The Belize Ag Report

Belize's most complete independent agricultural publication

NOV 2015
ISSUE 30

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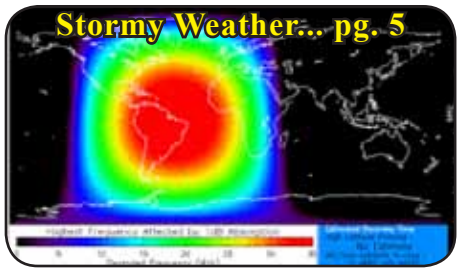

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Homemade Health

Essential Oils

By Marguerite Fly Bevis, RN, BSN

Last summer I had the privilege of staying with a friend who is particularly gifted in the nursing healing arts and complementary therapies. I know a little about aromatherapy but she practices it every day. Her favorite method is to add essential oils to coconut oil (cold-pressed) and use it for massage oil. I found her massage oil to be very helpful for swollen joints, so much so that I became intrigued and decided to learn more.

Pure essential oils have been pressed or distilled from the leaves, bark, roots, and other aromatic portions of a plant, yielding highly concentrated compounds. What I didn't realize is that they can be used with therapeutic benefit for a great number of illnesses and diseases. Digging deeper I learned that essential oils are used for not only treatment of stress and anxiety; they are being used with success in the treatment of cancer, pain, and for many other problems. Here are a few significant findings.

*"Cancer starts when the DNA code within the cell's nucleus becomes corrupted," says Immunologist Mahmoud Suhail. It seems some essential oils have a re-set function, correcting the DNA code.

*"Frankincense separates the "brain" of the cancerous cell, the nucleus, from the "body" – the cytoplasm, and closes down the nucleus, stopping it from reproducing corrupted DNA codes," says Suhail. "Frankincense oil is effective because it contains monoterpenes, compounds which have the ability to help eradicate cancerous cells at the onset of their development, as well as their progression stages, making it ideal for those who discover their cancer regardless of when it's found. Working with frankincense could revolutionize the treatment of cancer. Currently, with chemotherapy, doctors blast the area around a tumor to kill the cancer, but that also kills healthy cells, and weakens the patient. Treatment with frankincense could eradicate the cancerous cells alone and let the others live. There are 17 active agents in frankincense essential oil," says Dr Suhail.

*Credit: http://peacefulwarriors.net/essential-oils-stop-cancer-in-its-tracks/?utm_campaign=shareaholic&utm_medium=facebook&utm_source=socialnetwork

There are hundreds of essential oils to choose from depending on the condition you're trying to address. Let's look at a few more.

Perhaps the most well-known is from the lavender plant, *Lavandula angustifolia*. **Lavender** is used as a calming agent and for skin care, wounds and burns. **Lemon oil** is a mood enhancer, a relaxant, and is useful for wounds and infections. Added to coconut oil, it also helps repel insects. **Peppermint** is used for nausea and headache, muscle aches, and indigestion. Avoid using Peppermint during pregnancy and for children under seven. **Tea tree**, *Melaleuca alternifolia*, is an antifungal, antibacterial, immune system booster. **Rosemary**, *Rosmarinus officinalis*, is a mood booster, immune & digestive system booster, and muscle relaxant. Avoid if you are pregnant, have high blood pressure or have epilepsy. For inflammation and pain, **arnica** is very effective added to a carrier oil and applied directly to sore muscles and joints. Do not inhale it.

Perhaps the most common method of delivery is by using Aromatherapy. Desired essential oils are dropped on a cotton ball and breathed-in whenever necessary. Besides coconut oil, other carrier oils are sweet almond oil and avocado oil. Carrier oils are pressed from the fatty parts of the plants, the seeds and nuts. They do not evaporate quickly which helps deliver essential oils into the skin.

SAFETY TIPS: Essential oils are very potent and can cause irritation if applied directly to the skin. Dilute with a carrier oil and test before using. Do not use on babies, toddlers or children and keep them out of their reach. Aromatherapy is an art and it takes years to develop treatment proficiency. I recommend seeking the assistance and supervision of a health care professional.

I asked my friend what was her favorite or most common use of essential oils in nursing practice. She said "It depends on the season. Right now its lavender and eucalyptus to prevent and help with colds and flu." The method: add a few drops of eucalyptus to steaming water in a bowl. With a towel form a tent and breathe in to help with croup and congestion. "Thieves oil on your wrists, neck and temples is good protection against illness." I had never heard of thieves oil. She explained that thieves used it during the Bubonic Plague to protect themselves so they could rob the graves and homes of the stricken. Thieves essential oil is a blend of clove, lemon, rosemary, cinnamon and eucalyptus therapeutic grade essential oils. * Recipe available at: http://mountainroseblog.com/thieves-oil/

Sounds impressive to me. Think I'll try that. But, I promise, not for thieving.

Mission Statement:

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

TO THE EDITOR

Dear Editor,

Did you know that minimum wage in Mexico is close to 1/3 of minimum wage in Belize? This fact is the key to understanding the challenges that farmers face in Belize. Imported produce grown more cheaply in countries with a lower minimum wage competes unfairly with produce grown locally. Farmers in Belize suffer the same consequence in competition with imports from Mexico.

The great appeal of agro-chemical farming is largely due to the savings in labour. Farmers can simply spray rather than pay more workers to do the job by hand. In this way they can somewhat compete in both the world and local market by cutting the cost of production. This is where local organic farmers peel away the endemic veneer of false economy that oppresses growers the world over. The organic farmer uses labour rather than cheap agro-chemicals, which are specifically priced to target and entice farmers according to their local economy, making "agri-business" chemical farming the most economical choice. These chemicals, and the corporations that produce them, most often have their roots in chemical warfare applications from way back in the 1940's. As wartime dissipated in the 1950's and 60's these corporations had to find new applications for their products, and locked on to food production as a more stable market, introducing everything from preservatives to chemical farming applications, and everything in between, in the process of profit. Now we can rarely read a food label that does not contain unpronounceable ingredients about which we have little information, and no education.

So how does all this affect our local market here in Belize? Belizean farmers must compete directly with the cost of Mexican imported produce, which is generally as much as 70% cheaper, and represents approximately 50% or more of the fresh fruit and vegetables in the fresh food open air markets in Belize. Both vendors and consumers are conditioned to purchase this low priced produce, leaving Belizean farmers to do what they can to compete. If we take away the chemicals, and add the cost of the actual labour that it takes to farm, we can understand the "high price" of organic produce. However, within the context of Belize's economy the costs of agro-chemical farming are hidden in the high rate of diseases related to the misuse and consumption of these chemicals. The cost comes out of the health of the Belizean population, out of the soil, which is left depleted and chemical dependent, and out of the local economy, where instead of creating jobs in agriculture, we choose to save on labour, and poison our land, water, and people, to sell at a more competitive price. We might not pay at the market stand, but we do pay in the long run in the form of medical bills, subsequent medications, destruction of the farmland and the environment, and lastly, loss of jobs.

Let's get real, and pay the real price of farming in Belize. Support local organic farming for a stronger future for the people, the land, and the country of Belize. Stay Proud. Buy Local. Go Organic!

Laine Hoogestraten

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Dear Editor,

Recent flooding in Belize City and the associated threats of contaminated water had me wondering about advice for public safety. In the city apart from bacteria from septic systems and garbage the problems would include propane, petroleum, household and garden chemicals. In the country there may be more serious contaminants such as glyphosate or atrazine. I heard there was a study in progress re these dangerous chemicals but why wait to inform people. At least a government warning. Maybe there is one?

David S. Ford

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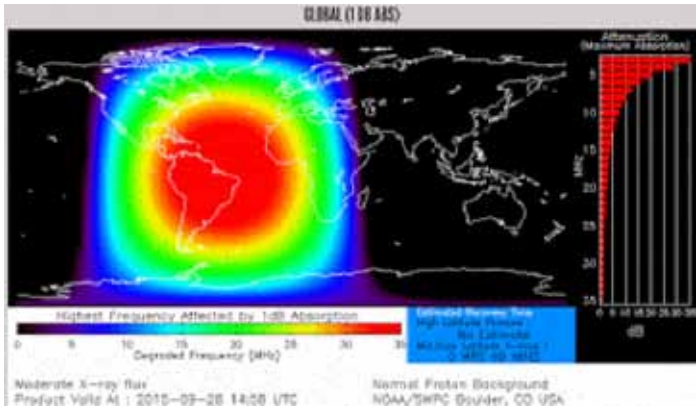
Telephone: 663-6777 ***(please, no text, no voicemail)***
Editors: Beth Gould Roberson and Dottie Feucht
Publisher: Beth Gould Roberson
Web design: Xen Wildman
Printed by BRC Printing, Benque Viejo, Cayo District, Belize
Submissions as follows:
Letters to the Editor, Ads & Articles to:
belizeagreport@gmail.com
Deadlines for submissions: 1st of the month prior to publication. 4 Issues per year

Stormy Weather



Where were you late afternoon on 28 September? Do you know the reason for that tremendous thunder storm that dumped 55 mm (over 2 inches) of rain in just 45 minutes around Belmopan? Don Thompson's Weather Analysis web site, www.weathertricity.blogspot.com, explains that the earth was hit by an intense burst of radiation from the sun. Belize was on the outer edge of this strike. The graphic on his web site shows the extent of the hit; South America was hit the hardest although it extended west to Africa and north to the Caribbean. He further explained, "There was a high pressure ridge down the east coast of the Yucatan into Central America. It looks like a line of cells got trapped under the ridge. The one over northern Belize at 5PM local, suddenly exploded and within minutes became a violent thunderstorm directly over Belmopan. The city power was interrupted 3 times. By 8 PM the whole storm system was gone.

Don, who came to Belize from the Toronto area in Canada to study tropical agriculture and environmental crisis, keeps records of rainfall and the correlation between rainfall and moon phases. He says that the most rain falls before and then after the full moon. The lowest rainfall occurs around the time of the new moon. The big storm of September 28 occurred a day after the total eclipse of the "supermoon".

2015 RAIN

2015	Belmopan Cayo District	Blue Creek Orange Walk District
May	1.8"	1.4"
Jun	11.4"	8.0"
Jul	7.2"	2.1"
Aug	3.3"	3.7"
Sep	10.0"	2.8"
Oct	13.0"	8.8"

Belmopan rain data courtesy of Don Thompson of Sibun Watershed Association. donbzwxnews.blogspot.com

Blue Creek data rain data courtesy of Peter B. Rempel.

Young Grove Management under Hunaglongbing (HLB) Scenario in Belize

By Luis G.Tzul, Citrus Growers Association

The challenge facing citrus growers today is how to bring into production young citrus trees under the heavy infestation of Huanglongbing(HLB) and Asian citrus psyllid (ACP). As infected orchards become unproductive, the decision to replace them with new ones is challenging. It is now six years since HLB was detected in Belize and there is an accumulated experience with the disease. The following are important guide lines on how to protect the new groves and minimize the infection rate with HLB.

The first priority for citrus growers is to join the coordinated Area-wide Integrated Management System (AIMS) to suppress the Asian citrus psyllid population. A combined effort by everyone is more effective than individual control at the farm level. Participating in AIMS ensures the use of selected insecticides which are applied in March/April and October/November within a three week interval by all citrus growers to suppress the population of the psyllid throughout the industry. This will help to reduce the psyllid population to a low level and in the long term will allow new plantings to come into production and thus maintain low incidence of HLB.

The second guideline is high density plantings: a higher number of plants per acre in the first four years. This will contribute significantly to early accumulated yields, reduce the time for recovery of investment and reduce the rate of infection.
The third guideline is to use certified plants from registered nurseries for new plantings. Do not buy HLB from illegal nurseries. A clean source of plants is the most important step to start the new investment.

There are different management programs available to prevent young trees from becoming infected with HLB and to bring these trees into production where HLB pressure is high. The following are management systems for controlling psyllids in young groves. Remember psyllids transmit HLB and so do humans when they purchase infected trees from illegal nurseries.

Systemic Insecticides

When young plants are purchased from nurseries, in most cases they are treated with a systemic insecticide to protect the plants in the field. You should verify this important detail with the nursery. This insecticide application will give at least one week protection to the plant. You must then move quickly to protect them from psyllids in the field. It is recommended that nurseries also use kaol in which serves as good protection against psyllid feeding. When kaolin is sprayed on young plants the leaves take on a white color and prevents psyllids from holding on to the leaves for adequate feeding.Although this product is highly effective against psyllid feeding the use of this product is new and customer acceptance is being sought.

Young citrus treated with kaolin

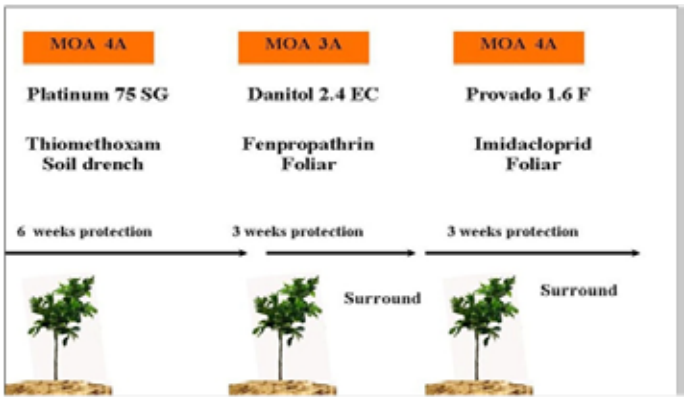
Soil-applied Systemic Insecticides

The group of insecticides most effective in controlling psyllids on young trees is the soil-applied systemic insecticides. These are the neonicotinoid insecticides. At present Jade and Admire Pro are the only ones registered for citrus in Belize. These are granules which are applied in the holes at planting. In trees that are 2 to 3 feet in height 0.025 oz per plant is used every three months. These are injected with special equipment. These insecticides are more effective when used in combination with kaolin.

Foliar-applied Insecticides

After a soil-applied insecticide is used a rotation with a foliar systemic insecticide is recommended (see Photo 2). There are several products available or registered for citrus, including imidacloprid which can last up to three weeks or lambda cyhalothrin (Engeo) which can protect for two or three weeks.

A recommended program for protecting young citrus trees



Note: MOA is mode of action for insecticide.

Repellents

Garlic, guava, neem extract and kaolin have been reported to help in repelling the psyllids although Citrus Research and Education Institute(CREI) has not tested them (except for kaolin). The use of kaolin (Surround) at the rate of 1 kg in 5 gallons of water or a 5% solution is very effective in repelling the psyllids (see Photo 1). Trials over a period of 16 weeks in Belize showed between 80 to 90 % reduction in the number of psyllids found per plant compared to the standard with no treatment. It is recommended that newly purchased citrus trees be sprayed with this repellent product and it should be combined with the foliar insecticide every three months to enhance the protection of young trees. The use of this product is economical for the first three years since tree volume is not large. In the fourth year the plants are large enough to be protected under the coordinated area-wide control of the Asian citrus psyllid as recommended by the industry.

The combination of soil-applied systemic insecticides, foliar insecticides and repellents such as koalin. garlic and neem sprays all contribute to suppress, repel or reduce the population of the Asian citrus psyllid. This reduces the stressful environment for young citrus trees. In addition the psyllid population on the farm must be monitored; when there is a spike in population numbers a control spray should be applied to reduce it. It is also important to take out a soil and leaf test to determine the reserves of nutrients in the soil and in the plant. The land must be well-drained and the soil pH maintained within the recommended range of 5.5 to 6.5. All these factors contribute to reduce stress and allow young plants to achieve their full genetic potential.

Corn That Says "No" to GMO
By Sam Vigue

In the modern world where large agriculture companies are gaining ground with GM (genetically modified) corn seeds, non-GM growers have been in an increasingly difficult situation from GM pollen drift. This pollen can drift over four miles in the wind and once it lands in a non-GM field, that corn becomes tainted with the GM variety. Once contaminated, the farmer typically gets a lower price, and for specialty food grade and organic corn the price can be as little as half what it would have been. However, one bright spot is that a few plant breeders have found a way to develop non-GM corn varieties that "say no" to the GM pollen when it comes blowing its way.

Blue River Hybrids in Ames, Iowa U.S.A., is the leading company that offers this type of seed, known as PuraMaize, for Midwest U.S. farmers. Blue River describes PuraMaize as a natural gene system which impedes pollination from GMO traited and blue corn pollen. It is naturally bred into Blue River corn hybrids, giving organic farmers a powerful tool to combat contamination from neighboring fields. Corn hybrids that contain the PuraMaize gene complex have the ability to recognize and favor pollen that also contains the PuraMaize gene complex. During pollination, the pollen grains move down the silk channel trying to fertilize the potential kernel.

A PuraMaize corn plant will quickly accept like pollen from other PuraMaize plants and slow the pollen of a foreign plant, like GMO or blue corn. The foreign pollen can't win the race down the silk channel and is unable to contaminate the PuraMaize plant.

Many years ago, some plant breeders identified this natural gene system occurring in certain corn plants. They spent a great deal of time crossing corn plants to breed this characteristic into different corn varieties that would produce well in commercial fields. It was eventually discovered that a specific complex of natural genes in the plant caused these corn plants to quickly accept pollen of its specific type when it landed on the silk. Researchers are continuing to work on developing corn varieties that contain this natural gene system. Called by some as "organic ready" because organic farmers can easily keep their crop GM free, plant breeders in North Dakota (ND) and North Carolina (NC)recently started developing more varieties with this trait for both the northern and southern U.S. growing regions. Unlike Blue River's PuraMaize seed which is patented, the seeds from ND and NC will not be patented which means farmers will have the option to save their own seed. Non-GM farmers will have increasingly more options for corn varieties that do not accept the GM pollen in the coming years.

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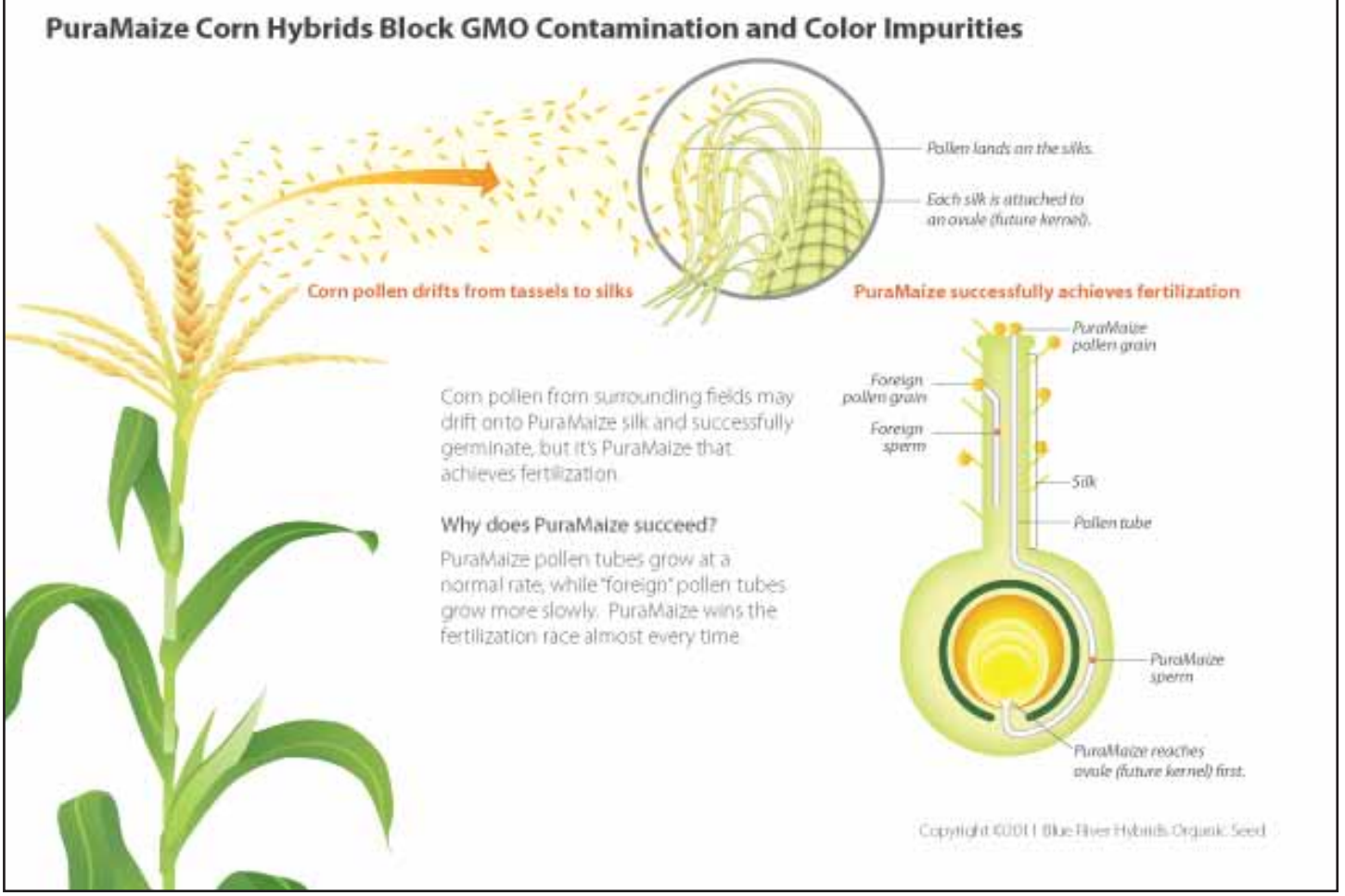

ENERGETIC AGRICULTURE
Pesticides and Healthy Crops
By Bill Lindo

Belize City, Oct 18th 2015: Late last year a farmer from Blue Creek in Orange Walk asked me how to effectively deal with aphids and mites in his crops. This was a hard question to answer. It took me several months of research to find the answer. The answer is so simple it spins the mind.

I knew part of the problem, but not the entire solution. From my previous research and 3 years of experiments, nutrition appeared to be part of the cause of this pest problem for farmers. I had also known that nitrogen was also part of the problem. Nitrogen in two forms is used in agriculture -- ammonia and nitrate depending upon the stage of growth of the plant.

All plants need nitrogen for their development but a major problem in agriculture is the mind-set of farmers. If a crop needs say 100 lbs./acre of ammonia, most farmers will put more than 100 lbs. because they believe that more is better. Biology, chemistry and physics are precise. Nitrogen should not be needed in quantities of more than 40 lbs./acre for corn crops in Belize if the other minerals are in balance. More than 60 years ago, the father on modern agriculture, Prof. William Albrecht experimented at the University of Missouri soils lab and showed that while nitrogen is needed for growth, too much brings pests. In the 1980's Prof. Philip Callahan from the University of Florida proved that if protein synthesis dominates then pests' attacks on crops are negligible, and when crops are in a healthy stage, the electronic/smell communication between plants and pests are also negligible. When plants are in poor health, they send a signal to insects the same as any living thing that is rotting – strong ammonia smell and wavelength.

But the bomb-shell was the research of Francis Chaboussou. He wrote that before the year 1945, aphids, mites, nematodes, and psyllids were not major threats to agriculture in Europe. Before 1945 when nutrition was lacking, insects were problems, but not aphids, mites and psyllids. So what happed after 1945 in Europe? The farmers started to use chemical pesticides such as DDT, 2,4-D. For some 70 years chemical pesticides have been used to control pests farmers considered damaging to their crops, but for the last 20 plus years the fight or "war" against pests has been a losing battle.

According to Prof. Chaboussou, "proliferation {of mites and aphids} is linked to a diet rich in soluble substances such as free amino acids, along with reduced sugars as a result of certain pesticides." The professor spent many years in France studying the effects of 2,4-D and other pesticides on plants. The results are that most pesticides speed-up the growth process in plants like auxins and gibberellins but plants cannot keep up with the nutritional requirements leading to a lack of protein synthesis, which, in turn, results in weak plants that fall prey to pests, etc. Japanese researchers have shown that rice borers always multiply on rice treated with either 2,4-D or DDT.

The conclusion is that the use of chemical pesticides is the main cause of infestations of mites, aphids, psyllids, and nematodes. The solution is to stop the use of these chemical pesticides, not only because they are very dangerous to human health, but that they are the main cause of the pests which are attacking the farmers' current crops. The farmer must also remember that plants need adequate nutrition in terms of the 80 plus minerals such as nitrogen, sulphur, silicon, calcium, carbon, potash, phosphorus, etc. To know what nutriments are necessary for energy, it is best for a farmer to get a soil test of his field or garden. If glyphosate has been used on the soil the microbes that provide energy to plants may also have been destroyed. The soil may have to be rebuilt. This takes time – sometimes over five years.

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Soil Inoculants
Nutrient Uptake, Water Use, Disease Resistance

By Dr. Stephen Zitzer

Understanding soil biology is important for keeping agricultural systems healthy and productive. Living soil is complex and includes creatures that cannot be seen with the naked eye, such as bacteria, fungi, actinomycetes, protozoa and nematodes, as well as familiar creatures such as insects and earthworms. One teaspoon of a healthy soil can contain billions of bacteria, fungi and other microorganisms. This community of organisms is bound together in a food web that affects the chemical and physical properties of soils. We care about these properties because they also affect plant growth and health. Practices such as adding manures or composts to soil, planting cover crops and rotating crops are all aimed at rebuilding and maintaining soil organic matter, recycling and retaining nutrients, and controlling soil disease and pest levels. These practices are usually associated with increased beneficial soil microbial diversity and abundance.

While there are examples of soil inoculants that successfully improve plant growth and crop yields (Table 1), their commercial production and use are still in their infancy. The success of a particular inoculant depends on direct and indirect effects on the desired plant species and interactions of the inoculants with the entire exiting soil biota land. Variation in soil physical and chemical properties, such as texture and acidity, also affect the success of inoculants. Finally, because inoculants contain living organisms, how the inoculants are prepared and applied can affect the outcome. Microbiologists think that the success of an introduced microorganism may be more linked to its ability to reproduce and establish populations in a particular niche around the plant root zone than to the numbers of the inoculant microorganisms applied. Introduced microorganisms must compete with those already in the soil and survive predation from native protozoa and nematodes. Introduced microorganisms can also be stressed by fluctuating soil water conditions, use of fertilizers or agrochemicals (both organic and conventional) and soil disturbance such as cultivation and erosion. Because of all these effects, introduced microorganisms may not persist for very long in the soil and the beneficial effects of an inoculant seen in the field are often less than those seen under laboratory or greenhouse conditions.

Commercial inoculants are formulated and sold as powders, granules or liquids. Inert materials such as peat moss are often used as a carrier to keep the organisms alive and aid in application. There are several methods for applying soil inoculants. These include coating seeds or seedlings or applying directly to the soil. Direct soil applications are made at the plant base near the roots. Different formulations require different application methods. The manufacturer's recommendations should be followed carefully for the best chance of success. Nothing should be added to the inoculants before application, especially those that might have properties that can kill bacteria or fungi.

Shelf life can also be an issue. Because the formulations contain living organisms, they should be kept in a cool place and, once mixed up, used as quickly as possible. As with any agricultural product, the user should pay attention to basic safety precautions and follow the label instructions. Although the inoculants are not human pathogens and manufacturers are required to take precautions to prevent contamination with other microorganisms, users should take common sense precautions. These include not breathing sprays, not exposing skin to the inoculant mixture and washing hands after use. The use of soil inoculants has promise for use in agricultural systems for improving nutrient status, water use efficiency and reducing plant diseases and pests, resulting in improved and sustainable yields. However, management practices such as rotating crops, growing cover crops and adding organic fertilizers and soil amendments provide similar benefits. The complexity of the soil and agricultural production systems makes it difficult to predict whether soil inoculants will perform as expected, and laboratory-raised inoculants often have a difficult time competing with native microorganism populations. Consequently the risk of an inoculant containing a harmful non-native invasive microorganism is relatively low, though it is still possible!

Table 1. Inoculants that have been shown to be effective in field studies (summarized from multiple sources).

Organism	What It Does	Crops	Persistence
Rhizobium species	Form nitrogen-fixing nodules on roots of legumes	Legumes	Several years if legumes are regularly grown.
Azospirillum, Azobacter, Bacillis, and Burkholderia	Rhizosphere bacteria that fix nitrogen.	Corn, rice, wheat	Occur naturally in many soils and persist for years depending on soil conditions.
Mycorrhizal fungi	Increase uptake of phosphorus, other nutrients and water. Increase disease and drought resistance	Most crops except spinach broccoli and cabbage	Several years if host plants are grown.
Bacillis, Pseudomonas, Streptomyces, and Gliocladium species	Release inhibitory compounds and activate plant resistance against numerous plant diseases above and below ground.	Cucumber, melons, squash, leafy vegetables	Populations decrease over time to low numbers in the soil.
Bacillisthurigiensis	Kills larvae of butterflies, beetles, fly larvae and nematodes	Most crops	Less than 4 days on foliage, 3 months in the soil.
Trichoderma species	Rhizosphere fungi that release anti-pathogen substances and promote plant growth	Flowers, ornamentals, vegetables, root and fruit crops	Survive indefinitely in lower numbers in most soils

BEYOND THE BACKYARD

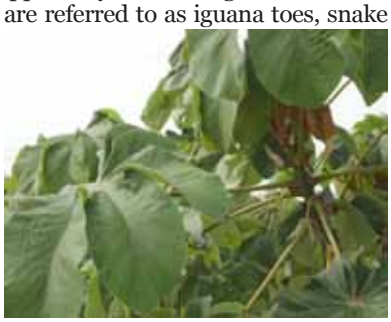
TROPICAL PIONEERS

By Jenny Wildman

Two trees that could be confused at a distance and have a lot in common are the trumpet tree and the balsa tree. Both arrived in my garden uninvited but the more I study them my respect increases. They are both fast growing indigenous jungle plants that play a very important role in the eco system.

Cecropia, named after the mythical first king of Athens, Cecrops, may have about 25 species in Belize of the family Urticaceae. Perhaps the most common is *Cecropia peltata* called the umbrella tree, embauba, trumpet tree, guarmo, yarumo and kooche as it is everywhere you look. It has been a seriously studied jungle weed due to its interdependency with biting Azteca ants which colonize its hollow stalks and feed exclusively on the muellerian food it provides. In Central America the leaves are also important food to howler monkeys, tapir, deer, sloths, birds,and bats plus a nesting place for chachalacas and an egg depository for the Cecropian Orion or stinking leaf wing butterfly.

When the leaves are salted, cattle will eat with gusto. Flowering is between May and August and the following fruit achenes are edible, highly nutritious and apparently taste like figs. The bunches look like stubby fingers and are referred to as iguana toes, snake fingers and dead man's toes. With such names I was reluctant to take that first bite. Not unpleasant, but as some say, the female fruit is delicious in dry weather; perhaps the ones I tasted were not quite ripe, a different variety or the wrong gender. Could be an acquired taste.



The traditional medicinal uses are mashed leaves to reduce swelling, leaf infusions to treat high blood pressure, diabetes, respiratory infections, asthma and calm coughs. A typical treatment is a cup of tea two or three times a day. The infusion can also be used to cleanse external sores, feminine hygiene and pain. Powdered leaves have been used in trials for Parkinson's disease and ground roots for eczema. In the USA patents were filed for extracts to be used for cosmetics, dermatology and slimming aids. The crushed root is also given to dogs that have had snake bites. Shredded bark and latex sap are used as a poultice for warts or to stop bleeding. The wooly material is smoked by Mexican Mayans and the leaves can be rolled and smoked like a cigar but I am not recommending this. The hollow stems make blow guns, water pipes, ceremonial trumpets and the wood for musical instruments and model making. The fibers from the bark make strong rope and the tree trunks, excellent long lasting rafts.

The cecropia has been used to prevent soil erosion and grows rapidly in sunlight. Due to its easy pollination and lack of predators it has been treated as an invasive species. Time to take a better look at this pioneer tree.

Balsa, which comes from the Spanish word meaning raft, is Ochroma, a member of the mallow family also known as polka. *Ochroma pyramidale* and *lagupus* are species grown for export in Papua New Guinea in defunct plantations of abandoned crops, not by deforestation. They are grown from seedlings with no pesticides. In Ecuador, the largest exporter of balsa, it is called boya, meaning buoy again signifying its prowess in the water. In 1947 a raft constructed of nine 45 foot long balsa logs strapped with rope of bark, decked with bamboo, a mast of mangrove and a cabin thatched with banana leaves set sail on the Pacific Ocean. The famous Kon Tiki expedition led by Thor Heyerdahl manned by six Norwegians and a parrot sailed from Peru to the Polynesian Archipelago. The indigenous materials, probably including cecropia, were to prove logistically the existence of ancient trade routes and the ethnic origins of man. Further daring expeditions were made and in 1973 Las Balsas became the longest raft voyage in history with a flotilla of balsa rafts.

The balsa spreads its seeds far and wide making its scattered jungle habitat a harvesting challenge. In the wild the balsa is considered a good nurse plant as its large leaves shade the slower growing plants under its canopy. However this is also a way of slowing other plants' growth and ensuring its own survival by being able to conserve enough nutrients. It is a therefore competitive; so unlike cecropia in the wild not too many of the same species survive in close proximity. As the tree grows, the size of the leaves decrease from several feet to ten inches, resulting in a simple but unique mallow shape.

The tree does not have annual growth rings but with its speed and lightness grows about fifteen feet a year to a majestic 90 feet in ten years. Logs are usually harvested commercially at five years when their diameter is 45 inches. If not harvested the tree trunk could grow to a diameter of six feet, hollow inside with a strong exterior.

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Beyond the Backyard... *Continued from Pg 10*

After three or four years just after the rainy season the tree begins to bloom. A huge single flower shaped like an Italian ice cream cone arrives late in the day filled with nectar that attracts a host of nocturnal visitors. Coati, kinkajou, opossum, and bats dine on this late night sweet treat and incidentally act as pollinators. In the morning the gregarious birds and buzzing bees take over. The fruit is a pod resembling a rabbit foot which is full of fluffy kapok that can be used to fill pillows and upholstery. The pod explodes with seeds attached to a furry golden strip resembling a caterpillar that floats on air until landing.

Balsa is perhaps best known by model makers. It is easy to whittle and makes good strong usable lightweight sheets which traditionally were used to make aircraft starting in World War II as a substitute for cork. Jeff Taylor from Akron, Ohio built drones from balsa which were flown in Belize to monitor illegal fishing. His drone, Event 38, has been used to discover further Maya ruins in Mexico and in agriculture to monitor crops, determining the best growing conditions of various varieties.

The lightness of the wood is due to the ratio of the solid mass to open space which becomes filled with water holding the tree trunk high and strong. Balsa is also low in sticky lignin; once the water is carefully removed the light wood that we know as a craft item remains. For health the roots and bark can be boiled to a tea and used as a diuretic. The flowers and bark concoctions for coughs and even as emolument for moisturizing skin. So the tree has something for everyone.

In conclusion, both trees have contributed vastly to the continuance of life across continents and are valuable assets to our environment.

Topical accounts you will enjoy:

A must to view the photography of Christian Ziegler - The Balsa Tree- Party at the Nectar Bar.

To view plantations, harvesting and manufactured products pngbalsa.com

Messages from the Gods by Rosita Arvigo and Michael J. Balick, a guide to the useful plants of Belize, an excellent insight into the beliefs and traditions regarding native plants complete with photographic identification.

As always love to hear your comments and insights.

Jenny Wildman
bayshorelimited@gmail.com

Pictures courtesy Xen Wildman

Corn That Says "No"... *Continued from Page 7*

Currently, Blue River Hybrids has been the largest company selling the PuraMaize corn seed. It has averaged a yield of 190 to 200 bushels/acre in Iowa test plots making it competitive with other widely grown varieties in the Midwestern corn belt. At least two other smaller companies in Iowa and Minnesota provided PuraMaize seed to farmers this year. The other breeders which are currently developing more "organic ready" varieties are working on some open-pollinated corn, but it is still in the research phase. Breeders in Florida, Georgia, and even Chile are also getting involved in the process of developing these corn varieties.

In the international export market, conventional non-GM corn typically receives a $.40 to $.50 USD/bushel premium over GM corn with specific food grades known as "identity preserved grains" selling for much higher premiums. As breeders continue to develop varieties that can remain GM-free, this could benefit countries such as Belize. Once permanent port infrastructure to facilitate bulk export is in place, Belizean farmers may have an opportunity to grow conventional corn and receive a higher price using these GM-pollen-resistant varieties.

Editor's Note: Sam Vigue currently lives in Austin, TX. He grew up in Central Illinois, and received a Bachelor of Science degree from Iowa State University in agronomy, seed science, and horticulture. His interests are centered on improving the food supply through better farm practices. Sam works as an agronomist for Green and Grow, Inc. in seed treatment research. In his spare time, he does research and consulting on sustainable farming methods. He is especially interested in improving the availability of seed varieties that are adapted to local conditions.

PuraMaize description and illustration was provided by Blue River Hybrids. Blueriverorgseed.com

Information sources: "This Breeder Is Working on 'Organic Ready' Corn That Blocks GMO Contamination | Civil Eats." Civil Eats This Breeder Is Working on Organic Ready Corn That Blocks GMO Contamination Comments. 5 Sept. 2014. Web. 9 Oct. 2015. "'Organic Ready' Corn: The Fight to Stop GMOs." Triple Pundit People Planet Profit. 20 Apr. 2015. Web. 9 Oct. 2015.

Why Sulfur?

By David Thiessen

Although elements nitrogen, phosphorus and potassium, usually referred to as NPK, are the major considerations for fertile soil by farmers, sulfur should be considered the fourth major nutrient in terms of the amount required. Most crops use between 40 to 90% as much sulfur as phosphate. Corn, sorghum and rice use around 35% as much sulfur as phosphate; citrus and sugarcane, about 50%, but cabbage and onions, 90 to 110%.

There is a difference between sulfur and sulfate. Sulfur is an element, S; sulfate is sulfur combined with oxygen, SO_4. When you compare phosphate, P_2O_5, with sulfur you should use the sulfate form of the element to obtain an accurate comparison. Although soils are tested for the elements, it is the sulfate form broken down in the soil that the plant uses. And the higher the phosphate level the more sulfur is needed because phosphate is more stable than sulfate in soil; it doesn't leach away as sulfate does and is more readily absorbed. When the soil doesn't have enough sulfur, marked losses in production result and you may not be getting your money's worth for all the phosphate you use. In addition, the younger leaves on your plants will be light green or yellow, especially on soybean plants. Corn leaves will have thin yellow lines.

On the other hand, if you have enough sulfur in your soil you will have more rapid root development during early periods of growth, especially corn and citrus. Sulfur promotes nodule formation on legumes, aids in seed production and is necessary in chlorophyll formation. Sulfur is also important for increasing the protein content of crops. That's because, in part, sulfur is one of the components of some amino acids, protein, and co-enzyme A, which plays a crucial role in enzyme catalyzed reactions within the plant. And taste? Sulfur improves it. Tests have shown that farmers who use sulfur to grow watermelons report a substantial improvement in taste. The same goes for corn; sulfur makes it sweeter. A green bean farmer reported that when he applied sulfur to the soil before planting, the green beans had good quality and stayed fresh-looking even after 3 days in the cooler instead of becoming limp at the end of the day of picking.

The Sulfur Institute recommends nitrogen to sulfur ratio at least 10 to 1 but your soil base saturation and crop requirement may be different and your ratio might be better at 5 to 1. The minimum amount of sulfur in your soil should be 20 parts per million (ppm); that's an application of 40 to 50 pounds per acre. For high-yielding crops, pasture and fruit trees the amount of sulfur should be double that minimum. At the very least, sorghum requires 34 pounds of sulfur for a 180-bushel yield and soybeans, 27 pounds of sulfur for a 60 bushel yield.

If you have too much calcium and magnesium in your soil you can reduce them with sulfur. It takes 2 pounds of sulfur to reduce 1 pound of calcium and about 2 pounds of sulfur to reduce 1 pound of magnesium. Monitor the effects by rainfall or irrigation water which leaches out the sulfur that takes the magnesium with it. According to Neal Kinsey in his book *Hands on Agronomy*, the closer the calcium-magnesium balance, the less fluctuation in the sulfur level. Once equilibrium is achieved, it is not as easy for sulfur to be leached away.

But don't use too much sulfur because excess sulfur will compact the soil. It is best to test your soil to determine how much you need.

Comments and questions welcomed at thiessenliquid@gmail.com

The Soils of Belize by District/Region
The Belize District-East to West
By Harold Vernon

My last article (issue 29, Aug 2015) introduced the soils of the Belize District along and from the sea coast. This article is a further exploration of these soils extending westwards into the Cayo District as these soils are related to the course of the main agents of formation, the southern Belize and Sibun Rivers. We go from swamps to elevations of about 200 ft that have been formed by the Belize River in the north and the Sibun River, including the Caves Branch tributary, in the south. A major characteristic is the presence of relatively large and minor lagoons, creeks and streams. As the elevation rises the containing lowland pine ridge gives way to broken ridges interspersed with areas of broadleaf forest on undulating lands going to the west. Phosphorous is generally deficient.

These soils of the lower Belize River Valley, on the eastern seaboard, are mangrove swamps and do not have a true coastline. The soils are mucky and in many areas are impacted by a high water table that has saline intrusions. The lowest lying areas can be considered to be the Belizean lake district due to the presence of many water bodies, with the largest lagoons and lagoon systems (Crooked Tree Lagoon/Black Water Creek, and Northern/Manatee/ Western Lagoons) occurring here. The associated soils are mostly leached of granitic origin located on top of old alluvium that has compacted into hard pans (spodosols). The few good cultivable soils (inceptisols and entisols) occur in thin parcels along the river courses with high flooding a principal feature necessary to supply nutrients. Rice has been the historical crop in flooded areas with vegetables and fruits grown in the more arable soils.

The coastal soils give way to savannah grasslands that typically occur on lowland pineridges. These pineridges extend all the way to Belmopan although there are areas that are associated with the high limestone present in the areas in and around Belmopan. We also see the first introduction of heavily forested areas on heavier soils similar to mollisols (high organic matter with clear layers) and also somewhat like the heavy, black clay soils known as the vertisols. Limestone or other calcitic materials are mainly responsible for the nutrient status which can range from poor to modest.

Going further west in the low hill country, undulating terrain is present with larger, cultivable spreads especially on the north side of the Belize River including terraces such as in the areas now being used for sugar cane but were traditionally cleared and used as pasture. Some areas are now being used for crops such as corn, sorghum and beans (red, black-eye and soya) along with some rice and other minor crops. Most of the country's vegetables are produced on the better quality soils, i.e., having better textures and structures.

Two more types of soils occur but these are in the uplands of the Cayo District, known generally as the Pineridge and the North Chiquibul. Most of the northern uplands contain highly leached soils known as oxisols with highly oxidized red color of the native iron, or,in the extreme, known as ultisols that are friendly only to pine trees, low shrubs and colonizing species. The southern portions contain some fertile mollisols in small areas of plateaus but are located mostly in reserves and so are unavailable for agriculture.

Please send your comments and questions to hmvernon@yahoo.com.

Both Soils and Crops Need Boron

By Neal Kinsey

More often than not, the soils we receive to be analyzed for growing all types of crops are deficient in several micronutrients, but the one that requires constant vigilance to assure the greatest success is boron. Like nitrogen and sulfur, boron can be leached from the soil. So just as is true concerning sulfur, it is necessary to test for boron content and generally expect it to be required to correct the soil accordingly from year to year.

Although it should be, boron is not usually considered as a necessary addition for growing most crops including corn, soybeans, wheat, vegetables and even pasture. Without adequate boron more nitrogen is needed in order to produce the same amount of growth. Consequently, it needs to be present in sufficient amounts as plants begin to grow and throughout the growing season. Apply boron to your land based on need as established by a reliable soil test, not by guessing whether it is or is not needed.

The boron level in the soil should be at least a minimum of 0.8 ppm. But because it can be easily leached with rainfall or irrigation water, enough material should be applied to build for a higher level, and a 1.5 to 2.0 ppm is considered ideal. Excellent boron levels are only desirable when there is sufficient calcium and phosphorous. Though it can still be helpful, there is no need to expect the best response under circumstances where either one is not at sufficient levels.

In fact, calcium and boron work together in the soil, as plants need sufficient calcium to take up adequate boron and enough boron is needed in the soil to assure that calcium is taken up by the plants. Also, if phosphate is deficient in the soil, boron will not fill the seed or grain to the same extent as would normally be the case.

For example, one corn farmer, new to the program, always had problems getting his corn to fill all the way to the tip of the cob. Though many in plant genetics may disagree, once the nutrient levels are completely met for producing the desired corn yield, if boron is not kept above 0.80 ppm, the kernels toward the tip of the cob will not fill completely to the end. How many bushels of corn grain are lost due to that lack – even at ¼ inch per cob per acre?

This farmer had low phosphate levels in his fields. We recommended both the needed phosphate and the boron. However the farmer was convinced by his fertilizer dealer that his s oils had adequate P levels and only needed a little starter P. Though sufficient boron was supplied, the tips of the cobs still did not fill to the end. That same farm is still in our program. Once the needed P was supplied, and the boron level continued to be maintained, the cobs began filling out completely to the end and the yield increase from that extra grain is now a reality.

A lack of boron can also be caused by applying calcium or potassium excessively. Either case will cause boron to be tied up in the soil. Yet the more deficient the calcium saturation is in soil, the more likely boron toxicity problems will occur. So again, a balance between all the soil nutrients is needed for best results because one nutrient must be there to do its job in order to help the other nutrients to properly do their job.

Too much boron can be toxic to growing plants, so be careful not to apply more than is shown to be needed for obtaining excellent results. Clay soils can be built up to the point that boron is sufficient for a crop or even several cropping seasons. Sandy soils are much harder to build, and at times, it may not be even safe to apply the amount needed to produce the best results. Again, only a reliable soil test can safely provide that critical information. Just guessing can be extremely expensive in such cases!

Editor's Note: Neal will return to Belize to again deliver his Introductory Soil Fertility Course on February 8th, 9th,& 10th, 2016 at UB Central Farm. See ad below for registration details. For a headstart, read Neal's book: Hands-On Agronomy.

The Tropic Rice Part of "Rice and Beans"

By Dottie Feucht

The seeds of the rice plant are the grain that we eat in our rice and beans meal. Like most grains, the seeds have to be threshed to remove the hulls. In the old days this was done by swathing or bundling the stalks together and beating them in troughs manually. But not in Spanish Lookout where Tropic Rice uses the latest technology to mill rice. Paddy rice, as the grain coming to the mill is called, has to have only 12 – 13% moisture for milling. Sample paddy rice is tested for moisture and quality; the price to the farmer depends on both.

The first stop in the mill is a holding bin. The rice is unloaded and from there it goes through a pre-cleaner, and then to a paddy husker where the rice husks are removed and discarded. Next is the paddy separator, which removes the kernels that didn't husk from the brown rice. Rice to be made into white rice then goes through an abrasive whitener that removes the bran from off the kernel, after which it enters the polisher where the rice is brought to its natural whiteness using clean water and gently rubbing the kernels. Brown rice bypasses the whitening and polishing processes. The rice, either brown or white, goes through another sifter where it then enters the grader. The grader sorts the rice according to length, removing broken kernels and leaving the complete kernels to enter the next stage, which is a color sorter. It is a highly computerized machine that uses high-definition Nikon cameras to scan each individual rice kernel, and ejects any discolored or unwanted rice using compressed air. This eliminates the need for hand-picking the rice. The rice is then bagged in 20, 50 or 100 lb bags or packaged into 2 and 5 lb packages using a vertical form-fill-seal machine. The next machine bundles the packages into 50 lb bales, the final step, making the product ready for distribution. The color sorter and the packaging line are the latest addition to the mill and really help to make a superior quality rice packaged professionally.

This year the harvest in Spanish Lookout is less than 50% compared to 2014 because of the drought and less acres were planted. Some growers were not able to salvage anything from their fields while others used it for chicken feed. Irrigated fields still made good yields. In spite of the below average harvest, Spanish Lookout has enough rice in storage to meet market demand; so production at the mill has not been reduced.

For more information, visit Tropic Rice's website at www.tropicrice.bz. Information for this article was sourced from the website and visits at the milling facility with manager Ray Dueck.

Silicon's Role in Rice Production
Reprinted from Acres USA
www.acresusa.com

Silicon (Si) is the second most abundant element of the Earth's crust after oxygen. It has long been neglected by ecologists, as it is not considered an essential nutrient for plants. However, research in recent years shows that it is beneficial for the growth of many plants, including important crops such as rice, wheat and barley.

For instance, Si enhanced the resistance against pests, pathogens and abiotic stresses such as salts, drought and storms. Silicon might, thus, play a crucial role in the development of sustainable rice production systems with lower or zero input of harmful pesticides.

Researchers from the interdisciplinary LEGATO project on sustainable rice production looked in more detail at the cycle of plant-available Si in contrasting regions of Vietnam and the Philippines to provide insights on the importance of this element in rice production.

An article published in the journal Plant and Soil reports on Si cycling and budgets on the farm level in the Laguna province of the Philippines. The data shows that the irrigation water can provide a considerable amount of the Si that is taken up by plants. In rainwater, the concentrations of Si were below the detection limit of the analytical method; the researchers, thus, assume that rain is not an important Si source for plants.

Another major source of plant-available Si is the dissolution of solid soil particles. In a subsequent study, the LEGATO researchers focused on the soil processes that determine the pool of plant-available Si during the growing period. Recent literature suggests that the recycling and decomposition of rice straw plays a crucial role for Si availability. The farmers should therefore recycle the straw completely.

This is not done by all of the farmers that were interviewed within the LEGATO project, i.e., some of them remove part of the straw and use it, e.g., as fertilizer on vegetable fields. Over the long-term, this could have negative effects on the Si supply to rice plants. Particularly in regions where soils are strongly weathered and the Si availability is therefore very low, farmers should consider Si availability as a factor in the management of the rice field.

Reprinted from ACRES USA The Voice of Eco-Agriculture September 2015 issue # 531

Agriculture Prices at a Glance- $$$$$

NOVEMBER 2015

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

BELIZE CATTLE		T	A	B
Steers/Bulls, 750-1100 lbs	Cayo	L	2.20	2.00
" "	Blue Creek	L	2.50	
Weaner Steers	Cayo	L	2.40	
" "	Blue Creek	L	3.00	
Heifers	Cayo	L	breeding 2.50-3.00	cull 1.90-2.00
"	Blue Creek	L	" 3.00	
Cull Cows	Cayo	L	1.80	1.16
" "	Blue Creek	L	1.90	1.85

U.S. CATTLE			
U.S. price - corn fed - 1000-1200 lbs	L	US$ 1.3790	
U.S. price - feeders 600-800 lbs	L	US$ 1.81625	

BELIZE HOGS			
Weaner pigs - 25-30 lbs - by the head	S	100.00	
Butcher pigs 160 - 230 lbs, per lb	L	1.95	1.75

BELIZE SHEEP			
Butcher Lambs	S	3.00	2.50
Mature Ewes	S	2.75	2.50

BELIZE CHICKEN			
Whole sale dressed (Sp Lkt)	S	2.48	
Whole sale dressed (Bl Crk)	S	2.50	2.46
Broilers - live per lb (Sp Lkt)	H	1.26	
Broilers - live per lb (Bl Crk)	S	1.30	
Spent hens per 4 lb bird (Sp Lkt)	S	4.00	
Spent hens per 4 lb bird (Bl Crk)	H	4.00	

CITRUS		
Oranges per lb solid: Harvest starting late, price not available for new crop 2015-16		
Grapefruit per lb solid	H	first est price $2.5219 Advance to growers $1.6439

COCONUTS		
Green Coconuts, del'd to Cayo, bulk	S	sm .40 med .45 lg .50
Dry Coconuts, del'd to Cayo, bulk	S	.35 - .40

GRAINS, BEANS & RICE	T	A	B
Belize yellow corn, bulk (Spanish Lookout)	L	N/A	.27
Belize yellow corn, bulk (Blue Creek)	H	N/A	.30
Yellow corn/local retail (low volume)	L	.30	
Belize white corn, (Cayo)	H	.45	.40
US Corn	L	US$ 3.7300/56 lb bushel	
US organic, yellow corn feed grade	L	US$ 10.42/56 lb bushel	
Belize soy beans (Spanish Lookout)	L	.46	
Belize soy beans (Blue Creek)	L	.52	
US soy beans, #2 yellow	L	US$ 8.6750/60 lb bushel	
US organic, feed grade soy	L	US$ 21.36/60 lb bushel	
Belize milo	S	N/A	
Red kidney beans (Spanish Lookout)	L	.70 farm price	
Black eyed peas (Spanish Lookout)	L	.90	.68-.73
Black eyed peas (Blue Creek)		.85	.80
Paddy rice per pound (Spanish Lookout)	S	.40 -.53 farm price, dried	
Paddy rice per pound (Blue Creek)	S	.45 -.50 farm price, dried	

SUGAR/HONEY		
Sugar cane, ton, final for 2015 crop	H	75.89
Sugar cane, ton, estimate for 2016 crop	L	41.56
Bagasse	S	pending agreement
Honey per lb (Cayo)	S	2.50 (approximately 12 lbs/gal)
Honey per lb single source/varietal (Cayo)	S	3.75 (approximately 12 lbs/gal)

SPECIAL FARM ITEMS		
Eggs - tray of 30	H	5.58 farm price
WD milk per lb to farmer	S	.57 contract ; .57 non contract
Raw milk (farmer direct sales)	S	8.50 gal (5 gal + 8.00 gal)

CACAO		
Cacao beans (TCGA) /lb	S	3.00 dried fermented
Cacao beans (TCGA) /lb	S	1.10 wet beans
US Cacao beans, metric ton, New York	H	US$ 3,318.56

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

BIRD WATCH - FROM MY PERCH
By Marguerite Fly Bevis

Chiquibul Adventures - Watershed Awareness
Solitaire Canyon River Expedition

Photos courtesy of Tony Rath

With the aim of further exploring and understanding the Chiquibul National Park, the Friends for Conservation and Development (FCD) and Mountain Equestrian Trails (MET) completed another exploratory expedition on an un-explored river in the western jungles of the park during the month of August. Jim Bevis shares the essence of the team's experience:

We entered the crystal clear river with inflatable kayaks at a remote location on the western base of the Maya Mountain Massif. The purpose of the expedition was to explore the downstream and photograph points of interest in the 14 miles stretch for a period of five days. Soon after casting off from the north side of the river, we entered a rugged and beautiful steep walled limestone canyon, where in places the swift and turbulent floodwaters of many millennia had cut deep and smooth into the polished limestone walls. The upper part of this river was somewhat shallow in places and much of the first day was spent dragging our kayaks through and over basketball-sized "boulder gardens" to the next pool of deep water. We would paddle slowly until encountering the next set of shallows. It became evident fairly early on that we were the first ones, in modern times, to venture downstream and it was refreshing for us to see a place where no humans since the time of the Maya had chopped a branch or marked the ancient sapodillas. We heard within these jungle covered canyon walls the primal calls of howler monkeys, the loud squawks of the scarlet macaw and the ethereal flute-like song of the slate-colored solitaire above us as we passed through their territories.

On the second day, we encountered a large unexplored cave, which had not been visited since the original Maya inhabitants who had dwelled within and now their descendants stood proudly in awe at what their forefathers had left for them to marvel at and discover. There was a stream running through the long cathedral like cave, with a large pool in the center and along the sides of the main cave were found chambers with stacked stone flattened areas and limestone middens (refuse heaps). Because of the presence of the stream a light algae green hue covered some of the stalactites that hung from the tall ceiling.

On day three, just as the river was becoming more navigable, we came upon a group of massive rocks in the middle of the river, directly in front of a great limestone wall, several hundred feet high which was wedged across the canyon blocking the entire river from side to side. At this point we stopped as the river continued flowing between the big rocks and seemed to disappear under the great wall. After a quick survey by Arran Bevis and the FCD Rangers to follow the course of the river into the dark passage beneath the wall, it was determined that this was a huge fallen limestone arch, which had collapsed straight down at some point in time leaving a very low passage

Continued on page 21

BIRD WATCH...Continued from page 20

between the old limestone ceiling of the arch and the surface of the river. This was the only route and was barely passable for the kayaks and us to get through to the other side. Once on the other side of the wall, it took several more hours to portage our kayaks and gear around and over even more large boulders that were strewn for about a quarter mile on the downstream side of the wall. It was in this area, before going through the wall, that we saw a spider monkey troop hanging out in a tree beside the river.

For our 6 member team, comprised of Jim & Arran Bevis, Tony Rath and Rangers, Gliss Penados, Wendy Garcia and "Starvin" Marvin Puc, from FCD, it was an incredible opportunity to gather knowledge and understanding of the conditions of this river and document with photos another unspoiled area of the Chiquibul National Park.

Tony Rath continues to amass a wonderful photographic portfolio of these untouched and unexplored locations in the Chiquibul, identified from a map and exploring them consequently on the ground. It has become obvious after doing this for a while, that these photos need to be shared and the stories narrated on a world-class "Coffee Table"book. The book would also illustrate and document via photos and text the continuing evolution of FCD and the life of the FCD Rangers. These brave young men continue to protect the park from incursions, map remote locations, conduct baseline and inventory studies on flora and fauna, and educate the public about the importance of the Chiquibul National Park. The book will also serve as a tool during public presentations and promote Belize's case internationally for designating this largest contiguous unspoiled jungle forest in Central America as a World Heritage Site.

Watershed

The Chiquibul National Park has an abundance of wildlife, incredible beauty, and protection efforts are currently underway. But one fundamental resource that people need to be more aware of is water. The Chiquibul Forest and the Mountain Pine Ridge Forest Reserve provides water to more than 100,000 Guatemalans and to more than 130,000 Belizeans who live on the Chiquibul, Mopan and Macal watersheds. The Mountain Pine Ridge is also the principal watershed area for the Sibun River. It is no longer a theory, that the clearing and adverse disturbance of watershed areas has dried up rivers. Great rivers have dried up or are quickly drying up in Africa, South America, Central America and the United States. The resultant cleared areas become very hot. Heat rises and literally 'chases' away the rain. Let me be clear. If we allow the Chiquibul Forest and the Mountain Pine Ridge to go unprotected and be irresponsibly developed, it will be destroyed bit by bit and eventually the water supply will also be gone. Watershed awareness is a topic that you will start to hear more about in the near future. Every Belizean needs to know what is at stake.

The work of FCD is extremely important and I am grateful for all those individuals and companies of Belize who banded together to support hiring more rangers for FCD through the FCD Telethon. With that help more rangers are now patrolling and working and taking care of the Chiquibul. Thank you, and please participate in the fund-raising efforts of FCD.

Team Picture from left to right: *Wendy Garcia, Gliss Penados, Tony Rath, Arran Bevis, Jim Bevis and Marvin Puc*

Reminiscing with Joe Friesen Sr., Cattleman Par Excellence

By Feucht/Roberson

Of all the families who moved to Belize from Chihuahua, Mexico in 1958 one of the largest families was the Peter Friesen family. Joe, who is the second oldest of 11 children was 6 years old when his family moved from Manitoba, Canada to Mexico and 16 when they moved to Spanish Lookout. As a pioneer in the developing country Joe's father, Peter Friesen, did lathe work and made his own machinery for whatever he needed.

They settled in Spanish Lookout on lands along the Belize River. At the time, it was in bush with many cohune trees and much bamboo. Rather than bring cattle from the 7,000 ft elevation area they left in Mexico, they purchased Brahman-type cattle from local sources, such as Eduardo Juan, Trinidad Juan, Negroman {Ranch} and the Delafuentes.

Beginning in 1964, Joe began marketing cattle, a trade he would carry on for over 40 years until 2004, when he would turn things over to his sons. In the mid 60's, Joe sold 2 head per week, from his farm and from others in Spanish Lookout, for which the farmers received 11 cents/lb live wt for good cows, and 14 cents/lb live wt for the best steers – all local type Brahman. As the country was trying to increase the national herd, every heifer and cow had to be pregnancy-checked and receive a permit from the veterinary section before slaughter. In those days, with often muddy roads, Joe took them to Guy Nord's ferry at Barton Ramy to cross the Belize River. Hauling cattle to the river was done with a mule leading the way, with a cow tied to it, then Joe behind. On the South bank a waiting truck took them to Belize City for slaughter.

Some Mennonites from PA in the US established the Mennonite Center in Belize City. The Mennonite Center purchased the cattle, slaughtered them and sold the meat. Eventually, when this PA group felt that the Spanish Lookout community could 'stand on its own', they returned to the US. The agriculture business at that location in Belize City is now the Belize Farm Center. After Hurricane Hattie in 1961, a NY Mennonite community helped Spanish Lookout's cattle industry by sending them 30 head of Holstein cattle – heifers and bulls. Joe purchased a few and began his dairy breeding program crossing the purebred Holsteins with the local Brahman, to eventually reach a 1/8th Brahman - 7/8ths Holstein, a bovine with black and white coloring and big ears. The cows, reaching up to 1500 lbs, gave higher production than the pure Holsteins here.

Joe was one of the founders of Western Dairies and manager there from 1978 to 1989; being on the board of directors in those early days meant being called in the middle of the night to go fix some malfunctioning equipment and being the first delivery driver to Belmopan, Belize City, Corozal and Orange Walk in a one-ton truck. He said he just wanted to get the dairy business going. Joe sold his Holstein/Brahman dairy cattle in 2009. Now many of the dairy farmers in Spanish Lookout have purebred Holstein; raising dairy cattle is quite different now. Special bulls were brought in from NY or El Salvador, and now many use artificial insemination (A.I.) to improve both dairy and beef herds.

Meanwhile, Joe continued with a beef line in addition to the dairy herd. Eventually he began to sell dressed meat, the first 20 yrs having been only live cattle sales. By 1975 he was marketing close to 30 head per week. In the mid-80's, they used the slaughter services of several, including Winston Smiling, the August family, Running W, and eventually Spanish Lookout's own Country Meats. In his last 15 yrs in the business, he sold between 5-10 head, 3 times per week, all as dressed meat. In the early 80's Joe began attending the Yucatán State Fair at X'matkuil, outside of Mérida, Mexico, and began purchasing Brahman bulls from the region. He is justly proud of his 1,800 lb Brahman cows and his breeding herd. The grand champion bulls at both the 2014 and 2015 National Agriculture and Trade Show (NATS) were JF Brahmans shown by son Cornie. They now have a waiting list for breeding bulls and heifers, and had their first production auction in September of this year.

Another need that Joe realized and acted upon, was livestock scales. In the mid-80's they began importing and distributing Oklahoma-made Paul Scales. These were first mechanical cable scales. Now many prefer the digital scales, as they are cheaper. The family still operates the scale sales and also distributes Filson chutes and squeezes.

Joe often assisted the community with veterinary issues. He studied vet medicine practices on his own as well as being taught much by an English veterinarian at Central Farm in the early

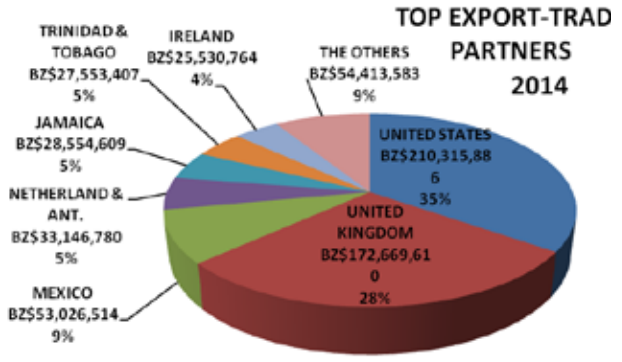
60's. He also served as a Director for the Belize Livestock Association (BLPA), although Joe admits "in those first years, it felt strange to be on a committee outside of Spanish Lookout".

Having adequate pasture all year long by not exceeding one acre per head of cattle, Joe believes, is essential good management. They run between 110 -120 head now on their 120 acres. In 1967 they hired a D-6 to clear and plow some of the land now in pasture. Joe selected a type of Bermuda grass known as blue-stem, from Eastern Texas, to plant. They have never re-plowed or planted it again in 57 years. They graze the cattle and also cut and bale hay from it in June or July annually, which enables good herd nutrition year round. Joe notes that the blue-stem actually does better in the warmer season, as it is not particularly suited to the cool wet season. It needs fertile soil, will tolerate a little flooding but not swamp. They also maintain in these same pastures, a native grass known as cable grass. This has a thick stem, does very well during the dry and is a favorite with the horses. The Friesens have to control the cable so it will not overwhelm the blue-stem. They graze some Brizantha and Mombasa grass for variety.

As Joe's 5 sons grew up, Joe Jr. and Cornie were the ones with the strongest interest in working cattle. Joe Jr created his own farm in the Iguana Creek area of Spanish Lookout, and Cornie manages the original Riverside Road home farm. Joe has turned most daily operations over to Cornie, especially following a 2009 accident in his corral, breaking both his hip and arm. Joe believes in allowing young people to take over responsibility and learn by making decisions, including mistakes sometimes; his sons assisted and made farm management decisions since they were 15 yrs old, so they are well experienced for taking the reins on the farms. As for working with cattle, Joe says "you have to have a relationship with your cattle... you have to talk to them", while realizing that "you can't sell the love for your cattle". Industries are built on the shoulders of their pioneers. The Belize cattle industry appreciates Joe Friesen Sr.'s contributions.

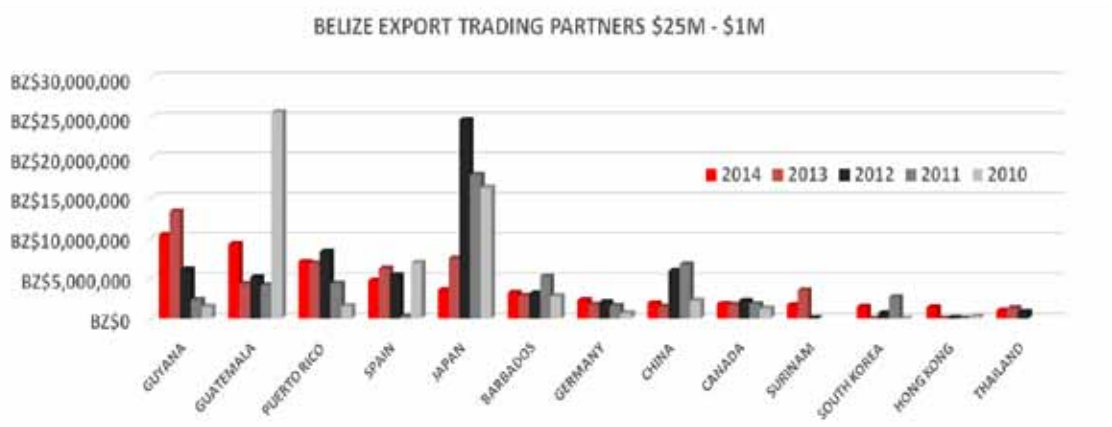
DGFT (DIRECTORATE GENERAL FOR FOREIGN TRADE)
TRADE INTELLIGENCE
2014 TRADE DATA DISAGGREGATION

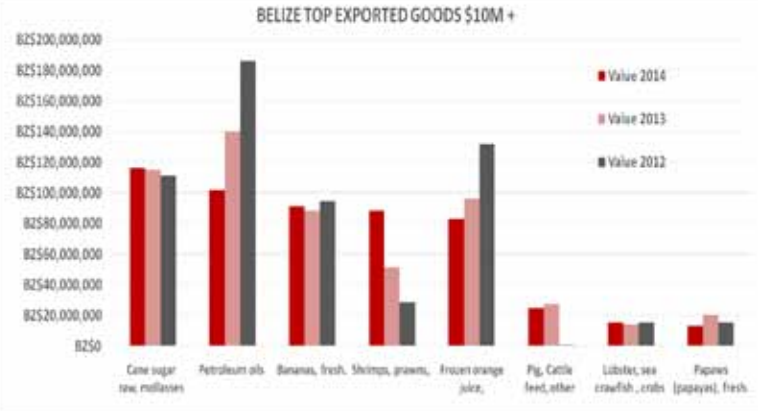
DATA EXTRACTED FROM THE STATISTICAL INSTITUTE OF BELIZE

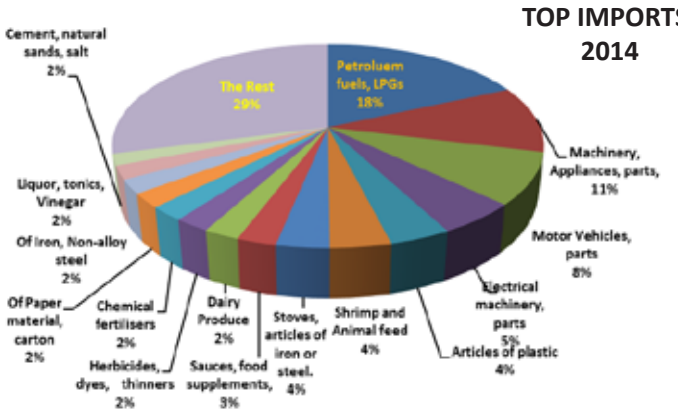


TOP EXPORT PARTNERS	Export 2014	Export 2013	Export 2012	Export 2011	Export 2010
UNITED STATES	BZ$210,315,886	BZ$245,327,559	BZ$307,117,340	BZ$308,060,353	BZ$245,146,696
UNITED KINGDOM	BZ$172,669,610	BZ$169,692,061	BZ$155,027,222	BZ$102,658,978	BZ$141,284,962
MEXICO	BZ$53,026,514	BZ$15,372,003	BZ$8,938,886	BZ$11,521,345	BZ$14,710,760
NETHERLAND & ANT.	BZ$33,146,780	BZ$45,794,774	BZ$51,505,608	BZ$13,594,453	BZ$20,657,258
JAMAICA	BZ$28,554,609	BZ$33,742,269	BZ$26,778,966	BZ$20,156,487	BZ$14,606,681
TRINIDAD & TOBAGO	BZ$27,553,407	BZ$32,570,423	BZ$32,384,816	BZ$20,735,084	BZ$15,366,825
IRELAND	BZ$25,530,764	BZ$26,415,221	BZ$18,879,292	BZ$0	BZ$0
TOTAL	BZ$550,797,570	BZ$568,914,310	BZ$600,632,130	BZ$476,726,700	BZ$451,773,182
TOTAL EXPORT TRADE	BZ$605,211,153	BZ$627,992,773	BZ$680,113,854	BZ$552,106,027	BZ$540,213,397
% OF TOTAL EXPORTS	91.01%	90.59%	88.31%	86.35%	83.63%

Partners	Export 2014	Export 2013	Export 2012	Export 2011	Export 2010
GUYANA	BZ$10,359,598	BZ$13,351,376	BZ$6,130,464	BZ$2,350,754	BZ$1,458,086
GUATEMALA	BZ$9,321,916	BZ$4,330,941	BZ$5,105,510	BZ$4,192,595	BZ$25,695,184
PUERTO RICO	BZ$7,068,903	BZ$6,844,261	BZ$8,317,882	BZ$4,367,714	BZ$1,528,121
SPAIN	BZ$4,705,547	BZ$6,261,097	BZ$5,439,470	BZ$317,313	BZ$6,920,491
JAPAN	BZ$3,524,112	BZ$7,533,172	BZ$24,784,718	BZ$17,962,889	BZ$16,353,340
BARBADOS	BZ$3,166,757	BZ$2,844,986	BZ$3,107,904	BZ$5,238,313	BZ$2,802,945
GERMANY	BZ$2,344,085	BZ$1,728,005	BZ$2,071,176	BZ$1,563,800	BZ$674,127
CHINA	BZ$1,939,902	BZ$1,468,336	BZ$5,978,616	BZ$6,728,115	BZ$2,270,849
CANADA	BZ$1,862,533	BZ$1,722,632	BZ$2,229,414	BZ$1,834,457	BZ$1,243,043
SURINAM	BZ$1,642,748	BZ$3,522,361	BZ$109,146		
SOUTH KOREA	BZ$1,444,516	BZ$14,171	BZ$689,364	BZ$2,681,856	BZ$1,412
HONG KONG	BZ$1,372,627	BZ$40,111	BZ$125,986	BZ$60,526	BZ$296,862
THAILAND	BZ$995,560	BZ$1,297,928	BZ$813,528		







Partners	Export 2014	Export 2013	Export 2012	Export 2011	Export 2010
VIETNAM	BZ$493,241	BZ$1,125,442	BZ$1,399,096	BZ$40	
EL SALVADOR	BZ$459,072	BZ$663,086	BZ$541,840	BZ$556,850	BZ$32,682
NEW TAIWAN	BZ$458,223	BZ$215,132	BZ$187,394	BZ$143,961	
ST-LUCIA	BZ$445,399	BZ$1,012,448	BZ$237,776	BZ$273,625	BZ$133,959
TURKEY	BZ$400,097	BZ$596,755	BZ$364,724	BZ$660,043	BZ$58,903
SINGAPORE	BZ$343,213		BZ$9,280	BZ$111,376	
PANAMA	BZ$296,641	BZ$222,504	BZ$70,744	BZ$69,739	
ITALY	BZ$208,723	BZ$345,372	BZ$2,916	BZ$114,084	BZ$119,776
SAUDI ARABIA	BZ$205,512	BZ$524,539		BZ$395,461	BZ$693,450
AUSTRIA	BZ$144,774				
INDIA	BZ$142,530	BZ$50,266	BZ$28,398		
ANTIGUA & BARBUDA	BZ$133,879		BZ$73,210	BZ$155,997	BZ$346,556
FRANCE	BZ$133,257	BZ$668,792	BZ$695,934	BZ$1,299,785	BZ$127,709
CYPRUS	BZ$101,916				
SOUTH AFRICA	BZ$61,558	BZ$8,532		BZ$11,537	BZ$1,584
BRAZIL	BZ$37,326				BZ$19,899
SWITZERLAND	BZ$30,258	BZ$464,652	BZ$1,350,174	BZ$184,408	BZ$131,138
HONDURAS	BZ$25,432	BZ$201,385	BZ$195,566	BZ$105,083	BZ$49,741
GRENADA	BZ$21,541	BZ$50,691	BZ$114,692		
ARUBA	BZ$17,653				
AUSTRALIA	BZ$4,276	BZ$167,069	BZ$454		
UNITED ARAB EMIRATES	BZ$679	BZ$481,125	BZ$48,616	BZ$924,701	BZ$1,018,582
LEBANON	BZ$404	BZ$90,411	BZ$1,210		
ARGENTINA	BZ$393				
ST-KITTS & NEVIS	BZ$242				

Please contact John Rivero at john.rivero@mft.gov.bz or foreigntrade@btl.net for data on specific product lines and/or trading partners.

The complete 50 page report can be found at agreport.bz

What Do ppm and ppb Quantities Really Mean?

By Beth Roberson

Macal River, San Ignacio, Cayo

Descriptions of minute quantities, parts per million (ppm) or parts per billion (ppb),can be difficult to grasp. How can we practically relate to one part per million or one part per billion?

One ppm is one part per 1,000,000, equivalent to one drop of substance diluted into 50 liters. In an analogy to time, one ppm is equivalent to 32 seconds of one year.

One ppb is one part per 1,000,000,000, equivalent to one drop of substance diluted into 250 fifty-five gallon (200 l) drums – that is one drop into 13,750 gallons! In time, that would be 3 seconds out of a century.

Many common synthetic-based pesticides' Maximum Contamination Levels (MCL) are figured in single digits of parts per billion, ppb, which hints at their intense toxicities. Synthetic poisons are much more concentrated than "botanical" poisons (those derived from natural botanical substances). Charles Walters points out: "... it would take a tractor-trailer load of botanicals to disturb, say, a water main, whereas a quart of Paraquat would do maximum damage." Another vital difference between the synthetics and botanicals is that the botanicals are not easily able to cross the placental wall; synthetics cross with ease. A benchmark study funded by Environmental Working Group (2005, AXYS Analytical Services and Flett Research Ltd.) identified 287 different chemical contaminants (from household, industrial, agricultural and other sources) in umbilical cord blood of newborns.

Atrazine, one of the triazine family of synthetic herbicides first licensed in 1958, is the 2nd most applied herbicide in Belize and in the USA. Glyphosate (Roundup™) firmly holds the #1 position. The Belize Pesticides Control Board's (PCB) tabulations showed that approximately 90 M tons of Atrazine (active ingredient) were imported into Belize between 2010 and 2013, primarily for use in corn and cane fields. Atrazine is a broad spectrum systemic herbicide,applied to the soil and carried up to the leaves, where it inhibits photosynthesis. Atrazine has many confirmed side effects which led to it being banned ("denied regulatory approval") in many places, including the EU. It is the world's 2nd most common pesticidal water contaminant, mainly via run-off, due to its high leaching potential, high persistence in soil (half-life of 60-100 days) and slow hydrolysis (breakdown in water). Its contamination levels are usually expressed in single digit ppb (parts per billion), which nevertheless can lead to significant detrimental health impacts.

The MCL for water in the USA for Atrazine is 3.00 ppb; Maximum Acceptable Concentration (MAC) in Canada for Atrazine is 5.00 ppb. World Health Organization (WHO) uses a Water Quality Criteria Concentration of 2.00 ppb, and Canada's Water Quality Guidelines for Protection of Aquatic Life is 1.8 ppb.

Studies in the Midwestern USA (corn belt) show overwhelming Atrazine contamination in both ground and surface water. One hundred per cent (100%) of all water sources tested in a large Midwest study,which included the Mississippi, Ohio, and Missouri Rivers and their tributaries, were positive for Atrazine, although only 27% exceeded the acceptable level of 3.00 ppb. The USA's Environmental Protection Agency (EPA) made a deal in 2003 allowing Atrazine's manufacturer, Syngenta, to test these waterway sites for Atrazine contamination. Syngenta's testing covers 3.4% of the 1172 highest-risk watersheds, leaving 96.6% of the endangered areas unstudied.

Another study comparing women from Illinois, in the USA corn belt, where their Atrazine water contamination averaged only 0.7 ppb, nevertheless showed marked differences/abnormalities in their reproductive cycles compared to women of Vermont, who had no detectable Atrazine contamination in their water. A study quoted by Dr. Tyrone Hayes of UC Berkeley shows women exposed to Atrazine-contaminated well water have a higher rate of breast cancer.

Dr. Hayes' landmark 2002 study discovered that Atrazine can "induce complete feminization" in male leopard frogs. Ironically, the first round of studies were contracted by Syngenta, who refused to allow the study to be published. Dr. Hayes severed his relations with Syngenta and repeated the tests with independent funding, finding the same results which were then published. In further published studies of 2007 and 2010 he found that frogs of both sexes "developed bisexual reproductive organs" from Atrazine exposure and he described "turning male tadpoles into females" from Atrazine exposure. Other studies by published scientists confirm that Atrazine "lowers testosterone and reduces sperm count in fish, reptiles, birds and mammals." A study of men in Columbia, Missouri found that men with Atrazine in their urine at "0.1 ppb had lowered sperm counts which compromised their ability to father children". Dr. Elizabeth Guillette attributes the "rising rates in the USA of cancer, especially neurological and endocrine (testicular, endometrial, breast, prostate and thyroid), to pesticides like Atrazine and DDT, which affect generations beyond the first exposure. ..... A grandparent's exposure can influence a grandchild's health".

Farming has always been very challenging; now farmers have arrived at a jumble of confusing crossroads forcing critical, difficult decisions. Many are reliant on information from foreign companies, who may have different priorities than farmers and the public. Never before today have so many people chosen not to grow their own food, thereby relying on others to do that for them. This puts more weight onto the decisions of farmers who must constantly select the best paths for both their profit and for the expanding health ramifications trickling down and affecting the handlers, consumers, and the public who utilize natural resources such as our water.

"Everything that happens in our environment happens to us, even if we don't know it yet." Celine Cousteau

The Southern Pine Beetle Is Speaking To Us!

By Wiley Forrest Tackitt

You would think that as an environmental advisor to the United Nations I would be a better steward of our planet, but alas I grew up in Texas where tree huggers are hard to find and in only the past ten years have I lightened my footprint on the world. No matter where you stand on global warming, you have to admit the planet is heating up. Whether this is a cycle in our globe's very long history, which has become very warm and very cold many times, or this is the last big heat up created by man's ignorance to his surroundings, I will leave to each of our readers. I will probably get a sigh of relief from many of you when I tell you this article is not about melting glaciers, but something much smaller.....The Southern Pine Beetle (SPB) *(Dendroctonus frontalis)*.

Dark brown to black in color, and approximately 1/8th inch long with a unique rounded rear end, the SPB belongs to the largest order of insects, Coleoptera, and family Scolytidae. It has a life cycle of 35-60 days; that's six generations per year capability and has increased with the temperature. In natural forest situations, pine beetles prepare the way for ecological succession by selectively removing mature, stressed or damaged pines. Consequently pine beetle infestations often begin on damaged trees, but the beetles quickly reproduce and move to other surrounding trees. As beetles bore into bark, the tree tries to protect itself by exuding pitch, resulting in the formation of characteristic pitch tubes. Weakened trees may not be able to produce sufficient pitch flow to prevent colonization and when beetle populations are high,the number of beetles attacking trees may be so large that even healthy trees cannot withstand infestation.

Both adult and larvae feed on phloem tissue under the bark. Feeding can result in death, but SPB also carry Blue Stain Fungus on their bodies and when introduced into the tree, colonizes the sapwood and disrupts the flow of water to the crown of the tree. Once Blue Stain Fungus is introduced, the tree cannot be saved.

Anyone who has spent more than a little time in Belize knows exactly who this little guy is, due to the fact that he decimated Belize's largest national jewel in just a few short years (1999-2003). The Mountain Pine Ridge (MPR), once hailed as a model of sustainable development, has lost more than 90% of its pines. The destruction is so complete that there is almost no likelihood the area will return to productive forest in the foreseeable future, due to lack of seed trees and presence of frequent fires, as in the recent past. You may be asking, how did the little insect clobber our Pine Ridge so hard, so fast? Well, we have to return to that global warming subject again. With more frequent hurricanes, fires and global weather events occurring in the last ten years, this subject may be at the front of our heads, but let us back up to the early 90's before most of us were pondering the climate. A quick recap leading up to the outbreak was the climate pattern known as El Nino, which produced drought conditions and increased fuels, leading to severe wildfires from Mexico into Belize. Then in 1998 hurricane Mitch brought high winds and excessive rain to the area, causing flooding throughout the region. The following year an unprecedented region wide outbreak of the SPB occurred and Pine Ridge has never recovered.

Kendrick Leslie was quoted at the Global Warming Conference, held in Belize 2007 describing the SPB infestation as a "monitoring system created by nature", and a warning it was. Pine beetles are currently wiping out pine trees from the Yukon down to New Mexico, with devastating effects, and as the climate continues to warm, it will continue to touch interconnecting eco systems all over the world in ways we cannot understand until it is too late. With the SPB it is simply the right conditions and continuous reproduction, with no winter diapause and a staggering ten overlapping generations per year. Those are numbers not seen since the Alamo, and given enough time the same fate will occur, it is inevitable. Warning signs of infestation are wood frass from the beetles boring activity, usually beginning at mid-trunk. Also, early crown discoloration, changing from green to yellow in color.

Back to our MPR and its future land management: the Government of Belize has made available carbon sequencing and carbon credits to help offset cost of projects like the Queen sland Australian pine hybrid breeding program. Carbon credits have been used to pay for many environmental projects worldwide, with much success. Adriano Vasquez, Belize Agricultural Health Authority (BAHA) entomologist reports future mass trapping programs in MPR to identify types of pine beetles currently present, to map out control strategies to help defend any future reforestation projects to replenish our MPR. The planet is speaking to us, and the Southern Pine Beetle has had his say..... "Think global; act local".

Questions and comments are welcomed by Forrest at: forrestbugmaster@yahoo.com

Users of Pesticides:
WHEN USING PESTICIDES,
Protect Yourself!
Protect Others!
Protect the environment!

Consumers:
Know where your food is coming from.
Support farmers with good pesticide management practices.

Lemon Grass
By Mary Susan Loan

The typical variety of lemon grass grown in Belize, *Cymbopogan citratus*, is commonly known as "fever grass" as a traditional remedy to reduce and alleviate symptoms of fever. Lemon grass is a perennial plant that grows in large clusters of long thin green leaves and produces a pleasant lemony, citrus aroma when crushed. It has a slightly pungent, but delicate lemony flavor with undertones of mint and ginger to season food, especially tea, soups, curries and salads. Stalks and bulbs of the plant are commonly used as an ingredient in Asian and Indian cuisine. As a gardening aid in tropical gardens it is used as a companion plant. Many Belizeans have lemon grass plants growing as an attractive decorative and useful plant in their home gardens. There are more than fifty varieties of lemon grass; not all are used for culinary, medicinal or agricultural purposes.

Lemon grass is indigenous to India and tropical regions of the Asian continent, including Thailand, Cambodia, Indonesia, Malaysia and Vietnam. It is also commonly grown and used in Central America, Java, Madagascar, China, West Indian islands and Zambia and other warm tropical climates. It grows year-round in all tropical countries and can successfully be grown indoors in cold climates. Mature plants resemble common field or "cattle grass" and generally grow from about two to four feet in height. Plants do not flower or produce seeds; they are propagated with portions of the root of the plant. Once established, lemon grass usually grows wild via underground rhizomes. It is an easy plant to grow and requires little care beyond a sunny location and watering in the dry season.

The main chemical compound found in lemon grass contains aromatic citral, also known as lemonal. Citral is extracted from the plant for use in aroma therapy and perfumes to impart a fresh lemony scent. Citral has antimicrobial and antifungal properties. When used as an insect repellent citral is known as citronella and is used in bug deterrent potions, incense and candles to help ward off insects. Surprisingly, citral is a lure to attract and control honey bees.

Lemon grass can be planted in gardens to help ward off insects, such as the white fly. The plant is intercropped as a helpful natural pesticide to many vegetables, especially broccoli and tomatoes. Due to its tendency to spread and perhaps take over the field, it is best to use physical barriers, such as large plastic pails with the bottoms cut off or wooden frames made of hardwood.

Lemon grass tea, prepared by pouring a quart of boiling water into one cup of fresh or one-half cup of dried leaves and steeping it for about 10 minutes, has many medicinal properties including lowering blood pressure, inducing sleep, relieving indigestion, reducing headache and nerve pain, reducing fever, alleviating respiratory distress, promoting healthy skin, and strengthening the nervous system. The tea is delicious hot or cold. Here is a tasty and healing iced lemon grass tea recipe from Chaa Creek Resort: Follow recipe above, add one tablespoon of chopped fresh ginger, pour into a glass or container and cool. Serve with ice and a lemon wedge. If you prefer a sweeter iced tea, add about one-half cup of sugar or about twelve drops of stevia extract to the hot tea mixture prior to cooling.

For tea and culinary purposes, lemon grass leaves and stalks may be used fresh, dried, frozen or powdered. To freeze, cut several stalks, rinse, dry, cut into slices about three inches long, store in plastic bags and use as needed. To dry, wash and cut the grass, place in a sunny location covered with a screen for two or three sunny days or until grass is crispy and dry, then place in a glass jar with a lid and store for up to six months. For culinary use the leaves and stems are simmered in water and strained to enhance the flavor of soups, stews, curries and vegetable dishes. Although stalks are generally too tough to eat raw or cooked, the lower end of the stalk can be diced finely and cooked with other ingredients.

Photos courtesy of Phoenix Photo.

Dairy Products at Home: Mozzarella and Ricotta Cheese

By Deborah Harder

The cheeses for this cheese-making workshop are mozzarella and ricotta. These are cheeses presumably invented in Italy but now prized all over the world, the second being a byproduct of the first. Mozzarella is the gooey topping for lasagna, pizza, and other Italian dishes which everyone likes so much. Here in Central America, mozzarella makes itself at home on enchiladas or quesadillas, with its famous melting quality. It's not easy to fit into a new culture, but if we were all so friendly and likable, sacrificing ourselves for the benefit of others, it would be much easier, more like... melted cheese.

Here is a simplified recipe which has evolved in my kitchen through the natural selection of shortcuts inherent to that environment. Recipes generally call to acidify sweet milk with citric acid, but milk that is naturally sour needs no acidification, so I just use a blend of sweet and sour milk. It may be whole or skimmed, or some of each. To make hard cheeses, you will need rennet, which can be purchased in liquid form from Western Dairies in Spanish Lookout. To make it easier to measure small amounts, I put mine in a dropper bottle. You need ¼ tsp to 4 gallons of milk, or 6 drops to a gallon. Stir in the rennet and let the milk set. In less than an hour, your milk will curdle, or become a solid rather than a liquid. The curd is ready to cut when you can cut into it with a knife and it makes a 'clean break', being of cutting rather than pudding consistency. Take a long kitchen knife and cut the curds into cubes, more or less. Stir them around a little bit to cut them in every direction, but don't be rough with your curds. After sitting for 10 minutes or so, you will see the curds have begun to shrink and the whey has increased, for the whey is being expelled. To complete this process, heat the curds gently on the stove, keeping them well stirred so they heat evenly. If you don't plan to make ricotta cheese, you can pour off most of the whey as soon as possible to save the energy of heating it all. Keep heating till your curds reach a fairly high temperature and begin to melt. Then comes the fun part. With your stirring spoon, pull the curds upward, letting them stretch down in strings. Once they are well stretched, fish out the mozzarella with a slotted spoon and place in a bowl. Add salt, cutting and kneading it while the cheese is still hot. Pack your mozzarella into a bread pan or other mold to cool and set.

Meanwhile, if you want to make ricotta cheese, which is derived from the remaining protein particles present in whey, let your whey keep heating until it is close to the boiling point (well steaming). Recipes call for adding ½ cup vinegar to the whey produced by 4 gallons of milk, but anything acidic, such as lemon juice or the whey from cottage cheese making, works just as well. Pour your acidic stuff in and watch as the whey clarifies and white chunks or particles form. You may have to let it sit awhile to let it work. Strain the whey through a fine cloth, not a colander or strainer. Let it drip overnight.

Your children will eat more raw veggies if you serve them with this nutritious dip made from ricotta cheese. You can vary it using your imagination and available ingredients.

1 c. ricotta cheese
1Tbs. sour cream
1 Tbs. mayonnaise or salad dressing

Seasonings such as prepared mustard, honey, garlic or onion powder, dried or fresh minced herbs, seasoning salt, relish or minced pickles, and salt, all to taste. Mix all the ingredients and serve with raw veggie platter.

By the way, you can also make ricotta cheese more easily from whole milk by heating 1 gallon of milk to around 190 degrees, then adding ¼ cup of vinegar a little at a time, until the milk curdles. Pour curds and whey into a colander lined with a fine cloth. Tie corners together and let hang till desired consistency.

Editor's Note: Raw/fresh milk mozzarella is definitely more smooth and delicious, but pasteurized milk does work; it just doesn't come together smoothly and perfectly like raw milk does.

World Food Day at Mopan Technical High School in Benque Viejo

World Food Day was organized in 1979 and promoted by the Food and Agriculture Organization of the United Nations to combat poverty and eradicate hunger world-wide; it is now observed in almost every country of the world. October 16, 2015 was the date of forums held and attended by millions of people around the globe. Belize held the event one week later on October 23, 2015.

The theme of the 2015 World Food Day was: "Soil Protection and Agriculture: Breaking the Cycle of Rural Poverty". Mopan Technical High School provided the venue and it was a showcase for the teachers and students of the school who provided tours of their healthy gardens and gave vibrant seedling plants to all who visited their booth.

The event was well-attended; students from twenty-one Cayo area schools came. Francico Tun, Principal of Mopan Technical High School; Erwin Contreras, Minister of Trade; and Jose Alpuche, Chief Executive Officer, Ministry of Natural Resources and Agriculture were among the inspiring speakers who shared the podium; all their messages shared a theme of supporting agricultural initiatives and the students who will be future farmers of Belize. Agro-business was described as being "in"

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Pro-Organic Belize on the Grow!

By Mary Susan Loan

The seeds for Pro-Organic Belize (POB) group were planted at a symposium "Sourcing Healthy Food in Cayo" which was held at Maya Mountain Lodge in November 2014. Following this well-attended event, POB paired up with the San Antonio Cayo Organic Growers Association (SACOGA) to cultivate a growing relationship with the goal of having organic produce for sale at the San Ignacio open air market on Saturday mornings starting in December 2014. SACOGA now has a permanent booth at the market, run by Abdias Mesh, the founder and director of SACOGA and takes orders for fresh organic produce each week for pick-up on Saturday morning (see ad below).

POB and SACOGA have developed a participatory guarantee system (PGS) of organic certification which is based on that of the International Federation of Organic Agriculture Movement (IFOAM). The mission statement of POB is "To support and promote the San Antonio Cayo Organic Growers Association and other organic initiatives in Belize." Following several meetings and farm inspections, the SACOGA became the first farmers to be certified by POB. In April 2015, SACOGA was certified as transitional organic year one of a three year fully organic certification plan.

Since November 2014 POB has met at least once a month. In May 2015 POB was introduced to the public at our booth at the National Agriculture Trade Show (NATS) in Belmopan; we were the only booth dedicated to organic agriculture at the fair. POB has developed a working document for certification which explains the tenets for organic crop production.

Jannin and Randy Cocon, full-time vendors (the Cocon stand) at the San Ignacio open-air market, have been long time supporters of organic produce; they were certified as vendors of POB, transitional organic produce, as of September 2015.

Franky and Jessica Mesh, vendors at the new farmers market produce building in Spanish Lookout, were certified to have an organic produce section at their market as of September 2015. The POB organic inspection team met with Oscar Figueroa of 'La Bendicion' farm in La Gracia, Yalbac, where the greenhouse and organic section of his acreage were certified transitional organic in September 2015. Oscar was also certified as a vendor under PGS with POB. Chaa Creek Resort farm was toured and inspected by POB in September 2105 and a PGS agreement as transitional organic grower and vendor was approved under PGS. There are several farms that are growing organic produce in the Cayo area. As of October 2105 POB has also visited Blancaneaux Lodge and Black Rock Farm, both of which are pending transitional organic PGS certification by POB. At present there is not enough certified organic produce to meet the demand in the Cayo District.

Members of POB registered Pro-Organic Belize with the Belize Companies and Corporate Affairs Registry in Belmopan in August 2015. POB has been a proud member of IFOAM since September 2015.

Pro-Organic Belize participated in Caribbean Health and Wellness Week and had a booth in Belize City on September 24th and was involved in the San Ignacio celebration at the healthy vendor headquarters under the guanacaste tree on market day, Saturday, September 26th.

Individuals and groups who are interested in helping to expand the organic movement in Belize are welcome to join POB. Meetings are held on the first Tuesday of each month at 2:00 pm at Maya Mountain Lodge. For more information, please contact proorganicbelize@gmail.com or call 677-9658.

Belize Botanic Garden Classes

Evening classes will be held at the Garden Shop, 37 West Street, San Ignacio: 6pm-8pm. All-day classes will be held at Belize Botanic Gardens: 7:30am-3pm. Bring notebook, pen, gardening clothes and water bottle to all classes! Instructors: Rudy Aguilar, Freddy Tut and Josue Mai instructors of BBG's two-year Professional Gardeners' Programme, funded by duPlooy's Jungle Lodge and the EU.

1. SOILS and ORGANIC FERTILIZERS $80 per person
Two part class: Saturday 14th Nov. 7:30am- 3:00pm; Saturday, 21st Nov. 7:30 am-3:30 pm Topics include: Soil Mixes, Soil Types, Rock Fertilizers, Manures, Compost, Liquid Fertilizers.

2. PLANT PROPAGATION $120 per person
Two evening classes plus two full days: Friday, 27th Nov., 6pm – 8 pm; Saturday, 28th Nov., 7:30 am to 3:30 pm; Friday, 4th Dec., 6pm – 8 pm; Saturday, 5th Dec., 7:30 am to 3:30 pm Topics include: Grafting, Budding, Plant layering, Cuttings, Seed planting.

3. ORGANIC PEST CONTROL $40 per person
One full day, Saturday, 12th Dec, 7:30am – 3:30pm**.** Topics include: Identifying common pests, Organic mixes for pest control, Catch crops, Crop rotation, beneficial insects.

4. LANDSCAPE MAINTENANCE $100 per person
Two evening classes and two full days: Friday, 18thrd Dec., 6pm – 8, Sat., 19th Dec., 7:30 am to 3:30 pm Friday, 8th Jan., 6pm – 8pm, Saturday, 9th Jan., 7:30 am to 3 pm. Topics include: Mowing, Weed whacking, Mulching, Planting, Transplanting, Watering, Pruning, Plant Bed Preparation.

5. **NURSERY ESTABLISHMENT $50 per person**
One evening and one full day: Friday, 15th Jan., 6pm – 8 pm, Sat., 16th Jan., 7:30 am to 3:30 pm. Topics include: Nursery layout, re-potting, Potting-on, Seed bed preparation and planting, Nursery plants set-up, Nursery Routine.

WORKSHOPS: "Worms Are Our Friends: Composting. With Children" Sat. 14th Nov. 9am-11am; "Make CHRISTMAS Decorations the Natural Way", Saturday 19th Dec. walk in anytime 9am-2pm. Drop by the shop any week day in December between the 1st and the 19th of Dec., 9am - 2pm and paint YOUR pot for CHRISTMAS. FIND OUT MORE at info@bbg.org or call

Register NOW at the BBG Garden Shop: 37 West Street, San Ignacio, Cayo Tel: 671-3322 or 824-3101; Limited Shuttle free with reservations

Sustainable Harvest International Belize

7th Annual Fair and Forum

Sustainable Harvest International (SHI) Belize, founded in 1997, has coordinated an annual forum and fair to recognize organic farmers in the Toledo district. October 30 - 31st 2015 marked the 7th annual event. The theme of the 2015 SHI Belize annual fair and forum was "Healthy soil + Organic Farming + You = A Sustainable Belize".

The forum on Friday featured several speakers. William Usher from Belize Agro Enterprises Ltd. made a comprehensive presentation about the benefits of his product, Effective Microrganism, to enrich soil and help grow healthier plants. Nana Mensah, Director of SHI, spoke of the importance of biodiversity and ways to feed the soil to feed the crops, citing cover crops and earthworms as some examples. Bartholomew Teul gave an in-depth presentation about Inga (Bri-Bri) tree intercropping to grow with crops to increase productiveness, citing the advantages and challenges of Inga alley intercropping. Elizabeth Kearns of the Southern Belize Vanilla Exchange gave an interesting talk and slide show about the many kinds of orchids in Belize and encouraged farmers to consider growing vanilla orchids as a niche crop. A talk about the history and works of Pro-Organic Belize was made by Mary Loan from the Cayo district. The male and female organic farmers of the year were presented with awards and wheel barrels with farm tools. Dominga Chuc was the female farmer; Antonio Paau, the male farmer of 2015.

In the afternoon Mr. Burton Caliz led a tour of his 35 acre farm near Blue Creek. Mr. Caliz has been farming for over 45 years and has developed a healthful philosophy and understanding of growing healthy plants without plowing the soil. His farm is rich in soil and the fruits of his labor.


Mr. Burton Caliz

Saturday's fair included several vendors of mostly agro-related products; some had lots of information about farming and preserving the tropical forests, while growing crops sustainably. There was an abundance of fresh food and fun for all with drummers from Emmeth Young Drum School and Mayan dancers to provide a festive atmosphere and appreciation of the rich culture of Punta Gorda and the Toledo district.

Paraguay: Banana Flour, A Productive Alternative

What do you do when the supply of bananas exceeds the demand and the price to the grower gets reduced too low to pay laborers in the harvest period? Look for alternative ways to industrialize the raw material! How about banana flour? The initiative to produce banana flour is still in its experimental stage in Paraguay. However, it has already yielded positive results because of the large profits of the product. It can be used in the cookie, candy, and ice cream industries and others. It also represents a great alternative for the segment that manufactures foods for people who are celiac as banana flour does not contain gluten.

The process for making banana flour is as follows: the green fruit is harvested and brought to the dryers, near the farms. There the raw material is received, both first class and second-class bananas (discarded bananas), and it is prepared in trays to enter a furnace. After about 30 hours, the bananas are fully dried and ready for milling. This work takes place in Asuncion, in an industry with an installed capacity of 30,000 kg per day (12 hours) capacity. Afterwards, the finished flour is packaged in the same facility and stored in a cool place free from humidity and heat until it is sold.

The project includes making use of the entire banana; 40% of the total weight of the fruit is in the shell, which can be used as an effective organic fertilizer for orchards.

Sabal's, in Stann Creek District, makes plantain flour. It has an off-white color and a slightly sweet flavor that can be used in baked goods. It does not require storage in a cool place free from humidity though; it can be stored in glass or heavy plastic containers that have good lids or caps.

AG BRIEFS

Second Annual Christmas Plant Sale to benefit the Belmopan Humane Society. Saturday December 5 --Blue Moon Restaurant @ the roundabout in Bmp. 10am-4pm. For Sale: plants & cuttings, poinsettias, palm trees, Christmas decor. Enter the raffle to win a completely decorated tree ready to plug in and light up your home or business! For more info email belmopanhumane@yahoo.com

Neal Kinsey will return to Belize to again deliver his Introductory Soil Fertility Course on February 8, 9,& 10th, 2016 at UB Central Farm. There may be a soybean field day after the course. For details see ad on pg 14 of this issue.

Spanish Lookout's 4th Bi-annual Commercial and Industrial Expo is scheduled for Friday Feb 26 and Saturday Feb 27, 2016 at Countryside Park, Spanish Lkt. Information: businesschamberspl@gmail.com

Ernie Thiessen, Chairman of the Pig Council, notes that there is a severe overstocking of pigs at this time, resulting in a decline in live wt prices. The Pig Council encourages all pig farmers to find a market for their finished pigs, prior to raising them. In the past, some farmers, on hearing that the price is good, begin fattening pigs only to find that by market time the market is flooded again. Also of note, is that with the corn costs so high, the profit margin on pigs is much lower.

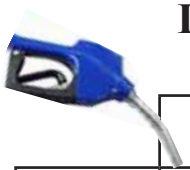
The cattle judging at the 2015 Feria X'matkuil, near Mérida, Yucatán, will be held between 13 Nov through 27 November. For more information on dates for specific breeds, go to http://www.en-yucatan.com.mx/merida-yucatan/xmatkuil/.

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.

Local and Regional Fuel Prices



	Cayo, Belize	Quintana Roo, Mexico	Peten, Guatemala
REGULAR	↓ $7.76 Bz/Gal	↓ $6.06 Bz/Gal	↓ $7.23 Bz/Gal
PREMIUM	↓ $8.68 Bz/Gal	↓ $6.43 Bz/Gal	↓ $7.54 Bz/Gal
DIESEL	↓ $6.88 Bz/Gal	↓ $6.35 Bz/Gal	↓ $5.69 Bz/Gal

Mexico's food exports (agriculture, livestock, fisheries and agro-industry) from Jan to July of 2015 were up 4.6%, creating a surplus in their food trade balance of 1,536 million dollars, as they also reduced imports by 9.62% for the same time period. **Mexico's organic sector is expanding at an 8% annual rate**, with the European Union as the main market for organic exports. Almost half of the organic export is coffee, followed by herbs, spices, fruits, vegetables, cacao and grapes. The states of Chiapas, Oaxaca, Michoacan, Queretara and Guerrero are the largest producers of organic products.

The Ministry of Natural Resources and Agriculture (MNRA) has responded to the crop losses suffered due to the drought, by farmers in the West and North of Belize, and will supply small farmers with seed corn. Although much of the data is still being collated at press time, it appears that Cayo had an approximate loss in yields of 25%, and the northern districts suffered losses in the vicinity of 50%. Yields per acre of corn have been decreasing in both Cayo and the North since 2013.

Saskatchewan's Agriculture Minister has made a proposal to change land ownership policy in this Canadian province, following a survey which showed 87% of respondents did not support foreign ownership of farmland; 75% were also opposed to allowing pension plan/administrator ownership. Farmers were concerned that foreign and pension plan ownership might drive up rents and prices for Saskatchewan farmland. Also, all financing for farmland will have to be via a financial institution registered

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AG BRIEFS

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to do business in Canada or by a Canadian resident. This would preclude foreign ownership in the event of foreclosure. This still needs approval but is expected to pass and come into effect by early 2016. All land sales consummated prior to the enactment of the new legislation will not be affected.

Worms that eat styrofoam: A Beihang University professor and his doctoral student, and a Stanford University professor co-authored a study, just published in *Environmental Science and Technology,* showing that mealworms, the larval form of the darkling beetle, can digest Styrofoam and produce a biodegradable waste. Cockroaches and other insects can eat plastic, but they do not produce biodegraded waste. They also found that mealworms fed antibiotics were unable to degrade plastic. This has been hailed by some as one of the greatest environmental breakthroughs in the past 10 yrs. Another insect which has plastic degrading properties, is the waxworm, larvae of the Indian mealmoth.

Nineteen of 28 European Union members seek opt-outs for all or part of their lands, from cultivation of Monsanto's GM Maize MON 810, the only GMO crop commercially grown at this time in the EU. Requests are from: Austria, Belgium for Wallonia region, Britain for Scotland, Wales and Northern Ireland, Bulgaria, Croatia, Cyprus, Denmark, France, Germany (except for research), Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland and Slovenia.

In October **the USDA gave the lowest Florida orange crop forecast in 52 yrs, down to 80 million 90-pound boxes.** They expect a 17% drop from the 2014-2015 season which was 134 million 90-pound boxes.

The USDA Center for Medical, Agricultural and Veterinary Entomology in Gainesville, Fl and the University of Florida have developed **a new type of vibrating device, with which they plan to thwart communication between male and female Asian citrus psyllids – the vector of the bacteria causing the incurable HLB (citrus greening).** Mr. Mankin of the USDA Center, believes that their small piezoelectric buzzer with wired microphone and a micro controller, will monitor the male's call to the females. Then during that one third to one half of a second typical time for a nearby female to reply – the vibrator device will mimic the female's reply, causing the male to enter the device and become stuck on adhesive, or at the least, the communication between the male and female has been disrupted.

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AG BRIEFS

Citrus... Continued from page 33

Some citrus pesticides have been reduced due to consumer health concerns, and the psyllids are expected to become resistant to the current pesticides. The devices are still not commercially available at this time. For more info go to http://phys.org/news/2015-11-citrus-greening-vibrating-orange-groves.html

As the immigration/migrant movement is exploding in the EU and neighboring countries, trade in fresh produce has also been disrupted. This has especially affected produce arriving into the UK by vehicle as often person(s) have illegally entered sealed freight areas of trucks/trailers. Shipments with phyto-sanitary approvals that have been tampered with must be re-inspected, a time–consuming and costly waste. Techno Fresh Consultancy, who developed methods (ATP hygiene monitors) used at the Olympics to check eating establishments for contaminated food, is doing the testing. The last Olympic Games were the first with no cases of food poisoning, according to Techno Fresh. Their new testing system is designed to decipher the difference between clean untouched pallets, from those with light contamination (heavy contaminated, visible waste products etc are written off without testing). This system allows for contaminated pallets to be removed and balance re-sealed for onward travel at less cost in time and expenses.

A new North American pumpkin record was set this fall by Ron Wallace of Coventry, Rhode Island, with his 2,230 lb entry. The world record is 2,323 lbs, in fact, grown with Wallace's seed by a grower in Switzerland. Wallace has been growing competitively for 27 yrs. Growers can use any fertilizers or plant hormones, the only forbidden action is to doctor the actual fruit. Holes, cracks and rot disqualify entries. Also, this year Wallace unveiled his *Wallace Organic Wonder*, plant treatment, which includes mycorrhizal fungi. Serious growers tie plant blossoms closed and hand pollinate. If weather and water are fortuitous, pumpkins can put on up to 45 pounds/day. The other coveted prizes in addition to largest pumpkin, are for longest long gourd and heaviest squash.

How much pumpkin pie can you make with one of these jumbos? Probably none, as they are purportedly not tasty. Some breeders sell the seeds from prize-winning pumpkins, and sometimes the giant pumpkins are sold for around $1./lb for use in holiday displays.

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and promising as a sustainable career for the next generation of Belizean farmers. Marimba players and dancers from Mopan Technical High School made the event more colorful. Several agriculture-related booths distributed information and some had plants, trees, cohune oil, and yellow ginger (turmeric) for sale.

The theme was an inspiration for helping keep Belizeans well-fed and Belize be agriculturally sustainable with soil protection and nourishment. Thank you, Emilio Montero, chairperson of the World Food Day 2015 Committee and all those who planned and participated in the event.