"; goal # 14: "life below water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development"; and goal #15: "life on land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"²⁴.

All references can be found online in our WordPress version.

Calling St. Michael, The Dragon Slayer By Maruja Vargas



Citrus 'greening', HLB (huanglongbing) is literally translated as "the yellow dragon disease". A fire breathing dragon, this citrus disease certainly is, having decimated a large percentage of the citrus acreage in Belize. But there is good news for citrus growers and all lovers of oranges and grapefruit. The citrus industry can be 'saved' without extraterrestrial intervention. New research summarizes unequivocally that HLB is a **nutritional** condition stemming from the use of glyphosate (RoundUp) for weed control in orchards. The once held theory that an unclassified bacterium (*Candidatus Liberibacter asiaticus* or *Ca. L. americanus*) was the 'cause' is now firmly **discredited** by scientists who are fully recovering fallow, seemingly dead orchards in Florida.

Researchers, having observed the conditions in the orchards for extended periods of time, noted that the psyllid, claimed to be the carrier of the above referenced bacterium, only approached and fed on already diseased yellow citrus leaves. It then became abundantly clear, given the behavior of the psyllid, that there was a prior cause underlying the yellow diseased leaves and abnormal fruits.

The precursor to the yellow, nutrient-deficient foliage was in the soil from which the tress draws its essential nutrients. Simply, the orchards were being starved to death. This 'starvation' was traced to the use of the herbicide glyphosate, which was first developed by Monsanto as a chelating agent, not as an herbicide. Chelation binds up the minerals in the soil so that the tree cannot uptake the minerals it requires. Furthermore, glyphosate kills beneficial soil microorganisms whose function is to break down various elements in the soil so that the tree can utilize these elements effectively. In the absence of good micro-organic colonies in the soil, vastly larger colonies of fungi, *fusarium*, develop which in turn further alter the soil chemistry to the detrimental effect on the orchard. It is now recognized that glyphosate is adversely affecting **both** the soil and the trees.

The aforementioned three-prong action resulting from the use of glyphosate is how the chemical literally starves all vegetation to which it is applied. Herbaceous weeds succumb in several days. Given the size of trees in comparison to herbaceous growth, it takes a longer period of time to 'starve out the tree'.

Florida growers are now recovering abandoned orchards. Field results are quite remarkable. Within 8 to 12 months following application of the Citrus Production Recovery (CPR) program, once thought to be 'dead' orchards are now producing marketable fruit. CPR, formulated by biochemist Frank Dean and produced in volume by Lido Chemical Company, is a very specific protocol of nutrients that (1) cleanse the soil of glyphosate and its residuals freeing previously chelated minerals, and (2) supply precise minerals, enzymes and biologicals to boost the tree's health. The soil in which the trees reside are regenerated and restored to its normal functional colonies of beneficial organisms. The end result is the restoration of the natural synergy between healthy soil and healthy plant. Healthy citrus is no longer in need of pesticides and fungicides to produce excellent quantities of fruit.

To date, BAHA has cleared CPR components for importation and arrangements have been with Mr. Frank Dean, the program chemist, and Lido Chemical to begin the recovery of 250 HLB-affected acres in Belize.

Interested growers who wish to join CPR, kindly contact M. Vargas, Las Golandrinas PermaFarm, Cayo at 669-6247 or mail to amar.international.maruja@gmail.com.



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GMO, Failed Promises; Flawed Science: A Serious Health and Safety Issue By Dr. Don M. Huber



The advertised benefits of genetically modified food misrepresent both the safety and necessity of the procedure. There is nothing in biotechnology that has increased the intrinsic yield potential of any crop. Instead, there is a consistent yield reduction when the integrity of the normal genetics is disrupted by genetic engineering. Yield and quality factors are

complex genetics accomplished by traditional breeding and are not amenable to 'silver bullet' tinkering. **Genetic engineering is more like a virus infection than a normal breeding process**, and "substantially equivalent" is a myth that hides the highly mutagenic process of genetic engineering and its epigenetic consequences to health.

Rather than encouraging independent research on genetically modified organisms (GMO) safety or performance, the companies (such as Monsanto and other GMO seed producers) have denied access to the seed for research, forbidden publication of data, and threatened legal action if negative data are disclosed. Rather than the way to feed the world, current genetic engineering is a disaster in the making and is not a sustainable strategy!

The benefits claimed for GMOs are failed promises built on flawed science. It is well documented that many GMO crops have reduced root growth, lower nutrient density, increased disease, greater stress susceptibility and the need for more pesticides than "conventional" crops. The abundance of **weeds and insects resistant to GMO plants, or the chemicals they were engineered to tolerate or produce**, complicate our ability to control these pests and add additional toxic pesticides to the foods we eat every day. Because of this, GMOs should be characterized **and LABELED** as toxic chemical accumulating and pesticide containing foods.

Contrary to the common claim of safety, a large volume of peer-reviewed scientific information shows that genetically engineered (GE) products and the Roundup® herbicide that 85 % of GE plants were engineered to tolerate, are chronically toxic to human and animal tissues. They lead to cancer, premature death, kidney and liver failure, infertility, autism, allergies, inflammatory bowel diseases and blood disorders. There are NO peer-reviewed scientific studies that show that GMO crops, or the chemicals they are engineered to tolerate or produce, are safe for human or animal consumption.

Medical data indicates that millions of children and adults are suffering from consuming the chronically toxic GMO products or the glyphosate (Roundup®) and other toxic chemicals these plants accumulate. Massachusetts Institute of Technology scientists have documented the biochemical disruption caused by genetic engineering and concluded that glyphosate (Roundup®) is the most chronically toxic chemical in our food and environment. **The genetic traits are extremely promiscuous** in food and plant residues. Ninety-three percent of women tested had the GMO Bt toxin in their blood, and 70% passed this toxic pesticide to their developing child in the womb. The person then, in effect, becomes their own pesticide factory.

As a **patented powerful antibiotic**, the herbicide glyphosate is toxic to beneficial microorganisms in the soil and GI tract of humans and animals that are essential for mineral absorption,

vitamin production, immunity, tryptophan synthesis in autism, and defense against pathogens such as *E. coli*, *Salmonella*, *Listeria*, and *Clostridium*. The increase of 'gut related' diseases such as Alzheimer's, autism, birth defects, breast and numerous other cancers, celiac, chronic fatigue, diabetes, *C. difficile*, end stage kidney failure, infertility, irritable bowel, leaky gut, Parkinson's, peritonitis, rheumatoid arthritis, and many others are directly correlated with GMO proteins and glyphosate residues in food and feed products.

The indiscriminate use of glyphosate and GMO crops is precipitating a **major chronic health and environmental crisis**. Drift from spraying glyphosate on GMO crops increased birth defects, reproductive failure and cancer in adjacent towns up to 450 % in Argentina. Other studies show that as little as 0.1 part per billion Roundup® in drinking water increased infertility, breast cancer, kidney failure, liver failure, endocrine hormone disruption and cytotoxicity to cells and tissues.

Rather than fewer pesticide applications, there has been a many fold increase in pesticide use with GMO crops. Much of this increased pesticide accumulates in food and feed products. EPA has approved residue limits 4,000 times higher than previously permitted – all without any safety evaluation! The USDA, EPA, and FDA have NO independent testing on GMO or the accumulated pesticides safety, and rely solely on statements of the companies that the higher levels are safe.

Ninety percent of the people in the U.S. want GMO labeling; however, it is much more than a 'right to know' issue! GMOs are a serious chronic health and safety threat to all humans and to our environment. **Future historians may well look back upon our time and write, not about how many pounds of pesticides we did or did not apply, but about how willing we were to sacrifice our children and jeopardize future generations for this massive experiment we call genetic engineering that is based on failed promises and flawed science, just to benefit the bottom line of a commercial enterprise.**

Dr. Don M. Huber is Emeritus Professor, Purdue University; COL US Army (Ret, Medical Intelligence); Former Chairman, USDA National Plant Disease Recovery Program; member, US Threat Pathogens Committee; former member of the Advisory Board, Office of Technology Assessment, US Congress; and OTSG Global Epidemiology Working Group.

Some suggested reading

- Ayyadurai, V.A.S. and Deonikar, P. 2015. Do GMOs accumulate formaldehyde and disrupt molecular systems equilibria? Systems biology may provide answers. *Agric. Sci.* 2015, 6: [http://www.scirp.org/journals/as doi]
- Antonioni, M., Robinson, C., Fagan, J. 2014. GMO Myths and Truths Report: An evidence-based examination of the claims made for the safety and efficacy of genetically modified crops. 2nd Ed. Earth Open source 330 pp. (free download).
- Brown, G. 2018. Dirt to Soil: One Family's Journey into Regenerative Agriculture. Chelsea Green Publishing, White River Junction, Vermont.
- Carman et al, 2013. A long-term toxicology study on pigs fed a combined genetically modified (GM) soy and GM corn maize diet. *J. Org. Syst.* 8:38-54.
- Druker, S.M. 2015. Altered Genes, Twisted Truth: How The Venture To Genetically Engineer Our Food Has Subverted Science, Corrupted Government, and Systematically Deceived The Public. Clear River Press, SLC, UT.

ENSSER. 2014. Statement: No scientific consensus on GMO safety. European Network of Scientists for Social and Environmental Responsibility. 19 May 2014.

Gillam, C. 2017. *Whitewash: The Story of a Weed Killer, Cancer, and the Corruption of Science*. Island Press.

Guyton, K.C., et al. 2015. Carcinogenicity of tetrachlorvinphos, parathion, malathion, diazinon, and glyphosate. World Health Org.-IARC, Lyon France DOI: [http://dx.doi.org/10.1016/S1470-2045\(15\)70134-8](http://dx.doi.org/10.1016/S1470-2045(15)70134-8).

Honeycutt, Z.. 2018. *Unstoppable: Transforming Sickness and Struggle into Triumph, Empowerment, and a Celebration of Community*. Moms Across America Publishing.

Hoy, J, Swanson, N, and Seneff, S 2015. The high cost of pesticides: Human and animal diseases. Poultry, Fisheries and Wildlife Sciences 3:1-19.

Krimsky, S. 2015. An illusory consensus behind GMO health assessment. Science, Technology, and Human values 1-32.

Leu, A. 2018. *Poisoning Our Children*. ACRES U.S.A. Greeley, CO.

Mitra, T. 2017. *Poison Foods of North America: Guide to navigating the glyphosate mine field in our food web* (ebook). https://www.amazon.com/POISON-FOODS-NORTH-AMERICA-navigating-ebook/dp/Bo6XS4Y6H2/ref=sr_1_1?ie=UTF8&qid=1490569537&sr=8-1&keywords=poison+foods+of+north+america

Perro, M. and Adams, V. 2017. *What's Making Our Children Sick? Exploring the Links Between GM Foods, Glyphosate, and Gut Health*, Chelsea Green Pres.

Samsell, A. and Seneff, S. 2012. Glyphosate's suppression of cytochrome P450 enzymes and amino acid biosynthesis by the gut microbiome: pathways to modern diseases. Entropy 15:1-x manuscripts; doi: 10.3390/el40x000x.

Samsell, A. and Seneff, S. 2013. Glyphosate, pathways to modern diseases II: Celiac sprue and gluten intolerance. Interdiscip. Toxicol. 6:159-184.

Samsell, A. and Seneff, S. 2015. Glyphosate, pathways to modern diseases III: Manganese, neurological diseases, and associated pathologies. Surg. Neurol. Int. 6:45-70.

Samsell, A. and Seneff, S. 2015. Glyphosate, pathways to modern diseases IV: cancer and related pathologies. *J. Biol. Physics Chem* 15: 121-159.

Seralini, G-E, Clair, E., Mesnage, R., Gress, S., Defarge, N., Malaesta, M., Hennequin, D., and de Vendomois, JS. 2012. Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize. Food Chem. Toxicol. <http://dx.doi.org/10.1016/j.fct.2012.08.005>.

Seralini, G-E, Clair, E., Mesnage, R., Gress, S., Defarge, N., Malaesta, M., Hennequin, D., and de Vendomois, JS. 2014. Republished study: Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize. Environmental Sci. Europe 26:14-31

Shehata, A., Schrodll, W., Aldin, AA, Hafez, HM., Krueger, M. 2012. The effect of glyphosate on potential pathogens and beneficial members of poultry microbiota in vitro. Current Microbiology DOI 10.1007/s00284-012-0277-2.

Swanson, NL, Leu, A., Abrahamson, J., and Wallet, B. 2014. Genetically engineered crops, glyphosate and the deterioration of health in the United States of America. Journal of Organic Systems 9:6-37.

Wilson, J. and Ryznic, J. Improving Our Health and Reducing the Violence in America: An Expose of Glyphosate Poison in Our Food and the Cover-up. EBook Free at: www.Myfoodstuff.com



Poisoning Our Children The Parent's Guide to the Myths of Safe Pesticides

By André Leu

A Review by Mary Loan

Despite the grim sounding title, this a readable educational resource book which may inspire you to feed yourself and your family organic food or source or grow your own fruits and vegetables. Author André Leu is a founding member and director of Regenerational International. He served as president of International Federation Organic Agriculture Movement (IFOAM) from 2011 to 2017. He has written and lectured extensively about the dangers of conventional farming and the benefits of regenerative organic agriculture. André and his wife run a regenerative organic, agro-ecology tropical fruit orchard in Australia.



The book is comprehensive and written to inform readers about the dangers of synthetic agro-chemicals and the impact they have on children. It is divided into five chapters which expose the myths of the safety and efficacy of agro-chemicals and their effect on children. The author explains that fetuses and young children are the most vulnerable to toxicity and health problems due to their size and weight ratio and high food consumption as they are growing to adulthood.

Testing of agro-chemicals often does not include the adjuvants added to the pesticide, herbicide or fungicide, or the increased risk of combining various agrochemicals. The "inert" ingredient in glyphosate, for example, is considerably more toxic to human cells than the "active" ingredient.

Toxic agrochemicals are negatively impacting the world food supply and water, and have an especially negative impact on bees and other pollinating insects, birds and aquatic animals.

The last chapter in the book "Protecting Our Children and the Future" is a welcome antidote with solutions for creating safe, sustainable farming practices which use sustainable organic farming practices. André reminds parents that organic food may cost more, but is less costly than medical bills.

Editor's Note: André Leu, a founder of Regeneration International, was instrumental in the establishment of Regeneration Belize (RB). See André's 2018 talk at RB's 1st Annual Tropical Agriculture Conference

<https://www.youtube.com/watch?v=3mccLVb5uW8>

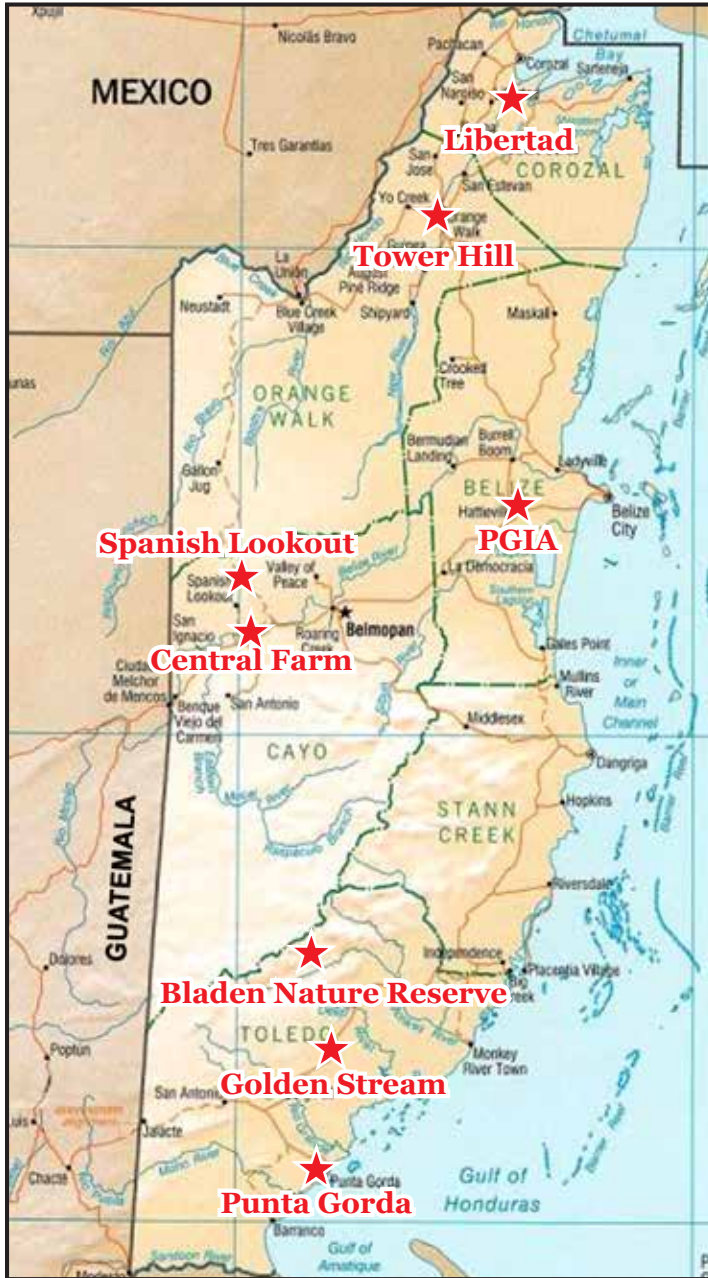
Grasshoppers...Continued from page 23

Although grasshoppers and locust are responsible for billions of dollars of destruction and crop loss world-wide, they hold promise for helping solve famine by harvesting, cooking, and grinding billions of grasshoppers and other insects for distribution to malnourished regions of the world. The Bugsfeed organization, as well as the North American Edible Insect group, promotes eating grasshoppers and other insects. In many countries especially Mexico and Indonesia, grasshoppers are usually fried or skewered. Difficult to catch, they are sometimes herded by fires to pits where they are more easily harvested. Chapulines, toasted grasshoppers with chili, lime and salt are growing in popularity. For centuries native ancestors have dried and ground grasshoppers into flour for adding to meals for survival and taste. Amazon now sells cricket flour on-line. In Israel a company is using greenhouses to breed, grow and harvest grasshoppers for food.

Rainfall 2019

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.

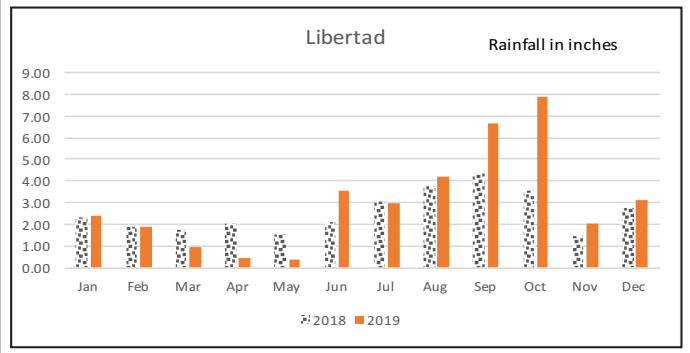
All of the rainfall charts and graphs for this article were created by Dottie Feucht.



Rainfall - Libertad Corozal District

Corozal rainfall courtesy of Belize HydroMet

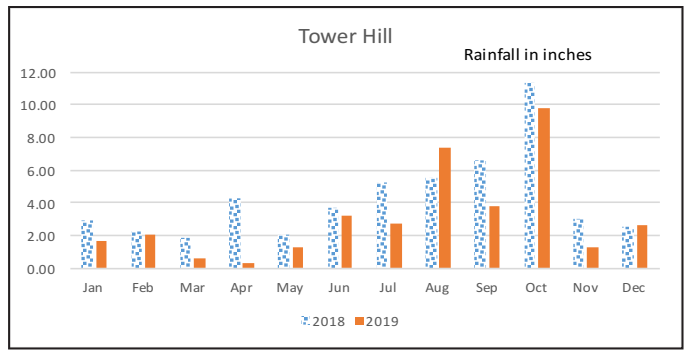
2019	inches
Jan	2.41
Feb	1.88
Mar	0.94
Apr	0.43
May	0.38
Jun	3.54
Jul	2.94
Aug	4.18
Sep	6.65
Oct	7.89
Nov	2.02
Dec	3.12
2019 Total	36.38
2018 Total:	30.35 in



Rainfall - Tower Hill Orange Walk District

Orange Walk rainfall courtesy of Belize HydroMet

2019	inches
Jan	1.64
Feb	2.05
Mar	0.62
Apr	0.31
May	1.28
Jun	3.20
Jul	2.72
Aug	7.41
Sep	3.78
Oct	9.81
Nov	1.31
Dec	2.65
2019 Total	36.78
2018 Total:	51.55 in



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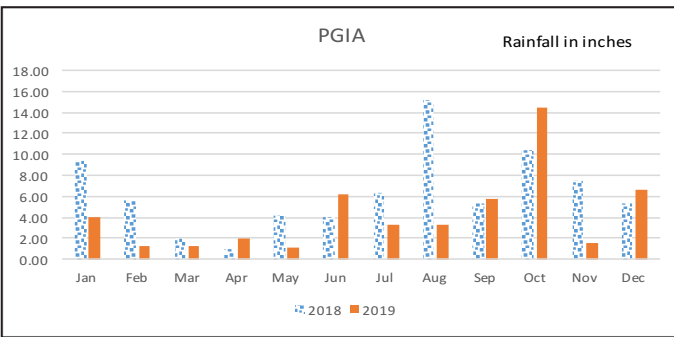
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Rainfall - Phillip Goldson Intl Airport Belize District

PGIA rainfall courtesy of Belize HydroMet

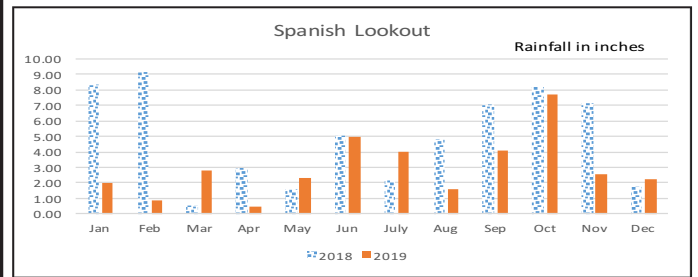
2019	Inches	
Jan	4.07	
Feb	1.21	
Mar	1.23	
Apr	2.00	
May	1.10	
Jun	6.18	
Jul	3.26	
Aug	3.26	
Sep	5.80	
Oct	14.43	
Nov	1.61	
Dec	6.63	
2019 Total	50.78	2018 Total: 76.57 in



Rainfall - Spanish Lookout Cayo District

The David J. Thiessen family have been keeping rainfall records in Spanish Lookout for 52 years. The highest year on record was 1979 when 84.58" fell. The lowest year was 2019. Thank you Thiessen family and Friesen Hatchery for sharing these records.

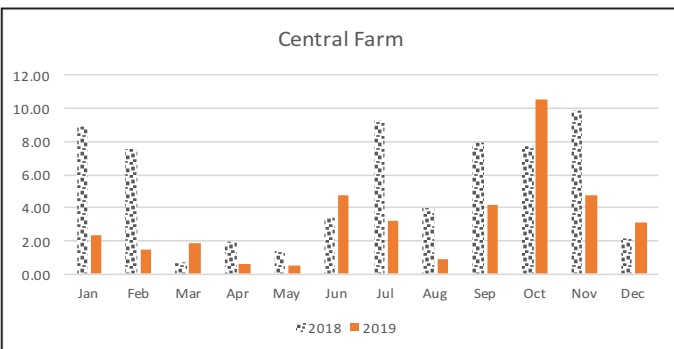
2019	Inches	
Jan	1.97	
Feb	0.89	
Mar	2.80	
Apr	0.46	
May	2.34	
Jun	4.95	
July	3.99	
Aug	1.58	
Sep	4.07	
Oct	7.68	
Nov	2.52	
Dec	2.23	
2019 Total	35.48	2018 Total: 58.60 in



Rainfall - Central Farm Cayo District

Central Farm rainfall courtesy of Belize HydroMet

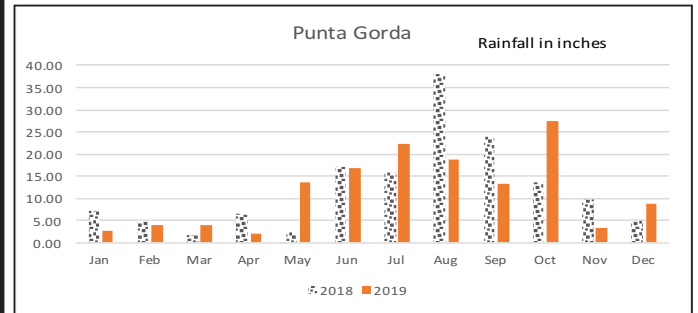
2019	inches	
Jan	2.37	
Feb	1.47	
Mar	1.89	
Apr	0.61	
May	0.47	
Jun	4.78	
Jul	3.24	
Aug	0.93	
Sep	4.15	
Oct	10.56	
Nov	4.76	
Dec	3.09	
2019 Total	38.33	2018 Total: 64.96 in



Rainfall - Punta Gorda Toledo District

Punta Gorda rainfall courtesy of Belize HydroMet

2019	inches	
Jan	2.73	
Feb	3.83	
Mar	4.09	
Apr	1.96	
May	13.63	
Jun	16.70	
Jul	22.26	
Aug	18.83	
Sep	13.39	
Oct	27.30	
Nov	3.43	
Dec	8.91	
2019 Total	137.06	2018 Total: 132.77 in



Continues on page 33

Soap Nuts – Laundry Soap of the Mayas

By Karin Westdyk



Water pollution is a serious environmental problem worldwide and many of the toxic chemicals that are disposed of in water come from laundry detergents. According to some studies, these detergents can even contain suspected carcinogens and ingredients that never fully biodegrade. Commercial laundry detergents can also contain oxygen-reducing substances that may cause severe damage to fish and lead to eutrophication, a process by which a water body becomes so enriched in dissolved nutrients, it causes an overgrowth of aquatic plant life, resulting in depletion of oxygen. A few more harmful components of detergents, such as herbicides, pesticides and heavy metals can cause water to become thick, blocking out sunlight and disrupting the growth of plants and clogging the respiratory systems of fish. Pathogens from these toxic water bodies can cause diseases in humans or animals, which can be fatal. Such contamination in water also compromises soil needed to grow healthy agricultural crops.

Fortunately, nature has provided us with a unique solution to detergent pollution with a safe and effective way to wash clothes. Native to the Himalayas of India where they are known to protect the land from typhoons, soap nut trees have also flourished in the tropics of Belize and when used instead of detergent, the water from washing clothes can safely be directed to the garden.

Though most often referred to as soap nuts, they are actually not a nut, but a berry related to the lychee family. They are completely nut allergy safe and have been used with no negative reactions experienced by people with nut allergies. They are called “nuts” because, when dried, they more resemble nuts than fruits. Soap nuts and soap berries are interchangeable names for the same tree, also known as *Supindus mukorossi*.

Unlike expensive chemical detergents, soap nuts are considered hypo-allergenic and safe for babies and those with sensitive skin. In Ayurvedic medicine, soap nuts are actually considered a remedy for treating eczema and psoriasis as well as hair and scalp problems and for eliminating parasites such as lice. They have a mild anti-bacterial and anti-microbial function to help keep the scalp free from bacteria that can cause dandruff or inhibit hair growth.

Commercial manufacturers put foaming agent chemicals into their detergents to produce lots of foaming bubbles and they heavily market their products around this visual. But bubbles do not actually clean clothes. Though some bubbles are evident with soap nuts, it is the saponins in the nuts that actually function as

a surfactant, breaking the surface tension of water to loosen and remove dirt from fabric, leaving it suspended in the water that gets washed away. And no need to remove the nuts for the rinse cycle, as soap nuts will actually function as a fabric softener leaving no residue. Because they are organic and environmentally friendly, you can use your laundry water to water and nourish your house plants or garden plants. This is especially useful during the dry season when water can be scarce. When washing clothes, both the wash and rinse cycles can go directly to the garden.

Directions for washing clothes: though not essential, for best results break open dried soap nuts with blunt instrument and remove round black seeds. These have been used to make beads for jewelry, or you can plant them to grow your own soap nut trees. If washing clothes with hot water, place 7 to 12 sticky soap nuts into a small muslim or mesh bag and soak in a jar for 1 hour up to 3 days the first time you use them. The little mesh bags that hold garlic work well. Toss the bag directly into the wash tub. These can be re-used 5 to 7 times, after which you can boil the nuts to make an all-purpose cleaner, shampoo, or insect repellent. If washing clothes with cold water, boil the nuts first for about 10 minutes, then place in bag for use in the washer.

Directions for all-purpose cleaner, shampoo, and liquid dish soap that is gentle to hands: boil the soap nuts in 3 cups of water for 20 minutes to release the saponins (soap) into the water. When cooled, strain and add more water to bring back up to 3 cups. You can add a few drops of essential oil to give scent for shampoo if you like. Keep in refrigerator between uses.

To make a repellent, boil crushed and seeded nuts with a handful of neem leaves (or a tablespoon of neem oil) for 20 minutes, strain and cool. Use on your skin, your pets, or your plants.

Optional Tips: You can add 1/2-1 cup white vinegar for wash loads needing an extra boost, and during rinse cycle, you can add a few drops of essential oil such as lavender, lemon or your favorite scent, which is especially nice for sheets and towels.

To grow a soap nut tree: either soak or abrade the seed coat of the black inner seed of the soap nut before planting. Within a year, they will grow to about 4 ft tall and within 6 to 8 years they will start producing your zero waste, zero toxin, totally free cleaning detergent. Make sure you plant where there is a lot of space for the tree to flourish as they can grow to about 30 feet tall or more and produce thousands of soap nuts each year. An entire neighbourhood could share the soap nuts produced by one tree each year.

“The best time to plant a tree was 20 years ago. The second best time is now” – Chinese Proverb

Soap nuts will be on sale at Pro-Organic Belize’s booth at World Food Day and at the 2020 Tropical Agriculture Conference. All sales will benefit the work of Pro-OrganicBelize.org and SolarFamilies.Org



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Fruits, Roots and Shoots: Using Tropical Plants for Self Sufficiency

By Deborah Harder

A Review by Sue Harris

This 241 page book, available from www.amazon.com, is clearly a labour of love, written by a twenty year resident of Belize, originally from Canada. I reviewed a ring bound copy, and I really liked the look and feel of it. The writing style is clear, easy to read, and has a pleasant touch of humour. The layout is clean and easy on the eye. The index, often a weakness in self-published books, is excellent, and this book is very easy to navigate.

The book is divided into two sections, the first describing edible cultivated plants, and the second containing over 200 recipes. The first section has small illustrations in black and white, some line drawings, some photographs. The cultivation section also has information on how to cook standard dishes and how to process basic products such as peanut butter; relevant recipes are cross referenced. There are additional sections on dairy products, vinegar making, nutrition and canning methods. The cultivation section is sufficiently detailed to be useful to the home gardener and actually answers many of the practical questions that the person new to growing local foods, in particular, needs to know. (Like, "When do I dig up my cassava?" "When do I plant bean seeds?"). Many of us have felt frustrated when asking people these kinds of questions; the answers are often so vague as to be useless. (Of the, "When the moon is full" nature).

I was a bit surprised to find little or no information on cultivating many non-tropical vegetables. For example, there is not a mention of tomatoes, or peppers, and surely we all grow these! The purist will declare that in the tropics, we should grow and eat indigenous food, but that flies in the face of human nature! On the other hand, lettuce is included; the selection was made to include only things which are easy to grow.

The writer is nothing if not a truth teller – for example, squashing the foolish idea that black sapote tastes of chocolate, that craboo is anything but strange to the northern palate, and that all banana blossoms are good to eat, amongst other wild ideas which seem to circulate in Belize.

I have to confess to being an out and out foodie, and so I was very interested in the recipe section. Here you can find comprehensive instructions on making Belizean standards such as tortillas, rice and beans, caldo, escabeche, lab, tableta, sweet potato pudding and the like, as well as many Mennonite original recipes. (It was a pleasure to see recipes from some of my friends and neighbours). If you want to develop your classic Central American/Belizean basic repertoire, this is a great place to learn. I have to say that I didn't find an awful lot in these recipes that made my heart beat faster. I'm just too thoroughly European in my food tastes. There are a real few gems though; the hummus recipe is excellent, for example, but maybe I'm saying that because it is the same as mine! However, if the time comes, and it might, when I will be dependent on easily grown local food, this would be the perfect cook book to have on hand to help make something edible out of what might sometimes be considered by us northerners as rather dispiriting ingredients!

All in all, I think that this is an excellent book. It *must have* for any Belizean housewife or grower, containing as it does a wealth of practical knowledge based on real life experience.



proorganicbelize@gmail.com pro-organicbelize.org
626-9017 / 677-9658



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Lunch 12:00; speaker 1:00 - 2:30

September 1: A zoom presentation 1:00 - 2:30 pm with Bill Lindo 'Creating a regenerative future for agriculture in Belize, including job opportunities'

September 8: Field trip to Belize Botanic Gardens - Optional lunch \$15 - Noon; presentation by head gardener, Rudy Aguilar. 1:00- 2:30 PM. Optional garden tour and tea tasting - 2:30 PM \$15. (regular price is \$30.)

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Fruits, Roots, and Shoots - Using Tropical Plants for Self-Sufficiency is a new book published by Deborah Harder. It is available in spiral binding from Deborah or Dottie Feucht dottiefeucht@protonmail.com or in standard binding online from www.amazon.com



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AG BRIEFS



Changes in the Ministry of Agriculture: In April, longtime CEO **Jose Alpuche** tendered a 90 day notice of his resignation,



which came into effect in July 2020. Mr. Alpuche had served in several ministries, notably in the Ministry of Foreign Affairs prior to his time with agriculture, where he was highly respected by both GOB and the private sector. Also this spring, Minister Hulse transitioned the ministry's name to the more accurate **Ministry of Food and Agriculture**.



The UN's Food and Agriculture Organization (FAO) set the date for the 2020 World Food Day (WFD) as 16th October, long before COVID 19 struck. The theme *Building a Zero Hunger Generation* was also selected months ago. However, **due to**

Belize's current unpredictable circumstances, Ministry of Food and Agriculture has put all WFD plans on hold. Please check with Ministry officials or their website at www.agriculture.gov.bz closer to the date to learn more.



Looking for current retail prices for local fruits and vegetables? Find current prices, trends and notes of which items might be imported in the weekly BAPIS (Belize Agriculture Price Information System) report at: <https://www.agriculture.gov.bz/belize-agriculture-price-information-system-bapis/>



Acres U.S.A., North America's oldest publisher on production-scale organic and sustainable farming has held an eco-ag conference for the past 44 years. However, COVID 19 challenges have motivated them to turn their 2020 event into a **Virtual Eco-Ag Conference and Trade Show**. The dates are Dec. 1st through Dec. 4th. The fee for the online conference is a very reasonable \$99 USD. Learn more and register at: <https://events.acresusa.com/e/acres-2020/tickets>



Regeneration Belize's Tropical Agriculture Conference, held for the past 2 years during the 1st week in November, has been cancelled for 2020. Plans are for another terrific event November 2021. Check their FaceBook page for events.



Cheesemakers are aware that for every pound of cheese they make, they end up with about 9 lbs of whey. Small dairies traditionally use this byproduct to feed pigs, enrich their fields or even haul it to landfills. Large commercial dairies can afford the costly equipment to convert the whey into products such as protein powder. Recently, Dr. Paul Hughes, Assistant Professor of Distilled Spirits at Oregon State, following up on a suggestion by a grad student, has assisted **about 12 dairies/creameries to ferment the whey into artisanal alcohol**. TMK Creamery in Oregon makes a clear vodka-like "Cowcohol"; in Dorset, England there's "Black Cow Vodka"; in Ontario, Canada there's "Vodcow", and leave it to Tasmania to make a sheep whey vodka, gin and liquor. More on this at <https://www.atlasobscura.com/articles/alcohol-made-from-milk>

Trend-watcher Nielson.com makes some observations and predictions on recent consumer trends since COVID. Since the stay at home/cook at home lifestyle was virtually imposed on many, initially some in the middle to higher income brackets increased spending on luxury items (since they weren't traveling, eating out as much). However, latest data indicates that even those groups are now purchasing more cautiously. Consumers of every income level are reevaluating their spending habits seeking quality and cheaper prices. **Nielson predicts that foods and items promoting "health defense benefits and increased immunity benefits" will do well.** Also expected is growth in locally sourced products, as consumers have more trust in smaller local businesses. Nielson predicts that vendors may also find it easier and more reliable to source products locally. <https://www.nielson.com/us/en/insights/article/2020/recalibrated-consumption-dynamics-in-a-covid-19-altered-world/>

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"Keep the green bough in your heart and the singing bird will come."

Chinese Proverb:

Local and Regional Fuel Prices



★ Same

	Cayo, Belize	Quintana Roo, Mexico	Peten, Guatemala
REGULAR	↓ \$8.86 Bz/Gal	↓ \$6.37 Bz/Gal	↓ \$6.28 Bz/Gal
PREMIUM	↓ \$9.46 Bz/Gal	↓ \$6.51 Bz/Gal	↓ \$6.57 Bz/Gal
DIESEL	↓ \$8.31 Bz/Gal	↓ \$6.76 Bz/Gal	↓ \$5.07 Bz/Gal

For Information on the status of the Iguana Creek Bridge

waters rising or falling, out of water, under water, go to iguanacreekbridge.blogspot.com

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

Find all the Belize news sites linked from one site, including the Belize Ag Report.

BelizeNews.com



ACRES

Acres USA had a most fascinating and practical article for farmers dealing with insect competition for their crops, in their September 2019 issue: **Picky-Eater Insects Pass on High Brix Plants**, by **Thomas M. Dykstra** <https://www.ecofarmingdaily.com/grow-crops/picky-eater-insects-pass-on-high-brix-plants/>. Most Belizeans familiar with Brix understand its use regarding measuring sugar/solids in sap from citrus or other fruits/vegetables. Dr. Dykstra's article concerns **leaf Brix** and explains the basic principles of **insects as indicators of plant health and why "at some level, insects do not attack healthy plants"**. From his website, "Insects are interested in dead, dying and nutritionally poor plants". Dykstra breaks down leaf Brix levels into 3 categories, describing general implications: "When plants ascend the leaf Brix ladder, and reach between 8 and 11 Brix, insects metaphorically 'fall off the plant because the plant has a 'sword and shield' that protects itself from insect predators". Also explained are some basics on the role of sugar in Brix levels – how healthy plants can release sugar from photosynthesis via their roots into the soil, which supports soil microbes and absorbs water (increasing water retention and drought resistance). This article ties together many pieces of the Brix puzzle in a very understandable way for any farmer. He also ties in the health aspects of high Brix foods in the food chain. Healthy foods lead to healthy consumers; "by eating low Brix plants, our long-term health is compromised, although the effects may take years to manifest".

Dr. Thomas Dykstra can be reached at Dykstra Laboratories, Inc, in Gainesville, FL. He does consultations and public speaking worldwide. He specializes in entomological, agricultural and bioelectromagnetic consulting, and assists farmers weaning off chemical farming. www.dykstralabs.com dykstralabs@yahoo.com Check out and sign up for Acres USA's free daily emails of articles like this one, or subscribe.



Another interesting article about insects, **Healthy Mosquitos Don't Vector Malaria** by **John Kemp**, features a short interview with the same Thomas Dykstra.

<https://mail.google.com/mail/u/o/#inbox/WhctKJVzZK-FJKbfJFzBzrtgJPspIjgxpBqlPmLRqjhvLdKQgVxSdVkhPms-VVxcGltFBHZBv?compose=new>

Apparently, it's difficult to even infect healthy lab raised mosquitos with malaria. John Kempf, the interviewer, is an Ohio based Mennonite agriculture consultant, whose website offers free daily emails. www.johnkempf.com



SPANISH LOOKOUT RESCUE TEAM
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It has been our pleasure providing medical transportation since 1999. Spanish Lookout Rescue Team, a non-profit organization, consists of 2 Ambulances and 1 Rescue truck. The ambulances are fully equipped with lifesaving supplies and 3 Emergency Medical Technicians. The rescue truck has the Jaws of Life (hydraulic scissors) and other tools to open vehicles if people have been trapped.

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

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

Life is a Treasure, We CARE!

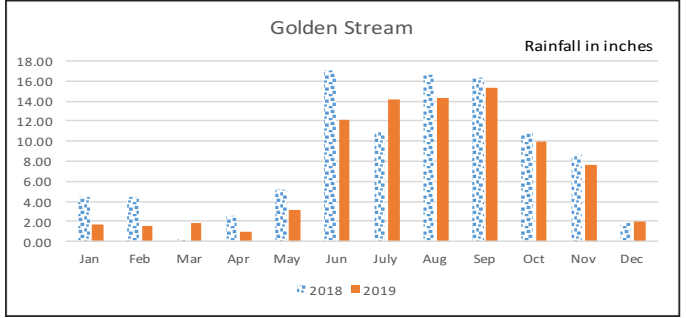
Rainfall...Continued from page 29

Rainfall - Golden Stream Corridor Preserve

Ya'axché Conservation Trust supplied rainfall data for both Golden Stream and Bladen Nature Reserve, Toledo. They have collected rainfall data since 2009. Thank you Ya'axché and Mr. Oscar Requeña.

2019	inches
Jan	1.69
Feb	1.57
Mar	1.80
Apr	1.04
May	3.18
Jun	12.18
July	14.17
Aug	14.26
Sep	15.31
Oct	9.99
Nov	7.63
Dec	2.03
2019 Total	84.85

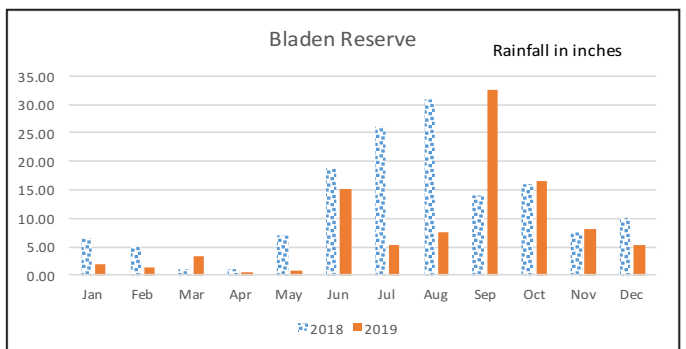
2018 Total: 100.35 in



Rainfall - Bladen Nature Reserve

2019	inches
Jan	1.98
Feb	1.43
Mar	3.44
Apr	0.52
May	0.92
Jun	15.03
Jul	5.23
Aug	7.46
Sep	32.53
Oct	16.64
Nov	8.24
Dec	5.36
2019 Total	98.78

2018 Total: 145.70 in



Cover crops, no-till...Continued from page 15

Sunn hemp about 3 months old and ready to crimp. As a legume it fixes nitrogen too.



Tips for success

- **Plant cover crops with good general practices.** The soil should be moist, not dry or swampy, and as free of weeds as possible. Plant plenty of seed; most cover crops need 20+ pounds per acre for good results. Let the cover crop grow to full size, at least 2 months.

- **When it is time to plant the main crop, kill the cover crop.** Chop it with a sickle bar or machete, crush it with a roller-crimper, graze it down with livestock. Spray it with herbicide or plow it only as a last resort. Some farmers combine multiple methods. There are many ways—just make sure the cover crop is dead!

- **Leave cover crop residue on top of the soil like a blanket.** In most cases there is no need to till or plow. Plant the next crop directly through the mulch using a no-till method. Feed and protect the soil with mulch.

- **Most often, it is best to kill the cover crop before it bears seed.** This way it does not drop seed and grow back. For certain cover crops like sunn hemp or millet, we need to kill them *while flowering* so that they do not re-sprout from the roots. Study the growth and reproduction cycle for each cover crop.

- **Maintain seed supply.** Leave a small portion of the farm as a 'seed bank', where you harvest cover crop seed. Selling cover crop seed can also be a profitable business.

- **Mix cover crops species together.** Mixes grow more vigorously and suppress weeds more effectively than single species. Think about plants that complement each other. Inga tree grows above the corn, and the cowpea grows underneath. Mucuna bean grows best with rain, but if dry weather comes then the jackbean will take over. Sunnhemp grows tall and straight, and the rice bean climbs up its stalk. Some farmers mix 10 or more cover crops together with incredible results!

- **To avoid weeds, re-plant the next cover crop as soon as possible.** For corn, casava, tomatoes, and other tall crops, we can re-plant cover crops while the main crop is still growing. For smaller crops like beans and vegetables we may need to wait until closer to harvest before re-planting a cover crop. Mulch from the previous cover crop helps control weeds in the meantime.

- **It is also good to use manures, composts, charcoals, effective micro-organisms, rock powders, organic mulches, and other fertilizer amendments** as complementary ways to improve and balance soil fertility. These do not substitute photosynthesis as the driving energy force of the soil ecosystem, but rather help make that force stronger.

- **Be patient. Experiment. Observe.** Each failure is a learning opportunity. If you keep planting and do not give up, you will succeed. I encourage you from personal experience as a practitioner of these methods in my own farming, and as someone who has witnessed many other farmers and agronomists demonstrate the same results.



See the pretty corn? Bwai! No weeds. Lone mulch. This farmer roller-crimped a cover crop and planted no-till corn.

Conclusion

Cover crop and no-till practices are available to every farmer, anywhere in the world, at any scale of production. Within a few years of work, dark and crumbly topsoil begins to return to the farm. Weeds go down. Crop health and yields improve. Chemical herbicide and fertilizer may be eliminated entirely. The farm becomes stronger against droughts and storm. This is what we should expect from healthy soil.

Most importantly, when we restore soil health, we ensure that the people of Belize have a secure, sovereign, and sustainable supply of high-quality food. I urge government, NGO, and international organizations to take these ideas and practices seriously, especially as we plan for adapting to climate change and feeding the country during global economic crisis like we are living through today. Belize needs a national soil health strategy for cover crops, no-till, agroforestry, and related agricultural solutions.

To conclude, let us study the principles of soil health one more time:

1. **Keep the soil covered**, never exposed.
2. **Minimize disturbances** like tillage, fire.
3. **Feed the soil with plants** like cover crops.
4. **Promote biodiversity** in the farm.

If anyone would like to connect, continue the discussion, or request more information, please kindly contact me.

henryantonpeller@gmail.com

Additional resources

ATTRA. 2017. Cover Crop Options for Hot and Humid Areas.

<https://attra.ncat.org/product/cover-crop-options-for-hot-and-humid-areas/>

Bunch R. 2019. Restoring the Soil 2nd edition. <https://bit.ly/restoringthesoil>

Exapta. 2002. Guide to No-Till Seeding. <https://www.exapta.com/working-knowledge/guide-to-no-till-seeding/>

Everything Cover Crops facebook group. <https://bit.ly/everythingcovercrops>

Magdoff F and van Es H. 2010. Building Healthy Soils for Better Crops, 3rd edition.

<https://www.sare.org/Learning-Center/Books/Building-Soils-for-Better-Crops-3rd-Edition>

Peller H. 2019. Ecological soil management with cover crops and no-till farming. Presentation to Regeneration Belize conference. <https://bit.ly/notillcovercrops>

Rhodale Institute. 2020. Organic No-Till and Benefits of Roller-Crimping. <https://rodaleinstitute.org/why-organic/organic-farming-practices/organic-no-till/>

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