

The Belize Ag Report

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Opportunities and Global Perspective of Cacao for Belize

Cacao Field Day and Forum

By Dottie Feucht

The market for chocolate couldn't be better. There is a worldwide deficit of 60,000 metric tons. Just at the time that production is decreasing in the two main exporter countries of Ghana and Brazil the demand is increasing by 3% per year, creating a wonderful



market opportunity for Belize. This was the theme of the forum held in Toledo on June 12, 2013. The forum developed from an idea that the U.S. Ambassador, H.E. VinaiThummalapally, had when he visited Toledo cacao producers in February. Having heard about Belize's excellent chocolate quality in places he's visited and seeing the potential for the chocolate produced in Toledo he contacted Mr. Jose Alpuche, CEO of the Ministry of Natural Resources and Agriculture (MNRA), and Dr. Muhammad Ibrahim, Country Director of InstitutoInteramericano de Cooperación para la Agricultura (IICA), and Mr. Anhil Sinha of Caribbean Agriculture Research and Development Institute (CARDI), to sponsor the forum. In addition to the sponsoring organizations, the stakeholders included members of the Toledo Cacao Growers Association (TCGA), the Toledo Agriculture Development Association (TADA), cacao farmers and processors.



The group visited the headquarters and farm of the TCGA where they saw seedlings being grafted and prepared for planting, cacao beans fermenting and being dried and heard about the training being offered to the local cacao farmers.

Spokesman, Marco Figueroa said the farmers have learned how to graft seedlings, prune trees, revive old fields and manage them for improved production. According to Armando Choco, head of TCGA, the number of TCGA farmers has increased from 270 to 800 over the last several years but the production levels are more impressive. Even with 400 acres left to graft, TCGA's production increased from 55 tons in 2011 to 88 tons in 2012. Marco estimates that 30% of the trees produce 70% of the crop but with new trees coming along he expects a large spurt in production. It takes only 2 years for a grafted tree to start producing cacao. In 2004 cacao all over Central America was hit with the Moniliarorens fungus. TCGA addressed the problem by extensive pruning and field rehabilitation; Belize was the only country to contain the blight.

TCGA is also doing research on using biochar for fertilizer. All the cacao in Toledo is grown organically which has caught the attention of buyers. They are willing to pay top dollar for Belize's recognized top quality organic chocolate. Having recently returned from a nationwide food show in the U.S., Mara Jernigan, chef and general manager of Bel-Campo, said that people are becoming increasingly knowledgeable and very interested in the source of their food and are turning to organically grown food.

She believes the organic market niche is wide open for Belize. This is the first year that a 100% Belizean chocolate bar is being entered in a worldwide competition. Although chocolate bars are produced in Belize, the bar for the



competition was made in the U.S. Emily Stone, co-founder and general manager of Maya Mountain Cacao (MMC) Ltd., currently has 5 customers in the U.S. who buy every pound of cacao beans they produce. MMC buys 2500 pounds of wet (unfermented and undried) beans per day from farmers. At the MMC facility at Cotton Tree Lodge they are processed by fermentation and drying before being sorted, polished, packaged and hermetically sealed manually in bags of special material for export.

Toledo is the ideal place for growing cacao, which needs shade and good soil for the best quality and highest production. A few areas in Cayo District that have cacao production potential have also been identified. Sapodilla is the wood used for the fermentation boxes; it is not uncommon for the beans to acquire a fruity flavor from the wood. Cacao beans in the boxes are covered with banana or jipijapa leaves to retain the heat. Each day the beans must be "stirred" by hand. To manage the fermentation process the bean boxes are rotated from the highest of three levels to the next lower level every two days for a total of 6 days in the fermentation shed. The liquid that drains from the beans is not currently used in a product but has potential for some enterprising experimenter.

The hardwoods, Sapodilla, Santa Maria and Sam wood, which grow abundantly in Toledo, are used for the drying racks. Not all woods can be used; pine, for example, reacts with the beans. Experience has shown that drying time can be done in 4 - 10 days depending on the sun but to maximize all-important air flow, the racks are raised and holes drilled in the floor of the racks. The roof of the drying facility is plastic to maximize sunlight and the sides, also of flexible plastic sheets, can be raised to maximize air flow and lowered to keep out the rain.

At MMC extensive data collection is done. Each batch in the drying racks is identified by source, field, dates, and other tracing data that become a permanent part of the record for the batch and is updated to its final destination.

Although there are 10 varieties, less than 2% of the world supply of cacao is the most favored Criollo with its white seed and unique flavor. {Criollo beans have no tanins.} When Africa and Brazil were the primary sources, over 75% of the world supply was the variety Foresterio which is not considered the best flavor. Criollo and Foresterio were combined, creating the Trinitario variety, in efforts to bolster disease resistance. This occurred in Trinidad over 200 yrs ago, after a disastrous blight to the more fragile Criollos; hence the name. It is the Trinitario variety that is being grown commercially in Toledo.



The forum met its goal to share information and experience among cacao stakeholders. A keen interest has been generated to grow and process organic cacao in Belize.

Good Pesticide Management Practices Execution Progress and Future Work

Background

The Good Pesticides Management Practices – Farmer Recognition Initiative (GPMP-FRI) commenced in November 2012 and is an interagency collaborative initiative undertaken to promote and recognize good pesticide management practices among



volunteer farmers by bringing into focus the potential sources of agrochemical contamination for horticultural products from the field to consumers.

The initiative is expected to improve the competitiveness of participating local farmers through a scheme that will award public recognition to those in compliance with the GPMP-FRI's requirements. Farmers' compliance is monitored and recorded by way of a toolkit which was developed based on Global G.A.P. criteria. In addition to farm inspection and field sampling activities, the initiative also has a farmer assistance component whereby volunteer farmers are provided with basic information and training in pesticide management and application practices. Tangible support in the form of personal protective equipment, pesticide storage units, field guides and other tools to improve pesticide management practices on the farm also form part of assistance offered to volunteer farmers.

Execution Progress

Presently there are twenty-three active volunteer farmers countrywide that are being evaluated under this initiative. After receiving training in good pesticide management practices, collaborator farmers developed their planting plans and began to record their field practices. GPMP inspectors in each district visit farmers 2-3 times per month, assisting farmers in record keeping and providing technical assistance to resolve field problems. Vegetable samples are collected from the farmers 3 days before harvest and sent to the BAHA central lab for the pesticide residues screening test. A total of 132 lab samples are reported to have been processed by BAHA from February to July. Of these samples, 3 samples were detected with organophosphate residues, 0 with carbamate residues and 8 with fungicide residues. In these instances, farmers are advised to postpone their harvest according to their pesticide application record and the post-harvest interval.

Farmers' practices are monitored using the toolkit checklist. Three inspections will be conducted for each farmer to monitor his understanding of the pesticide label, safe handling, storage and transport of pesticides, equipment management, record keeping and general field practices including integrated pest management and care of environment.

In a recent questionnaire survey at the National Agriculture and Trade Show (3 – 5 May 2013) among 280 countrywide

visitors to the GPMP booth, 71% of the respondents registered concern about pesticides residues in the vegetables they consume. 55% of those surveyed thought the farmer is responsible for the safety of local farm products, and 28% think that the government is responsible. 92% said that they would feel safer consuming vegetables from farmers that have been recognized under the GPMP-FRI; 71% said that they would be willing to pay more when buying produce from GPMP-FRI farmers.



Continued on page 5

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Mission Statement:

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

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TO THE EDITOR

Editor's note: The Belize Ag Report acknowledges and respects the need for dialogue among the agricultural community. Publication of a letter or an article does not indicate endorsement by The Belize Ag Report of the views and content therein.

Good Morning Beth,

I just wanted to say that I read every Belize paper every day and the Ag Report is the best of them all. Real stuff. Stuff that can help the country and our neighborhoods. NO POLITICS. Its manna from heaven. Thanks again.

Marty Casado
BelizeNews.com

Bill Lindo responds to Vernon's Response Issue 21 page 5

Dear Harry Vernon,

I refer to your letter to the editor in issue # 21 in *The Belize Ag Report* on my subject "Energetic Agriculture". You stated that I lack understanding of the subjects chemistry and soil sciences. If you mean that as it relates today to the teaching in schools and universities, then you are correct. The schools teach a pseudoscience in obedience to the corporate masters.

God made the universe and nature is a product of God's action. As human beings we have a job to try and understand how nature works and discover its laws. In trying to understand God's nature, we can never look at it in a linear-entropic way. This foolishness that the whole is just the sum of the parts is wrong to physical reality. The whole is always greater than the sum of the parts.

My friend, you lack understanding of nature because nature is not chemistry. Nature in regards to agriculture is made up of chemistry and biology -- physics is the bridge that joins them. You need to know all three and their relationship to each other.

Wikipedia states that the term "nutrient-density" has several meanings. My use is -- a nutrient-dense food is a food that delivers a complete nutritional package of the 80 or more elements required by a healthy human being. Rescue chemicals are the poison chemicals used as insecticides, herbicides and fungicides, such as, 2,4D, Warrior, Captan, Kendo, and Glyphosate. And, Harry, garlic and onion spray is not a rescue chemical. Rescue chemicals kill the soil, animals and humans; and they never work for more than 4 years. Nature always defeats them.

I suggest you read the current article in issue # 22 to see who Prof. Phil Callahan is.

You must know that God's nature **DOES NOT** obey your Laws of Thermodynamics because it is false to physical reality. The universe is not like a mechanical clock which winds up and winds down over time and it will not go to its "heat-death". God's universe is non-entropic as are all living things. Kelvin, Clasius and others like them who serve the Oligarchy are just as dishonest as Malthus, Smith, and Ricardo were in political economy. They all wrote that no matter what you do capitalism

will destroy itself, so best let unlimited consumption of the oligarchy be the order of the day, while the useless eaters die. The concept is the same heat-death foolishness. Einstein and Neils Bohr both reject your law of thermodynamics.

I know of what I speak Harry. God is the basis of life! Life is the basis of energy! Plants grow by energy, period. The fertilizers, when they react with each other as cations and cations, or anions and anions, or cations and anions, give energy. Time is not important to plants. The secret is to balance the mineral content of the soil, then use energy and biology to grow the plant free of insects and diseases, so that we humans who eat the plant get as many elements (nutrients) as we can from the plant.

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Good Pesticide ...Continued from page 4

Future Work

The first farmer recognition ceremony is expected to take place after August 2013, while a regional seminar is planned for November 2013 to share the initiative's experience in working with a group of volunteer farmers for the recognition of improved pesticide management practices aimed at a safer food supply for consumers.



To share the progress of the initiative and to raise awareness of pesticide residues and pesticide management, the GPMP-FRI team will be conducting a series of talk shows on television and radio in the upcoming months. In the month of September, to coincide with Pesticide Awareness Week observed by members of the Coordinating Group of Pesticides Control Boards of the Caribbean (CGPC), GPMP inspectors will be setting up booths at all farmers markets countrywide to promote GPMP and to introduce volunteer farmers who will be promoting their products at the booths. GPMP inspectors will also be visiting schools in the month of September to raise awareness at that level.

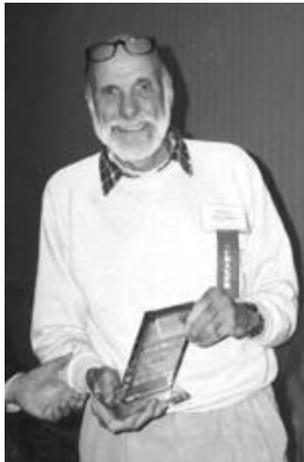
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What Has Professor Philip S. Callahan Done for Agriculture?

By Bill Lindo

In issue # 21 of *The Belize Ag Report* I wrote that Prof Philip S. Callahan is the greatest scientist of the late twentieth century. Who is this 90 year old scientist and teacher? Prof. Callahan has written over 18 books and published over 180 technical papers in various journals. Agriculture practitioners should read and study his books: *"Paramagnetism"*, *"Ancient Mysteries, Modern Visions"*, and *"The Soul of the Ghost Moth"*.



He got his Ph.D. at Kansas State in entomology (study of insects). He wrote that his assignment under Prof. Reginald Painter was "to find out why plants that grew on poor soil produced far more corn earworm moth eggs than those that grew on dark, well-aerated, bottomland soil". In other words, why is it that crops which are grown on healthy soils never attract diseases and insects.

He wrote that it took him 40 years to discover the answer and he also discovered how insects communicate. The results of his insect discovery caused a "fire-storm" in entomology. Many teachers were angry that he over-turned their "pet Theory of Olfaction". But the United States government was very happy about his discoveries. While he taught at Louisiana State University, University of Georgia, and University of Florida (Gainesville), he also worked for both the

Dept. of Agriculture (Southern Grain Insects Research Lab & USDA Insect Attractant and Behavior Lab) and the Defense Department for over 30 years. He has tested and done research on every insecticide, herbicide and fungicide known to man up to the year 1990. He holds over 15 patents, many of which are classified by the US government.

According to his proven insight into God's nature, insect sensory mechanism is both infrared and olfactory; insects "smell" odors electronically by tuning into the narrowband infrared radiation emitted by sex, prey, and host-plant scent molecules. Molecules do not need to interact physically with receptors; the interaction can be via the electromagnetic field. As he wrote in his book, *"Paramagnetism"*, the subject of why insects, such as the corn earworm moth, are attracted to certain corn plants is as follows:

"Put quite simply, it is because unhealthy plants from sick poison-fed soil give off slightly higher ethanol and ammonia infrared signals than healthy plants. This is particularly true of modern farmed ammonia-drugged plants. Ask any professional entomologist what are two of the most universal attractants of insects, and they will agree they are ethanol and ammonia, both precursors of fermentation and death. Farm crops should be harvested before they reach oil age, the attractive state that brings hordes of nature's scavengers, diseases and insects, to feed on them."

In other words, if the soil is healthy, and we use the correct fertilizers and amounts, the energy will contribute to a healthy plant free of diseases and insects. These discoveries by Prof. Philip S. Callahan were enough for most scientists' career, but not for this brilliant seeker of nature's secrets. He wrote that it was Divine Providence that led him on his next journey in seeking the secrets of good soils.

Paramagnetism is a physical force. It is detailed in every physics handbook in the world, but it took Dr. Callahan to discover, or as he wrote, rediscover the real importance of this low-energy force for agriculture, namely – growth.

Now what is this secret force of growth in plants? It is a very natural low-energy force that exists in certain soils, especially volcanic soils. The unit of measure is the *gauss*, which is the CGS unit of magnetic flux. Put another way, any rock or soil that will move towards a magnet is paramagnetic. If repelled, then it's diamagnetic. A good soil will read on a CGS meter from 120 to 3,000 CGS, but it really means $3,000 \times 10^{-6}$, or 3,000/1,000,000 of a CGS. The words *Paramagnetism* and *Diamagnetism* imply very, very weak magnetic fields. After many years of testing at University of Florida and the USDA lab at Gainesville, Prof Callahan has proven that any soil that is healthy (primary, secondary & trace minerals, with good biology) will grow healthy plants, but when paramagnetic rock dust is added to that soil, the growth of the plant increases from 200% to 875%, while the use of water (irrigation) is reduced by nearly 40%. His studies also led him to the fact that where the paramagnetic force in soils was weak, chemical fertilizers and insecticides were needed. He also found out that the ancient Mayans, Chinese, Babylonians, and Egyptians knew about this mysterious force and knew how to use it for both agriculture and religious ceremonies.

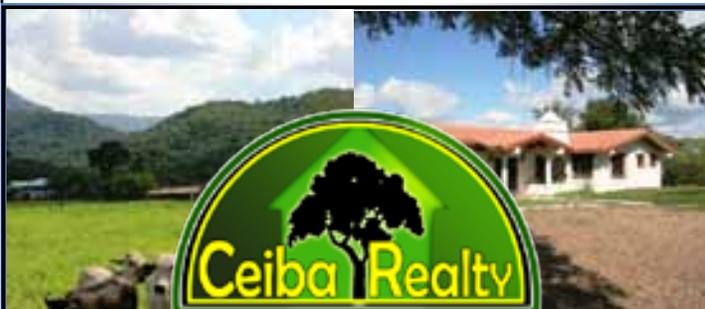
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Bill Lindo responds....Continued from Page 5

Yes, at least 80 elements or more are needed for good human health. God created the plant so that animals and humans can live by obtaining energy from the plants. The plant is for us. This, my friend, is the basic problem with the school teachers. They teach rubbish. Sure the plant can survive with maybe 15 to 22 elements but you as a human cannot. After looking at his patients (at Boston General Hospital) die for 15 years of degenerative diseases, a medical doctor and bio-chemist named Maynard Murray discovered that the ocean contains a perfect balance of trace minerals in bio-available form to rid mankind of those dreaded diseases. He then spent years developing methods and getting patents to apply the trace elements to the soil so plants can give them to us in bio-available form. When he died in 1983, he had discovered about 67 elements needed for human health. Last year it was at 81, with the discovery of nickel as essential for plant and human health. The trace elements support the human immune system, organs, brains, and enzymatic reactions. Without the rare earths and noble gasses like lithium, humans get sick.

Proof? My simple question is how many friends and family members you know who died in the last ten years compared to thirty years ago of degenerative diseases. In 2009, PAHO published a report that degenerative diseases were now a major problem for Belize. This is what makes me angry – our nutrient delivery system from the geological deposits, going to the soil, into our food, and then nourishing our bodies has been broken. To fix the broken system requires 1st, soil energy (including paramagnetic & fertilizer energies); 2nd, foundation minerals; 3rd, humus & biology; and finally, trace elements. Then cancer and other degenerative diseases will stop killing our youth – our future.

Three fertilizers, muriate of potash, anhydrous ammonia, and triple-super phosphate should be banned. They destroy God's nature, and offend our sense of justice.

Signed: Bill Lindo

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http://www.organicconsumers.org/articles/article_27491.cfm

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<http://www.greenmedinfo.com/blog/how-gmo-farming-and-food-making-our-gut-flora-unfriendly>

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https://www.foeeurope.org/sites/default/files/glyphosate_studyresults_june12.pdf

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BEYOND THE BACKYARD

Tally Me Bananas by Jenny Wildman

Driving into my property the other day I was horrified to see how neglected my banana plants looked: overcrowded, with leaves dead and perhaps even diseased. Earlier on I had passed a newly erected sign just before Riversdale advertising Bunches of Fun Banana Tours 624 4297. Now there is a good idea. So I made an advance booking for a dozen ladies who were somewhat skeptical when I asked if they would like to accompany me. Our guide, Evin, was lively, charming and eager to tell us about the farm and the importance of the banana industry here in southern Belize. We were off to a great start with an informative video outlining banana history. Sagitun Farm is one of 24 farms in Belize owned by 9 farm owners all forming the Banana Growers Association supplying bananas to Fyffes. Although there are hundreds of varieties of the genus *Musa*, the Cavendish is THE banana of choice grown by the globes' largest producers. Export bananas were once the variety Gros Michel or Big Mike but this was wiped out by Panama disease. The Cavendish is its replacement and it could be threatened by other possible diseases such as Black Sigatoka, hence the need for strict handling and chemical control.



We walked to the fields and were surrounded by large luscious plants. The banana is, in fact, not a tree but the world's largest herb. If there was any dissent in my group to begin with it was soon replaced by smiles, keen interest and fascination. The ladies had lots of questions and were surprised at how little we all knew about the structure of a banana. It takes about 9 months to produce a stalk of fruit and this growing process was explained in great detail. Skilled workers demonstrated the labour intensive work that results in perfect hands of bananas worthy of the little blue sticker of Fyffes. Efficiency and keeping track of the work load is crucial ...the tally, as Harry Belafonte would croon.

We continued on following the convoy of bagged stalks to the packing plant, where the bananas are carefully handled, measured, washed, sorted, examined, sprayed and finally boxed ready for shipping. Each cardboard box contains 40 pounds of perfect green bunches which depart from Big Creek for their 25 day voyage kept at

a temperature of 58 F (14 C) to Fyffes HQ in Ireland. Later they are artificially ripened with Ethylene gas. Go Bananas go....We heartily recommend a visit to Sagitun Farm.

The bananas we get here at the market are mostly the Cavendish grade 2 unsuited for export and sometimes apple bananas. Red bananas are now becoming popular in North America offering a different raspberry flavour and many nutritional benefits. In my backyard I reviewed what I have learned and commence a new planting/maintenance regime including more varieties such as the Manzano, Nino, Burro, Red and Plantains too. All are rich in antioxidants, minerals, B vitamins, potassium and fiber but low in sodium, therefore good for blood pressure and the heart. Potassium helps prevent loss of calcium from the body, therefore good for your bones. Bananas contain natural sugars and are a good source of calories. All varieties differ in taste; the red banana has a higher content of beta carotene and vitamin C. You can use plantain leaves as a herb in cooking wrappers such as in tamales. You can eat the fleshy flower hearts raw or steamed and in Asian cuisine the core of the trunk is often curried. Bananas have been cited as aids to weight loss, depression, cancer, to quit smoking, relieve constipation and have aphrodisiac capability. Banana peels can be used to reduce swelling and itching of mosquito bites and for water purification, e.g. in rivers to reduce heavy metal contamination. Other uses for the fiber include textiles as in kimonos and handmade paper. During the sixties rumors spread across university campuses that dried roasted banana peels could be smoked for a psychedelic experience. Monkeys are said to go crazy for bananas yet athletes and performers proclaim their calming effect. Well by now we know that they are delicious, nutritious and very versatile so by all means go bananas.

Send any comments or Banana discovery to Jenny Wildman spectarte@gmail.com

Photos by Joe Carpenter

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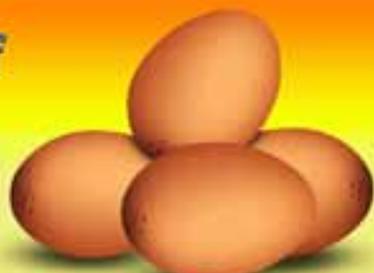
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Xate Survival Story

By Mary Susan Loan

What is Xate? Xate (pronounced SHA-tay or sha-teh) are ornamental palm plants. Xate are three of the eleven palms that are part of the *Chamaedorea* species. *Chamaedorea ernesti-augustii* is the most familiar of the three. It is typically known by its common name, fishtail, cola de pescado, pata de vaca or rabbit ears. *Chamaedorea oblongata* common name is Jade, Xate macho or oblongata. *Chamaedorea elegans* common name is Elegans, Xate hembra or parlour palm.



Xate palm leaves are green and smooth. Plants can grow to be seven feet tall, but generally fall over when they reach the height of an average man.

Chamaedorea palms grow from Mexico and Central America to Bolivia and Brazil. Xate varieties are most commonly found within Belize and Guatemala as they grow well in the shade and favorable climate of the neo-tropical rain forest. Birds and mammals of this region help to disperse and pollinate the seeds. Xate plants are harvested for their leaves, seeds and whole plants for the florist industry in the United States, Canada and parts of Europe. The leaves are unique as they are wilt-resistant and can stay fresh from forty-five to sixty days after being cut! It is estimated that millions of fronds are cut and exported to the United States and Canada for Palm Sunday as well as thousands per day for floral arrangements. Plants are sold to be house and garden plants as they are attractive and shade tolerant. Xate Elegans has been known to survive for up to forty years in an indoor environment! Unfortunately Xate plants have become endangered and have created a controversy in Belize and Guatemala due, in part, to unsustainable poor harvesting techniques and over-harvesting of the leaves, seeds and plants, especially in the Chiquibal reserve, which is Belize's largest forest area. Although it is illegal and prohibited, Xate is also harvested in the Chiquibal National Park.

Species of the Xate plant, seeds and primarily the leaves are cut and harvested in the forests areas of Belize and Guatemala and Belize by 'xateros', who are primarily men. Children and women help to sort and bind the leaves for export. It is estimated that approximately six to seven hundred xateros work for their livelihood each day gathering leaves. Many xateros in Belize territory are from Guatemala and are illegally harvesting Xate; most are poorly educated and cutting Xate is the only trade they know. Xateros change and harm the forest ecosystem by killing a wide variety of animals for food, looting ancient Mayan ruins and poaching, trap toucans, parrots and endangered scarlet macaws. In recent years, xateros have been implicated in attacks of researchers and Belize Defense Force soldiers. Each Xate leaf frond fetches approximately one U.S. dollar or two Belize dollars per frond. Xateros harvesters and workers earn only an average daily wage of \$5.15 U.S. dollars or \$10.30 Belize dollars per day. Most of the profit goes to the middlemen.

Survival of the protected areas and sustainable Xate farming are being assessed and improved methods of planting and harvesting are being developed by several groups including: The Rainforest Alliance (an international conservation organization), Association Forestal Integral San Andes Peten, as well as many other organizations and government groups working independently and together to conserve over 52,000 hectares of the Maya Biosphere Reserve and other areas in Belize.

Efforts are being made to grow Xate as a commercial crop by planting seedlings under shade trees. It takes four years for a Xate palm to grow to a harvestable height. Xate have traditionally been harvested in the wild, but may prove to be a successfully cultivated crop. However, one impediment to commercial production is the lack of a market channel for the leaves in Belize.

For an excellent, comprehensive guide to cultivation of Xate, please visit an on-line draft, Xate in Belize: a Grower's Guide Manual, http://www.belizebotanic.org/xate_manual.

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Apple Trees of Belize Featuring the Mammee Apple

By Mary Susan Loan

Mammee apples are not botanically apples, but have a similarity to apples and are recognized and known as apples in Belize and the other tropical countries where they are grown and enjoyed.



Mammee apple, *Mammea americana*, also known as mammey apple, mamey apple, coco apple, Saint

Domingo apricot, mamey amarillo, South American apricot, abrico and several other names native to the tropical country of origin, produce fruits, which, despite their resemblance to apples, are botanically considered to be berries. Mammee fruits are grown from an attractive evergreen tree of the *Garcinia* family (*Clusiaceae*) which resembles a magnolia tree.



Mammee apples are commonly confused with Mamey Sapote (*Pouteria sapota*) of the *Sapotaceae* family but are unrelated. Mammee apples are a tropical fruit related to the mangosteen.

This tropical tree is believed to have originated from the West Indies and northern regions of South America. Mammee apples were already part of the local diet in Central America in the 1500s. Propagation of the trees has spread to Bermuda, Central America, Bahamas, the Caribbean and southeast parts of Florida. Mammee apple trees were introduced to Hawaii in 1816.

Trees generally grow to be approximately sixty to seventy feet tall and thrive in deep, well-drained soil, but are adaptable to shallow sand terrain and grow well in limestone areas of Belize as well as in the oolitic soil of the Bahamas and southern Florida. Mammee apple trees are intolerant of cold weather and their propagation is limited to tropical, or near tropical countries. Trees and fruits are remarkably resistant of pests and diseases, even fruit flies.

Seeds of the Mammee apple are large and tan with a rough casing. They are easily germinated by laying the seed horizontally and covering the seed with one-half inch of soil and watering. As the trees are male, female or hermaphrodite together or on separate trees, planting a grafted tree will help to avoid disappointment. Seeds sprout in approximately two months. Trees are productive anywhere from six to ten years when grown from seed or grafted. Mature trees generally fruit twice per year producing one hundred and fifty to four

hundred fruits per tree.

Large green glossy leaves of the Mammee apple tree, opposite the stem are dotted with glands and are somewhat leathery.

White sweet-scented flowers grow to become tan-to-grayish mottled skin fruits which are from three to eight inches in diameter. The flowers are distilled to make Eau de Creole, a fragrant liqueur, which is said to help aid digestion. The fruits are roundish in shape, approximately the size of a large orange. The fruit is ripe when it softens and the tannish-grayish skin becomes deep yellow to orange in color. Scratching the fruit with a fingernail helps to determine the ripeness. If a light scratch reveals green, the fruit is not ripe, if it is yellow the fruit is ripe. Fruits bruise easily and are best picked before they fall from the tree. The skin, which is around one-eighth inch thick, is a bitter rind which encloses the sweet aromatic sub-acid flesh, whose flavor is described as tasting like a combination of naseberry, peach, apricot and red raspberry. It is eaten raw or used in preserves, jelly, in 'smoothie' and other beverages or cooked in pies and tarts. Beware: beneath the skin there is a bitter-tasting, thin dry whitish membrane which must be removed prior to eating. It is advised to score the fruit to ease the peeling process. Mammee apples pair well with cinnamon and ginger. In the Dominican Republic, the raw flesh is blended with sugar and made into frozen sherbet. In Brazil, wine is made from the fruit and fermented sap of the tree. Caution: in some persons Mammee fruits create digestive discomfort. Fruits are high in vitamin C and A and protein and contain free radical anti-oxidants.

Mammee apples are used in medicines and insecticides in Central America, South America and the Caribbean; each fruit contains one to four seeds which are resinous and used as an anti-worming agent and are ground for use as an insecticide. Beware: the juice of the seeds leave an indelible stain! The acrid, resinous gum of the unripe fruit has traditionally been used to destroy skin-infesting chigoe fleas.

The leaves can be wrapped like a collar around tomato plants to help protect them from cut worms, moles and other critters. The leaves are placed one-half above the ground and one-half below the plant.

The bark of the tree and the greenish/yellow gummy resin of the immature fruits are strongly astringent. In Mexico and Jamaica, the thick yellow gum from the bark is melted with fat and applied to the feet to combat chiggers and is used to rid animals of fleas and ticks.

In Central America the tree is protected because the fruit is valued. In other Mammee apple producing countries, trees are felled and the wood is used to make cabinets and furniture and fence posts or for wood stove firewood. The wood is decay-resistant but is susceptible to termites.

Mammee apple trees and its fruit, seeds and wood are not exported commercially. In Belize the Mammee apple may generally be found in limited quantities in the market place from around April – June and early in the new year if a second crop is produced. If space is not an issue, trees make a handsome and tasty addition to the 'backyard' garden.

30 Years of Growth and Firsts For Cayo's Running W Meats

By Beth Roberson



Worldwide it is not uncommon for people to consider an imported item more valuable than a locally produced product. In Belize this has often seemed especially true. For a small and less developed country (LDC), as Caricom classifies us, we are accustomed to much importation. However, as one of only 2 Caricom net exporters of food, the game is changing; Belize is gaining a reputation not only in the numbers for exported food and commodities but also in the high quality of our products, especially in the agriculture/food arena.

Running W's manager, Abdala Bedran, was chosen as one of the main speakers at the 2012 International Brahman Congress, held in Panama, in recognition of not only their excellent products but for Running W's exceptional forward thinking sustainable management at Cayo District's Running W Farm.

Running W is a family based business. The late Mr. Escandar Bedran and his wife, the late Mrs. Paulita Bedran, parents of 7, instilled a strong worth ethic in their children. Mr. Bedran was successful in many varied businesses and had an affinity and talent for purchasing land; Mrs. Bedran, a popular civic minded woman and exceptional mother, instilled a strong respect for education in her children and grandchildren. Wanting to maintain a strong and close family, Mr. Bedran always encouraged and facilitated, when possible, businesses which would maintain his family together

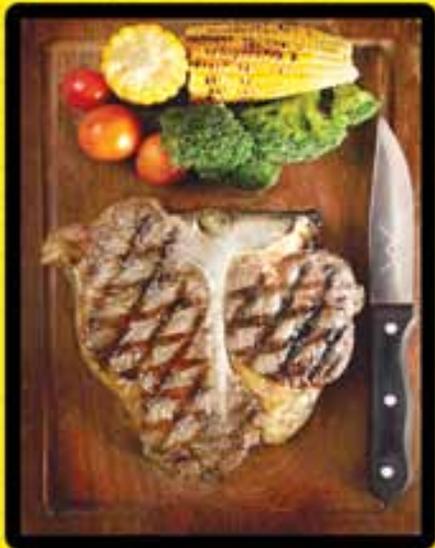
in Belize. They were remarkably successful, as 6 of the Bedran children today reside and work in Belize. The 2 brothers, Abdala and Escandar Jr. Bedran, own and manage Tiger Run Farm Ltd., home of Running W Meats. Several of the next generation are already active in the various Bedran businesses.

Having spent much of their early years on Bedrans' Cool Shade Farm, on the Pine Ridge Rd. (Cayo), the family had cattle along with other stock. In 1981 Mr. Bedran purchased the 1,400 acres of what had formerly been known as Norland Farms, just west of Central Farm along both sides of the Western Highway and reaching the Belize River. The Bedrans called their new farm Tiger Run, after the 'run' (rapids) in the Belize River along the farm's northern boundary. Roughly 40% of Tiger Run was cleared at the time of purchase. They sold all the cattle and rented the land out for the first 2 to 3 yrs. The Bedrans logged some of the land, and that timber work led to the eventual creation of Pine Lumber Ltd., another Bedran enterprise.

At about that same time, Dr. John Pentec had been invited to Belize to assist the Belize Livestock Producers Association (BLPA) to develop processing of livestock. BLPA, assisted by U.S. AID, rented the existing slaughter house from the Belgians who had purchased that portion of Norland. After less than a year, Dr. Pentec left the project in frustration. He returned to Belize in 1983 to assist in livestock processing, but this time to help Abdala Bedran, who had by this time graduated (1979) from the Belize Agriculture School at Central Farm (now the University of Belize College of Agriculture). The newlyweds, Abdala and Yvette, contacted Dr. Pentec, and in October of 1983 they purchased the equipment of the former processing plant and rented the building. With the addition of a Land Rover and some spices, they were in business. 3 days a week they operated their slaughter facility, processing an average of 4-5 steers and 3 pigs weekly. They made deliveries in San Ignacio, Belmopan and Belize City from the back of their Chevy pick-up truck.

Continued on pg 26

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FACING THE GIANT: AVIAN INFLUENZA IN MEXICO

By **Dr. Victor Gongora**

Animal Health Department
BAHA

The Highly Pathogenic Avian Influenza (HPAI) 2012 and 2013 outbreaks in Mexico have always been worrisome to Belize but now, almost a year later, with the disease now in five Mexican states Belize faces a formidable giant. The outbreak first started in Jalisco in June 2012 and, by November, Mexican authorities considered it eradicated. However, there was a loss of some 22 million birds due to the disease or control measures and some 166 million doses of vaccine were applied. But it re-surfaced at the start of 2013 with a vengeance spreading to nearby states and resulted in 12 states vaccinating against HPAI, 9 of these states being unaffected states. This giant with the outbreak now being reported in Puebla, Mexico has its sword drawn against Belize, Guatemala and the Yucatan peninsula. As in biblical times when David faced Goliath, Belize now needs to face the threat of HPAI from Mexico. This giant is a threat to Belize's food security, economy, poultry industry and animal health. Public health is not under any threat as the disease is primarily a bird disease.

Belize's response is a coordinated response with the lead being taken by BAHA and the Belize Poultry Association (BPA). Regular meetings of poultry committees (poultry advisory committee, poultry health committee) are held to update on the evolution of the disease as well as to harmonise preparation and prevention measures. While BAHA is strengthening its veterinary services for early detection and prompt response, the BPA is ensuring that its producers are aware of the threat and step up biosecurity measures. While BAHA is strengthening its quarantine service with increased inspections at ports of entry from Mexico, the BPA is assisting in risk assessments of cross border movements. While BAHA strengthens its public awareness on HPAI, the BPA keeps advocating at national and regional level for countries to realize the strength and size of the giant and to be properly prepared. While BAHA establishes coordination with Guatemalan and Mexican officials, the BPA is also strengthening ties with regional poultry associations. BAHA, in response to request from poultry farmers, has established a **BAHA HOTLINE: 605-2100.**

Belize and Guatemala are entry points to Central America and are thus expected to face the giant head-on, stopping it from moving into Central America. Hence, OIRSA, the regional agricultural health organization:

- Has facilitated the development of an HPAI prevention and control plan for Belize and Guatemala in addition to a regional emergency response plan.
- Has declared a regional alert for HPAI in Mexico.
- Holds regular meetings of its poultry committees (regional avian health committee, sub-committee on HPAI) and chief veterinary officers to ensure regional preparedness but with special focus on Guatemala and Belize.



- Facilitated support at both the regional government and industry level for the establishment of a vaccine bank, for a regional HPAI simulation and for full support to the joint Guatemala and Belize prevention and control plan.

We all hope to wake up one day to find that the giant is gone. However, while it continues to wreak havoc in Mexico, very much alive, Belize cannot afford to ignore it. It is our responsibility – as government, as BAHA, as BPA, as farmer, as consumer, as Belizean - to be alert and to be ready for any eventualities due to HPAI.

Any suspect cases can be reported to the **BAHA hotline 605-2100.**

Further information can be obtained from BAHA by calling the nearest BAHA office.

Farmers can get advice on biosecurity from the BPA (824-3221).

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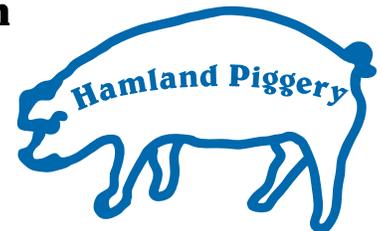
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BEL-CAR UPDATES

These are Bel-Car's main products, by percentage (dollars, not volume) with note of direction from previous year.

BLACK EYE PEAS: down, approx. 10%

RK BEANS: level, 25%

CORN: up, 64%

SORGHUM: slowly up, less than 1%

BLACK EYE PEAS: Production this past year is still low, and is expected to remain low again next year, due to prices returning to \$0.65-0.70/lb, down from the unrealistic \$1.00 to 1.10 of last year. Bel-Car management travels extensively, analyzing global factors, increasing their marketing success. Trips to the Middle East increased understanding of the short but premium market for black eyes for the Ramadan holidays. Europe has also purchased some Bel-Car black eyes this season and discussions are under way with southern US growers, who may need to import to meet their regular customer demands.

RKs: Bel-Car is still buying at \$1.60, although international prices are cheaper; Bel-Car will need to reduce prices or stop selling. After a time of world scarcity of RKs, the USA and Argentina raised their production levels, which lowered world prices. Buyers such as Trinidad are already buying out of the region, paying the heavy 40% Common External Tariff (CET). Presently slightly more RKs are inventoried in country than will be consumed locally, so prices must decline. Higher local consumption will likely follow, and more beans in local rice and beans.

CORN: There are upwards of 24,000 corn acres planted in the Spanish Lookout area, up from last season's approximately 20,000 acres. Almost all cultivated lands are planted in corn with very little milo. Bel-Car's corn inventories are sufficient to last until the new harvest arrives. Most exports are still going to the Caribbean, while some white corn is going to Guatemala. Coordination between growers and marketers has led to projections of ample supplies until the new crop comes in, with little overlap. Exports to the Caribbean for ground corn are slightly decreased. Factors include international competition, perhaps from N. America or elsewhere. Bel-Car's largest ground corn buyer Jamaica is experiencing economic challenges in their local pork industry, which may also be a strong factor in the decline.

RICE MILLING: A little known service Bel-Car offers, mainly for non-member smaller farmers is rice milling. Farmers from Salvapan and Valley of Peace bring in hand-cut harvests, usually under 10 bags per farmer, as Bel-Car is the only mill in Cayo District offering this service.

Article based on an interview with Bel-Car's CEO Otto Friesen and reported by Beth Roberson.

Cattle Sweep in Spanish Lookout Finally Begins

The Belize cattle sweep, which began in the Northern Mennonite community of Blue Creek in November of 2012, finally arrived in Cayo's Spanish Lookout. 400 head of cattle were tested on Monday, June 17th, with a follow up reading of results on Thursday, 20th June. Two visits with each animal are required to complete the service. On the first day the cattle have blood drawn for bovine brucellosis and are given a bovine TB (tuberculosis) test under the tail. Blood samples are sent to the lab, but the TB tests require the cattle to be individually handled again precisely 3 days later, to manually read those results. For the completion



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of testing for the approximately 14,000 to 15,000 head within the community, the national committee projects a 4 week timeline. Spanish Lookout cattle committee chairman, Paul Penner thinks this will be closer to 8 to 10 weeks, with circumstances such as heavy rains contributing delays. The total dairy herd there, estimated at 1,300 to 1,500 head will be closely checked, as brucellosis typically has a higher incidence in dairy than beef herds. To date all the results country-wide have been negative.

All Ranchers May Choose Eartag Type: Computer Readable or Not

There seems to be much confusion within the various Mennonite communities concerning the 'computer ID chips' which are available, but are not required. The 'computer chip' tags are not connected to any satellite; they have no capacity to indicate where the animal is located. The tags only have an individual reference number, identifying each specific animal on a computer which must be on the ranch with the animal to enable reading it. Hence, if a group of cattle with the computer tags are moved through a gate, en masse, and the reader computer is there, it can 'read' all the individual numbers onto the computer immediately. With the non-computer tag, each one must be manually read by the handlers. There are sufficient tags for ranchers to choose the type they prefer. Charges for the cattle owner for the sweep services are the same for both types of tags: \$10 Bz\$ per head. Penner explained that at least one northern Mennonite community which had objected on religious grounds and chose not to get the computer-readable tags, are now gaining a better understanding of the system with some ranchers requesting a changeover to the computer-readable tags. The Spanish Lookout ranchers are anticipated to select the computer-readable tags.



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Belize Cattle	T	A	B
Young str. & bulls- 750- 1100 lbs	H	1.90-2.00	1.75-1.90
Cows & heifers for butcher	H	1.50	(thin)1.45 - 1.50
Heifers for breeding 500-800 lbs	H	1.50	1.35 - 1.45
Young grass cattle- 350- 650 lbs	H	strs.1.60	heifers 1.45
U.S. Cattle			
U.S price -corn fed- 1000- 1200 lbs	H	1.21-US=2.42-Bz	
U.S price - feeders 600- 800 lbs	H	1.48-US=2.96-Bz	
U.S price- calves 450- 600 lbs	H	1.50-US=3.00-Bz	
U.S price- aged butcher cows	S	.80-US=1.60-Bz	
Belize Hogs			
Weaner pigs- 25-30 lbs- by the head	S	\$90.00 - \$100.00	
Butcher pigs 160 - 230 lbs	S	1.75 - 1.85	1.65 - 1.75
Belize Sheep			
Butcher lambs	S	2.00 - 2.25	1.75- 2.00
Mature ewes	S	1.70 - 1.75	1.60 - 1.70
Belize Chickens			
Whole sale dressed	H	2.44	
Broilers- live per lb	H	1.27	
Spent hens	H	0.95	
Fruits & Vegetables			
Tomatoes, cabbages, cucumbers	S	whsl .75-1.75; ret-\$1.00-\$2.50	
Local potatoes	H	1.00 - 1.10	.90 - 1.00
Local onions	S	.90 - 1.00	.80 - .90

Grains, Beans & Rice	T	A	B
Belize yellow corn	H	.28 - .29	.27 - .28
White corn	H	0.29	.27 - .28
Corn/ local retail (low volume)	H	.33-.36	.31 - .32
US corn @ 6.60-per 56 lb bushel	H	\$23.60/ BZ 100#+8¢ frt. to BZ	
US soy beans @15.16 per 60 lb bshl	H	\$50.50/BZ/per100+8¢ frt. to Bz	
Guatemala corn price/Peten	H	.31 - .34	.29 - .31
Belize soy beans/cwt	S	.52 - .53	.51 - .52
Belize milo	L	.22 - .23	0.21
R-K's, little reds & blacks (beans)	S	1.50 - 1.60 farm price	
Black eyed peas	L	.65 - .67 farm price	
Milled retail rice per pound	S	.75 - .83 farm price; distribution .93	
Citrus			
Oranges per 90 lb box-lb.solid basis	H	\$10.50 Est. 2013 price	
Grapefruit- per 90 lb box	H	\$ 9.50 Est. 2013 price	
Sugar			
White sugar- 112 lbs- controlled	S	.45 per bag + 3-5 cent mark up	
Brown sugar- 112 lbs- controlled	S	.39 per bag + 3-5 cent mark up	
Special Farm Items			
Eggs- tray of 30 eggs	H	6.75 farm price; retail .30 -.33 per egg	
WD Milk per lb to farmer	S	contract .50; non contract .45	

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

Bird Watch - From my Perch How Technology Changed the Way We Watch Birds

By Marguerite Fly Bevis

Watching birds used to mean carrying a backpack filled with bird books and notebooks. Today a birder can carry his books, bird songs, and a notebook, all in one pocket-sized compact tool. Birders all over the world can enter their observations into a global database, for the benefit of birders everywhere.



Launched in 2002, eBird.org provides data sources for basic information on bird abundance and distribution. In March of 2012, participants reported more than 3.1 million bird observations across North America. Belize has its own community of e-Birders, people who faithfully record their observations in the field or in their own backyard. As a result, there is already a wealth of information available online about your favorite bird species, where they are and when you might find them.

The application, Bird Log CA (Central America) is a tool to use when you're "on the go" or to keep track of the birds you see in your own backyard. It is a "real-time, online checklist program" that works on your smartphone or tablet, and with it you are able to make entries in the field. When you connect to the Internet, you can submit the data. Your observations then become part of a huge global database at the Cornell Lab of Ornithology and the National Audubon Society. The information can be accessed at <http://www.ebird.org>. Go to <http://www.birdseyebirding.com/> or the iTunes App store to find the mobile applications.

Why would you want to spend Bz \$19.95 for an app? One reason is that it helps avid birders to organize and keep track of sightings. Gone are the small slips of papers or entries in notebooks you can no longer find. Your observations can significantly contribute to a worldwide database, helping scientists and conservationists understand more about bird life cycles and migration patterns.

Another app linked to the same data, BirdsEye HD, will help to find species you're looking for. Maybe you especially want to see a Roseate Spoonbill, for example. You can look online or in the app for that bird, and find out a lot of information regarding where they are and the last time they were seen.

When you submit sightings to BirdLog, it brings up a list of expected birds depending on the location you choose. Maybe you're going to go to Xunantunich. Before you go, while connected to the Internet, start a new submission. Select "Submit Sightings." On the next page, select "Choose a location from a map." You will have the option of choosing from hotspots in your area, or choosing your current location using the device's GPS. Xunantunich is one of the hot spots. Enter the date and time you expect to be there. The application will load a list of the birds you might be expected to see at that location. You can then take your device with you to the site and be able to enter your observations on the go. When you get home, connect to the Internet and submit your findings online.

If you don't have a portable device, you can add an account at ebird.org and enter your records by computer. This means you carry a notebook and paper. (Write it down! Don't try to remember.) There are benefits to looking at your account on a computer. There are detailed records and reports available online not available in a portable application.

If you enter a rare species or a migrant that is early or very late, a small box appears next to your entry. This means you need to describe the bird in the comment section for that bird (not the main comment

section.) If at all possible, get a photo of the bird so you can submit it for review by the local experts. When you are ready to "review and submit," be sure to select the box to insert a check. This signifies you have made a comment. You won't be able to submit until you have placed a check in that box.

Why use it? For years, I have watched birds in my yard and on my travels and have always wished I was organized enough to write it down every time. I made a few lists over the years, but nothing significant. Now I am making lists almost every day. I started adding high and low temperatures plus rainfall for my own records in the Comments section. Finally I have an easy, portable method of keeping track. I can access my personal data from any computer. The information I submit is now available for Birders, scientists, and conservationists around the world.

Now, when I go somewhere to watch birds, I carry binoculars, my iPhone (in a waterproof case), water, and a portable stool for sitting when I find a particularly nice spot. About 90% of watching birds is listening to them. On the iPhone there is a popular app called iTunes. There are other applications for music and you can use any. Usually you need to use your computer to add files to your library and then sync it with your personal device. My favorite is, "A Bird Walk at Chan Chich" by John Moore. I have also recently acquired MP3 files of bird songs of Mexico. These are now all in my library on my phone, which is now with me in the middle of the jungle. I hear a bird but I can't nail it down. I think, "flycatcher," but which one? Search for "flycatcher" in the Songs menu of your library. Always enter a singular word, not "flycatchers." A list will appear and you can go down the list, listening, until you find the bird you just heard. Another useful tool on the phone is "Voice Memo." You can easily record a bird song and save it to analyze later.

Enjoy the way technology can enhance your bird-watching experiences!
Happy Birding!

Bird Photos Credit J. Carridi

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From The Belize Grain Growers Association

GMOs – Brief History and Prospects for the Future

By Hugh O'Brien

The month of May 2013 marks 30 years since scientists first published that they could place functional foreign genes into plant cells. This technology, known as GMOs, or Genetically Modified Organisms, however, has been around for a bit longer, with the first GMO product, human insulin, released for marketing by Genentech as far back as 1982. The scientific breakthrough using genetic engineering in plants signaled an exciting phase in biotechnology, a phase heralding the ability to artificially insert desired traits and characteristics into plants used for food, fibre and fuel.

In early 1992, analysts predicted that one of the first biotech crops, the Flavr Savr tomato, which was engineered by Campbell Soup Company to remain firm after ripening, would obtain regulatory approval and be the first success story of a GM crop on the market. Campbell believed that tomatoes that can ripen on the vine, obtain their full natural flavor while on the plant, and still make the trip to the supermarket and the dinner table, without getting mushy or rotten, would be a delight to producers and consumers alike. The anti-GMO campaign, led largely by organized organic farming groups in the US, launched a very effective campaign, leading to Campbell's decision to withdraw the Flavr Savr tomato from the market.

Following the failure of the GMO Flavr Savr tomato, intense research on GMO crops suffered a major setback and efforts

were directed to the more serious problems faced by the farmers, notably controlling difficult weeds (Roundup Ready soybeans) and protection of crops from ravaging insects (Bt crops). Technology that was considered safe in organic and conventional agriculture was embraced to develop new varieties of crops. In 1996, Monsanto, headquartered in St. Louis, Missouri, introduced its popular 'Roundup Ready' soybean which was equipped with a bacterial gene that allows the crop to tolerate glyphosate herbicide (better known by its trade name, Roundup). This meant that farmers could kill a majority of weeds with one herbicide rather than several. Roundup has long been considered the safest herbicide used by farmers worldwide, especially when compared to pre-emergent herbicides like atrazine, and contact herbicides like paraquat (better known by its trade name gramoxone).

Genetic engineering then focused on the naturally occurring bacteria, *Bacillus thuringiensis* (Bt), which produces a group of proteins that kills a specific group of Lepidoptera worms, is proven harmless to other insects and is used by organic farmers to spray on numerous vegetable crops right up to one day before harvesting. The ability to produce Bt proteins was then introduced into corn, cotton, sugar beet, potato and a few other crops, reducing the use of more toxic insecticides by farmers.

Monsanto has been at the forefront of GMO crop technology and the anti-GMO lobby claims that GMO technology concentrates power and profits in the hands of a few large corporations. Now a whole new generation of GM crops is making its way from the laboratory to the market. Some of these crops will tackle new problems, from apples that do not get discolored to 'Golden Rice' with a very high content of Vitamin A aimed at reducing blindness in hundreds of thousands of people mostly in Asian countries.

Continued on page 26

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The advertisement features a background of a green field with a fence. In the foreground, there are several rolls of fencing materials. On the left, there are two rolls of wire with labels: 'CORCEL III GALVANIZADO CLASE III' and 'VAQUERO I GALVANIZADO CLASE I'. On the right, there are several rolls of different types of fencing, including a tall roll of green chain-link fence and several rolls of grey and blue mesh wire. The 'DEACERO' logo is prominently displayed at the bottom center in a stylized, bold font with a red and black color scheme.

Citrus Greening

Citrus greening, also known as huanglongbing disease or HLB, has been called the most serious pathogen ever to infect citrus. It has already killed millions of citrus trees in Florida and resulted in an economic loss totaling 4.5 billion dollars and 8,000 jobs. The disease causes fruit to drop prematurely and to grow misshapen and bitter, thereby making it unsuitable for either juice or the fresh market.



Greening is a bacterial disease transmitted by the Asian citrus psyllid (ACP). It originated in China last century and found its way to Brazil, Mexico and Florida early this century. Most recently it has been identified in Texas, Louisiana, Georgia, South Carolina, California, Arizona, Cuba and Belize. In areas where only isolated cases of the disease are present rigid quarantine measures have been implemented to prevent its spread.

Such is not the case in Florida where the disease is now endemic in virtually all areas where citrus is planted. Growers are faced with a decision: to destroy all their trees and plant something else or try to manage through the disease.

Fortunately, research suggests that it is possible to keep infected trees productive with good management practices. Successful growers use a two-pronged approach that consists of spraying to control the insect vector and implementing an aggressive crop nutrition program that includes foliar fertilization. Foliar fertilization is important because after an infected psyllid feeds on the tree Candidatus bacteria enter the vascular system where they multiply and block the phloem tissue. Since phloem carries sugars and nutrients from one part of the plant to another this chokes off the supply of food available, thereby weakening and eventually killing the plant.

Foliar applications of micro and macronutrients have been shown to unblock the phloem tissue in HLB affected plants. Once the phloem is unblocked nutrients can travel downward through the plant to regenerate damaged root systems, thereby allowing root feeding to proceed again and nourish the plant. Foliar fertilization alone cannot supply all the plant's nutrient requirements; healthy soil is also important. However, research in Florida has shown that infected citrus trees can be kept productive if micro and macronutrients are foliar fed during the spring, summer and fall vegetative flushes. Even trees which are unproductive and close to death have been resuscitated and made productive again after four or five seasons of nutritional foliar sprays.

Agro-Culture Liquid Fertilizers are specially designed for maximum uptake and effectiveness when applied through the leaves or roots. Plant extracts are chemically attached to micro and macro nutrients through the use of organometalics so that nutrients can travel through the cuticles and membranes easier. The high concentration of readily available micronutrients in agro liquid fertilizers means more nutrition gets into the plant per gallon applied and the low salt index means that leaves will not get burned.

Contact David Thiessen at Thiessen's Liquid Fertilizer in Spanish Lookout (see ad this page) for details on how ACLF can keep your grove productive even when citrus greening is present.

USING A REFRACTOMETER

The ability to easily measure Brix in the field makes it possible to determine ideal harvesting times of fruit and vegetables so that products arrive at the consumers in a perfect state or are ideal for subsequent processing steps. A refractometer is an instrument for measuring Brix. An explanation of the background and importance of Brix in determining quality of produce can be found on page 10 in issue 17 of the Belize Ag Report, Aug/Sept 2012.



Degrees Brix (symbol °Bx) is the sugar content of an aqueous solution. Specifically, one degree Brix is 1 gram of sucrose in 100 grams of solution and represents the strength of the solution as percentage by weight (% w/w). For fruit juices, 1.0 degree Brix is denoted as 1.0% sugar by weight. This usually correlates well with perceived sweetness. If the solution contains dissolved solids other than pure sucrose, which can be the case in vegetables, then the °Bx only approximates the dissolved solid content.

When light moves from one medium to another it changes direction, i.e. it is refracted. A refractometer measures the refractive index of liquids or solids. It typically measures some angle of refraction or the critical angle for total internal reflection. To measure the Brix of fruits and vegetables, a thin layer of the liquid to be measured is placed on a prism. (To measure the Brix of vegetables that are typically not juicy, an instrument to squeeze the juice from it is used.) The result is observed through an eyepiece. The critical angle (the angle beyond which light is totally reflected back into the sample) is a function of the refractive index and the operator detects this critical angle by noting where a dark-bright boundary falls on an engraved scale. The scale can be calibrated in Brix or refractive index.

Continued on page 24



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Pig production

Faculty of Science and Technology University of Belize Central Farm Campus

By Felix Tzul

One of the key components of the livestock section at the University of Belize Central Farm Agriculture Department is the piggery unit which serves the following purposes: 1. Generate income for the institution's development and sustainability, and 2. Serve as an instrument to expose and involve students in the day-to-day management and husbandry practices of a farrow-to-finish swine production unit.



But the program is about to change in preparation for the offering of a Bachelor's Degree in Applied Agriculture in the near future. For this purpose, the following expansions are contemplated over the

next three years.

UBCF Expansion Program

1. Expansion of current operation to an 18 sow farrow-to-finish unit
2. Establishment of feed mill and feed mixing unit on campus
3. Construction of a finishing unit with a capacity to finish all piglets born in the facility
4. Improve and expand processing capacity of the school processing facility
5. Construction of a biogas facility to provide energy and organic fertilizer

The expansion will provide students ample opportunities to enhance knowledge and experience on the day-to-day management and husbandry practices of swine production, nutrition, feed formulation, processing and packaging. The feed mill will complement the production of grain since a portion of the grain will be utilized to feed the livestock (swine, sheep, and poultry) of the farm and remaining grain sold for income generation. Revenues are contemplated from the sale of the following: grains (corn, sorghum), weaned pigs, finished pigs, pork and/or pork products from the processing unit.

The projected gradual increase in stock can be achieved in the three years as shown below and demonstrates the outputs that can be attained under good management practices from an 18 sow farrow-to-finish unit on the farm on three litter-size scenarios.

Projected Three-year Expansion Program

Number of sows	12	16	18
Number of Farrowing Per Year	2	2	2
*No of Pigs Farrowed/Year When Litter Size Is:			
8	192	256	288
9	216	288	324
10	240	340	360
Maximum number of pigs in finish at one time			
8	96	128	144
9	108	144	162
10	120	170	180
Maximum Finishing Area (8 Sq. Feet/Hog)			
8	768	1024	1152
9	864	1152	1296
10	960	1360	1440

The information provided below can be used as a guide for anyone interested in swine production to estimate the consumption and cost of ration in a pig production unit, small or big.

Projected feeding regime per animal class as guide to estimate annual feed consumption and costs for the expansion program

Average Feed Consumption per Day	Method	Amt. daily	
Sow (gestation)	Confine	4 – 5 lb	
Sow Lactation	Full Fed	12 lbs.	
Growing Hogs.	Method	Amount lb.	Daily gain
30	Full Fed	0.5	0.3 lb
75	Full Fed	1.9	1.0 lb
150	Full Fed	4.6	1.6 lb
200	Full Fed	7.0	2.0 lb
220	Full Fed	9.5	2.1 lb

However, as with all business ventures or investments the technical parameters set to measure and evaluate production and productivity - the number of litters/sow/year, number of pigs/litter and number of pigs weaned/litter - are all influenced by management practices. UBCF will need to meet these challenges in order to move ahead successfully in its ambitious program of development.

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Let's Make an Agricultural Revolution, Belizean Style

By Jo Carpenter

This country has a big, ugly debt problem. Mostly it smolders; in 2012 it bubbled up, but one day it's going to erupt in the form of a sharp currency devaluation and painful austerity measures that set the country's economic and social development back generations, with all the human misery that that entails. Fortunately, we have the power to change the future through our economic choices and agriculture has a leading role to play.

Belize imports more than its exports: the merchandise trade deficit rose by Bz\$81.3m or 23.3% in 2012-13; the balance of payments current account deficit widened to 2.7% of GDP. The value of exports of goods produced in Belize (rather than re-exports) dropped by Bz\$25.3m; imports for domestic consumption increased by Bz\$162.8m. The fixed exchange rate is feeding our addiction to imports, but hamstrings export competitiveness. The trend is unsustainable and eventually the dollar peg will snap.

But the problem is bigger than trade. We don't save enough to generate funds for investment: the IDB Country Strategy for Belize talks about the high cost of domestic finance as a brake on growth and the need for foreign investment, including in agriculture. There is no stock exchange for companies to raise capital and the banks are ineffective in recycling savings to feed cash-hungry businesses. Governments periodically indulge in spending splurges, resulting in a precipitous public debt level of 78% of GDP. We borrow to cover current expenditure: the government had a Bz\$17.3m deficit in 2012-13 and capital expenditure is dependent on handouts from foreign agencies.

Transport, telecommunications, power generation, education and healthcare. These are the building blocks that enable a society to improve productivity and living standards over the long term. Why can't Belize afford to invest in infrastructure? We have a thriving tourism industry; oil, which earned Bz\$186m in 2012; and an enormously fertile and productive land with highly skilled farmers. We have a largely peaceful population, no refugee crisis, no insurgencies, and no terrorist groups. And yet the basic problem remains that the economy despite its healthy preliminary figure of 5.3% in 2012 does not produce enough wealth to invest in the future and underpin long-term economic and social development.

The problem is partly a fiscal one. Simply put, there is not enough tax revenue and the little that comes into government coffers quickly flows out. In fiscal 2012-13, 56% of government expenditure went on wages, pensions and related expenses and a mere 18% on capital expenditure. The public sector is bloated, though we can't entirely blame successive administrations: Dr Ydhalia Metzgen in a September 2012 report prepared for the Central Bank, states: "Many Belizean citizens also consider the government employer and provider of last resort". The state sector as a whole represents about one-third of the economy and is crowding out private enterprise.

Agricultural produce comprised a muscular 61% of domestic exports in 2012. Clearly, Belize has considerable expertise in agricultural production, but if it were to supplement commodity exports with value-added food products, foreign currency earnings would less vulnerable to adverse swings in the terms of trade. Pepper sauce is one such example, which earned Bz\$1,987,821 from overseas sales in 2012. The exports would not only be more valuable, but also less volatile. Metzgen agrees: "Belize's export growth would benefit from an upgrading of the export basket via new activities entering the export sector or by introducing more sophistication in export products" and the IDB: "Belize needs to upgrade its export basket, particularly to non-traditional agriculture for export, given the eroding preferences for banana and sugar exports as well as explore other potential areas such as high value foodstuffs..."

So where are the Belize health snack bars, the chocolate covered, spicy banana chips, the coconut water sports drinks? Where are the attractively packaged, branded goods that tumble readily into the shopping baskets of American consumers? "The main challenges for export competitiveness" according to the IDB, "are compliance with sanitary and phytosanitary international standards, production technology, infrastructure, and difficulties in obtaining long-term capital". Not to mention a thorough understanding of marketing, logistics and supply chain management.

It would seem an uphill battle to develop these skills from scratch and expensive to buy them in from abroad. Fortunately, Belize has a reservoir of extremely knowledgeable professionals with relevant skills and experience and networks of relationships in key overseas markets. They are the retirees and prospective retirees who could be given credits towards residency and citizenship in exchange for knowledge transfers, coaching and mentoring and consulting for local businesses.

Agricultural producers must look for opportunities to work with new food businesses. Agriculture must be a cheerleader for innovation, challenging received wisdom, breaking down rivalries and looking for new ways to do business: new methodologies, new technologies, new markets, new business partners and new products. It must channel its extensive expertise in new directions and adopt a long-term outlook, seeking out investment opportunities that will be the enduring success stories of the next decade not the marginal revenue improvement of the next quarter.

Government is uniquely positioned to be an enabler in this agriculture-led revolution. It can support and reward entrepreneurs, risk takers who have the capability to build internationally recognized brands and create thousands of new jobs; it can drive reform of the financial sector to make it easier to source start-up capital; it can build and communicate the Belize country brand through a government-sponsored global marketing campaign; it can prioritize investment in urgently needed infrastructure; and it can work to effect a culture change that embraces individual initiative and creativity as the sparks of sustainable economic growth not government expenditure and public debt.

If the agricultural sector and government can join hands to find common cause in the interests of national advancement and better living standards for all Belizeans, a new industry, an agricultural revolution and an end to successive debt crises is within their grasp. It will take bravery, determination and a willingness to look beyond narrow interests. Are our leaders up to the challenge?

Jo Carpenter, BSSc (Hons), MA, lives in Maya Beach. She is a distance learning MBA student at the University of Warwick in the UK and founder of 'Safer Business Travel for Women', a website providing expert travel security advice for female business travelers (www.saferbusinesstravelforwomen.com). Comments about the article may be sent to her via belizeagreport@gmail.com.

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UAVs: Unmanned Aerial Vehicles in Belize Usher in New Era of Precision Agriculture

Unmanned Aerial Vehicles, commonly known as drones, are already at work globally in agriculture for both small and large farmers. Belize is embracing the high tech aerial systems, with dealers in



place for agricultural drones, creating new opportunities in the exciting realms of agriculture. Due to their efficiency compared to other systems of ag monitoring and applying crop treatments, UAV use is expected to expand drastically. The Association for Unmanned Vehicle Systems International, (AUVSI) predicts the agricultural sector to comprise 90% of worldwide UAV use. Japan, South Korea and Australia have thousands of these already in agricultural use. The most experienced UAV makers at this time are from the Orient.

UAVs fly in an ultra-efficient tight pattern of up one row, over and down the neighboring row, compared to turning necessary with a fixed-wing aircraft. They accomplish more tasks than traditional aircraft by not being limited by direct human visibility. UAVs can monitor crops for yield or health and can disperse applications of liquids, granules or coated grains. They can work as low as 12 INCHES above the plants, reducing application medium and minimizing unintended treatment of neighboring lands. The

UAV's helicopter rotor wash (air turbulence) turns the leaves as the drone passes, increasing the coating surface application area, reaching both sides of the plant's leaves. The hover capability enables the drone to selectively linger over specific target areas such as tall tree crowns for spray application. This efficiency of application and reduced costs are reasons farmers have been turning to the UAVs.

Helicopter drones are run remotely by a trained operator on the ground. Battery UAVs can carry cameras, such as CropCam, but they cannot lift the payload required for spraying, so those are gasoline engines. UAV-Belize Ltd expects its gas powered (97 octane) NLA brand UAVs to be available in Cayo in July. The smaller ones, which can spray 1 acre in 3 minutes, and 2.5 acres per flight have a payload of 10 liters; the larger model will cover 5 acres per flight and have a 20 liter payload. Individual ownership as well as collective ownership with a delegated pilot is anticipated; a two day training is included with all sales from UAV-Belize.

Prices for UAV-Belize's drones landed in Belize are projected to range from \$49K USD for the smallest unit and \$79K USD for the larger. They will offer crop spraying services, sales, training and maintenance services. They expect rental fees to be \$300 BzD/hr; average spray plane fees exceed \$1,000 BzD/hr.

Belize's Civil Aviation Authority has no restrictions on UAVs at this time. In the USA, drones are unrestricted at altitudes under 400 ft with new FAA restrictions expected in 2015.

Editor's Note: For more information on the drones that will soon arrive in Cayo District, check out the www.uav-belize.com website, or drop in to their offices at the Central Farm airstrip.

Unmanned Helicopters - In Belize

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Cheesemaking at Western Dairies

By Dottie Feucht

What evolved into Western Dairies began with cheese making by the Abram J. Thiessen family in their home in Spanish Lookout; their private operation lasted about 8 months before it was decided by the leaders of the community to form WD. Now WD produces cheese in 9300 pound vats and forms it in 20 40-pound molds every processing cycle, during which only one type of cheese is made. Like the rest of WD, the process for cheddar and regular mozzarella cheese is mechanized; of the 106 employees only 3 people make all the cheese.



All cheese starts with milk that is brought in daily. Before farmers started feeding their cattle hay during the hot, dry season milk production fluctuated by season. Now Western Dairies (WD) can expect about 430,000 pounds of milk per month (8.6 lbs. of milk = 1 gallon). Small farmers collect milk in 5 gallon containers but big farmers have much larger containers, some holding upwards to 1000 gallons, on their farms to collect milk. Every day WD sends out a technician to test milk for impurities, including water. Every container of milk is tested before it is brought into WD's processing plant. WD sends a truck to collect milk from the large dairy farms.

The first step in processing milk is an in-line pasteurizer that raises the temperature to 161 degrees F and then within 15 seconds down to 35 – 40 degrees F. Milk to be homogenized is also done in-line. Homogenization is the process of breaking up milk particles under pressure: 2300 pounds per square inch (psi). Raw milk contains 3.5% butterfat. Skim milk is produced by separating the cream and milk in a large 250 gallon tank by centrifugal force after which the skim milk is re-pasteurized. It takes 30 – 45 minutes to separate off the cream which is collected from a lower outlet since it is heavier than the skim milk.

One gallon (8.6 pounds) of pasteurized milk goes into every pound of cheese. Cheddar cheese is made from milk that is up to 2.8% butterfat; whereas regular mozzarella is made from 1.8% butterfat milk. Their newest mozzarella, called *Chef Master*, is produced from up to 2% butterfat milk. Regular mozzarella is made by a mechanized Canadian process whereas *Chef Master*, an artisan cheese, is hand-stretched.

It takes about 3 hours to make one type of cheese. Milk in the large cheese-making vat is heated to 100 degrees F. before rennet, the enzyme that turns milk into cheese, is added and mixing begins.

The rectangular-shaped vat has a rotating mixer that continually moves back and forth from one end of the vat to the other. Then it sits for 30 minutes while it hardens. Huge wire mesh frames are then used to drag through the hardened cheese (curd) in two directions to cut it into small cubes. The whey is separated during a second mixing. It takes 15 – 20 minutes to separate the whey from the curds; then the whey is sucked out. 20% of the whey is used for energy drinks flavored as strawberry, banana, or, more recently, chocolate, a product that has become very popular. These drinks have a shelf life of less than 2 weeks because they contain no preservatives. The rest of the whey is used as fertilizer by farmers. Salt is the preservative of cheese; it is added after the whey is extracted. The cheese is then transferred to molds, each of which holds 40 pounds where it is pressed into shape overnight before being vacuum-packed and placed on shelves in the large walk-in cooler to age for 21 days. The aging process is required to form the texture and flavor of the cheese – a reaction from the enzymes. That aging process for regular mozzarella cheese stops after 21 days and the cheese is ready for market but the process for cheddar cheese continues on even in market coolers. The shelf life of cheese is about 180 days. The longer cheddar cheese is aged the "sharper" the flavor. Three months' aging is common for sharp cheddar. Cheese is naturally white in color but annatto is added to cheddar to produce the golden color so familiar to cheddar cheese lovers.

Chef Master is a whole different story. One of WD's cheese makers was sent to Zamorano University in Honduras to learn how to make the hand-stretched mozzarella cheese. Although the first mixing/hardening and 72 hour cold storage is the same as other cheese, the rest is customized to *Chef Master*. Approximately 40 gallons of water is first heated in a smaller vat before dumping

in 200 pounds of cheese cubes. Steam is continually pumped into the walls of the vat to keep the cheese at 200 degrees F. As the cheese begins to melt, the water is drained and salt is added and the laborious task of hand-stretching it begins. Two men,



working as a team, use big paddles to lift and fold it over again and again, kneading the cheese, in the vat (see cover photo). During a tedious ½ hour of lifting and stretching and folding, the cheese begins to harden slightly, making it even heavier to lift and stretch. The men are experienced enough to recognize the proper consistency of the cheese. When it is sufficiently stretched, the men, using the same paddles, transfer the hardening cheese to 20 pound molds for aging. They have to act quickly while the cheese is hot enough to pack. Their experience, once again, helps them to portion the cheese exactly right for each of the 10 molds used for pressing. Like other cheeses, the *Chef Master* mozzarella is vacuum-packed and placed in the cooler but it's ready for market after 72 hours.

WD has its own lab for testing for impurities but currently has to send samples to Guatemala to test for moisture. Plans are in place to obtain their own machine for moisture testing and other test equipment for microbiological testing. WD is also working with BAHA toward HACCP certification.

NATIONAL AGRICULTURE & TRADE SHOW

May 3rd – 5th, 2013

By Mary Susan Loan

2013 marked the sixty-fifth year of recognizing and celebrating Belize's rich history and bright agricultural future. This year's theme describes the mission of the fair, "Stimulating Prosperity in Agriculture and Food Production through Renewed Public and Private Partnership".

The newly renovated and updated fairground was bustling with over forty-two thousand visitors from across the country for a week-end total. The mission of the NATS show is to showcase and introduce new products made by Belizean farmers with the goal to educate, support and encourage improved agriculture practices in Belize, including cattle, shrimp, sugar, citrus, produce, coconuts, rice and many more crops. Awards were given to Farmers of the Year, Senior Farmer, Woman Farmer and Junior Farmer. Members of the Taiwan Technical Mission who are working with the Belizean Ag sector to help improve farming techniques and to promote diversity displayed their ag techniques and displayed fruit, rice and vegetable exhibits. Many Belizean-based new businesses were on hand to proudly promote their products, including WOW soy sauce, Northern Heat hot sauce, cassava products, jellies and jams, gluten "veg meats", grain and fruit cereals and many other innovative products.

It was a festive occasion and offered something for visitors of all ages, including a rodeo, two playgrounds, a carnival, live music, lots of great handmade Belizean food, crafts, farm products to see, taste, hear and enjoy.

Long range plans for the NATS fairground include a five-year redevelopment project, with the goal to improve existing structures and build more durable all weather buildings for use of the fairgrounds as a year-round national exhibition forum.

The proverbial good time was had by all at the annual national event which provides an opportunity for networking, education, inspiration, learning about all kinds of new agricultural information as well as being a popular social event for residents and visitors to Belize.



Rice Seed Production Project Field Day

By Ina Iris Sanchez

A rice field day was held on May 24th, 2013 at the Central Farm rice field. The event was organized by the Taiwan Technical Mission (TTM) and the Ministry of

TAIWAN



Natural Resources and Agriculture (MNRA). Invited guests attending were Hon. Hugo Patt, Minister of State in MNRA; Mr. Douglas Chang, First Secretary of the Embassy of the Republic of China-Taiwan; Mr. Eugene Waight, Chief Agriculture Officer, MNRA; and Mr Fernando Yeng, Chief of TTM. A total of 91 guests attended including MNRA technical officers, representatives of collaborating institutions, farmers and students.



At the end of the opening ceremonies the attendees accompanied Mr. Wayne Chen, Rice Specialist, TTM, and Ms. Ina Sanchez, MNRA officer to a field tour of the seed

producing plots. The highlights of the field tour included:

- i. a demonstration plot established under the System for Rice Intensification procedures;
- ii. three different plots planted with green manure species (Jack Bean, Sun Hemp and Cosmos) that can be planted in a *rice-green manure-rice* crop rotation system;
- iii. the process of germinating rice seed for higher crop stand;
- iv. a trial batch of compost made from shredded rice straw, fresh cow manure and efficient micro-organisms; and
- v. a depiction of agronomic activities carried out at the field (manual harvesting and threshing, fertilizer application by broadcasting, flooded and dry land preparation, and the application of pesticides utilizing a high pressure sprayer).



The TTM plan is to transfer the Rice Seed Production Project to the MNRA in December 2013. In Central Farm, additional activities include the design of a rice seed certifying system and the opening of a seed lab.

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Tilapia Hatchery Center Ground Breaking Ceremony

By Dottie Feucht



After four years in the making and much hard work by the staff of the Taiwan Technical Mission (TTM), former Chief Agriculture Officer, Eugene Waight, and others in the agriculture ministry, the project for establishing a tilapia hatchery was launched on July 17, 2013 on Baking Pot Road, Central Farm, Cayo. The project is a joint co-operation by the Government of Belize and the Republic of China (Taiwan). Funded by the International Cooperation and Development Fund of the Republic of China (Taiwan ICDF), the 5 year Aquaculture Project signed in February 2012 is estimated at BZ\$5 million. It includes the construction of a tilapia hatchery building (which will also house a research facility), 18 earthen ponds, a reservoir, a sedimentation pond, 12 nursery tanks and 16 fry (young fish) concrete tanks.

Ambassador of Taiwan to Belize, the Honorable David Wu, who gave an overview of the project at the ground-breaking ceremony, said that primary objectives are to (1) produce one million "all male" high quality tilapia fingerlings to assist the development of small-scale tilapia farming operations on Belize, (2) promote the use of modern tilapia culture technology to increase the annual tilapia production and gradually decrease the price of fingerling production (3) reduce the cost of commercial feed by 30 - 35% with the use of alternative feed and (4) supplement the meat protein intake to families in rural areas through improved tilapia production in the region. Deputy Prime Minister and Minister of Natural Resources and Agriculture (MNRA), Honorable Gaspar Vega responded with heartfelt thanks on behalf of the people of Belize for the generous gift and outlined support for the project. Mr. Franco Tsai is the project leader for TTM; the Aquaculture Unit of the Ministry of MNRA is responsible for the operation and management of the Aquaculture Project.

The tent for the ground-breaking ceremony was tested to its limits when a rainstorm hit the area. The dignitaries were forced to "break ground" twice: once under the tent in the rain and once in the designated area after the rainstorm passed. The big banner announcing the project that hung behind the podium was signed by all the dignitaries and guests attending the ceremony. It is intended that the banner will become a permanent display in the hatchery after its anticipated completion early in 2014.

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DIESEL	↓ \$10.37 Bz/Gal	↑ \$8.14 Bz/Gal	↑ \$10.29 Bz/Gal

Refractometer...Continued from page 18

Often the prism mount contains a thermometer which can be used to correct to 20°C in situations where measurement cannot be made at exactly that temperature. Temperature is very important because refractive index changes dramatically with temperature. It is important, therefore, that users of refractometers either make sure the sample and prism of the instrument are both at very close to 20 °C or, if that is difficult to insure, readings should be taken at 2 temperatures separated by a few degrees, the change per degree noted and the final recorded value referenced to 20°C from standard tables.

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Garden Tools: Back to Basics

By Mitylene Bailey

The dry season is here and we home gardeners are waiting for the first rains to come down to kick start that backyard garden. In the mean time you can accumulate seeds, pick out an area in the backyard for your home garden and get your tools ready. While there are many single function trendy tools on the market that promise to make soil most manageable with the least effort, the basic multifunction tools are space saving and most practical for budget gardeners such as ourselves. After all, the purpose of home gardening is for higher output from low input. These eight tools are a great start for your home garden and are multifunctional, practical and space saving.

Standard shovel or spade is the first on the list; these are used for digging up the softened earth and moving away extra materials, such as sand. When purchasing a spade or shovel choose a sturdy handle and comfortable grip. Shovels and spades with D-shaped handles make it easier to lift what you have dug or scooped. Look for a curved foot rest below the neck of the blade for easy insertion into the ground. Find an appropriate height and don't be afraid to ask the store assistants to see all that they have. A slick metal surface allows material to slide off easily, so stay away from rusty blades even if it gets you a discount.

A lawn rake, either plastic and metal, is ideal for removing fallen leaves, twigs, and other debris as well as smoothing new and existing beds. Make sure the tools you purchase are sturdy and the heads are securely attached to the handles. Metal rakes last longer and perform better than plastic or wood.

A hoe moves soil, digs planting trenches, and removes weeds. The metal blade should be attached to the handle with solid-socket construction, so it will not come loose. There are some types that are held to the handle with a metal wedge. These types require soaking in water to expand the wood before use. This is a great addition to the home garden but it requires about thirty minutes of prep time before use. This may be a bit of a hassle if the head is not on right. Slippage and accidents are prone to occur. Choose carefully.

A trowel is a mini-spade, for transplanting seedlings and flower plants. **A Hand cultivator** alongside a trowel is used for turning over soil and compost. Both of these are helpful for weeding between rows of cabbage and large leafy plants. When buying these items quality and ergonomic design is key; if the metal part wiggles even slightly, don't buy it.

Gardening gloves protect the hands from sun burn, traction blisters, garden critters and drying from exposure to soil. Gloves that are part knitted and part latex allow for firm grip on tools as well as a breathable panel to keep hands cool and dry. Grab a couple pairs of knitted gloves also to use when picking up leaves, twigs or pushing around a lawn mower.

A wheel barrow is great for those of us with smaller muscles to assist in hauling leaves or soil, collecting weeds and debris, and so forth. It can also double as a tool caddy to tote seeds and tools. Choose the sturdiest wheelbarrows with tubeless wheels that are made of one piece of heavy steel with extra braces on the legs. If a wheel barrow is too much to maneuver a four wheeled wagon is better. Your little garden helpers can hitch a ride with you back to the house after all the hard work is done.

A watering can is suited for watering jobs too small for a hose, like that upside down tomato and orchids hanging in the window. Watering cans should have at least a 2-gallon capacity but should be easy to carry when full. They are great for dissolving and diluting organic fertilizers in and applying to delicate plants. A garden hose is useful too since it carries water longer distances. Attach two or more together to reach farther. Adjustable nozzles do everything from gently sprinkling new plants to delivering a hard stream for garden clean-up. This gives water control for specific plants better than traditional sprinklers.

Choosing tools carefully and wisely will give many years of great gardening assistance for many growing seasons to come. Remember to invest in great quality tools rather than the low quality bargains. Grab your seeds, start collecting your tools and start that compost pile. The next growing season is right around the corner!

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Jaime Vega

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Running W....Continued from page 11

With the Belize Defense Force (BDF) meat contract already in hand, a huge boon for their expansion was Abdala's winning of the bacon, pork and beef contract for the British army – who had at that time 4,000 meat-loving soldiers stationed in Belize. They imported lamb for the Brits too. At the high point during that era, they were killing 50-60 steers a week, 70% of which was destined for the British army. Soon their business needed a new and expanded location. During those years they had an average growth of 10-20% per year.

To meet those needs, in 1986 they borrowed from Development Finance Corporation (DFC), an institution of the Government of Belize at 12% over 13 years, and built their existing building for slaughter and processing. Younger brother Escandar Jr. took refrigeration courses at the Robert Morgan Vocational Technical School from 1984-1985, in anticipation of a need for in-house expertise. In 1993 the British army announced their eventual pullout of troops, which affected sales. But by then local sales were booming and new products coming on line. Meeting the high standards of health and environment, required by the British in their regular inspections during Running W's contract years, were maintained.

Running W today has between 1,900 to 2,000 heads of cattle, and proudly finishes 1,200 heads of steers/heifers for slaughter on 650 acres. This excellent head-of-cattle-to-pasture-acres ratio is accomplished by a well-managed system of small pastures which are monitored and cattle rotated frequently. To meet their market demand they formerly had to purchase from outside sources 70-80% of the cattle processed; this has now been reduced to 30-40%. They maintain a herd of 100 to 200 pigs, supplying all their needs, although for many years they contracted pigs. The farm also has 170 acres of Valencia oranges and cultivates 150 acres in corn/bean rotation.

Running W has made many firsts in Belize meat processing and they continually attend courses to stay at the leading edge of the industry. They were the first to cure bacon locally (causing the end of Belize's long importation of canned bacon), and to vacuum-pack meat. They adhere to Hazard Analysis Critical Control Point (HACCP - see Belize Ag Report issue 11, pg 12 for more on HACCP) procedures and have a traceability system which identifies all packaged meat to the farm of origin and date/batch. Issue 10, pg 1 of The Belize Ag Report discussed Running W's current breeding program of Black Angus crossed with Nelore. It is working well, and the aged grass-fed beef resultant from this cross is of exceptional quality.

Running W and their 65 employees have met many of their goals to raise and process uniform carcasses in an environmentally sustainable manner. Abdala hopes that in the future, many ranches in country will be raising the uniform, high quality carcasses which will be required in order for Belize's beef export market to expand to our potential.

Editor's Note: A 10 minute video, directed and produced by Running W Meats (videography by Danny Vasquez) was made for Abdala to use during his presentation at the 2012 Meeting at the Int'l Brahman Congress. Please contact Ms. Alexandra Bedran at Running W at Tel 824-2126 or email running@btl.net if you would like to request use of this video for your school or organization.

From the Belize Grain Growers Association... Continued from page 17

After extensive field tests, 'Golden Rice' was approved in 2013 for commercial cultivation in the Philippines. Bangladesh and Indonesia are soon to follow once ongoing field trials are complete. Earlier this year, West African scientists endorsed the use of GM cassava with resistance to cassava mosaic virus and Australian scientists donated their fortified GM bananas to India to improve the diets of the Indian population. The Bill and Melinda Gates Foundation recently donated US\$10 million to the John Innes Center to begin efforts to integrate nitrogen fixing capabilities into major food crops, beginning with corn. When developed, it is anticipated that this will reduce the use of nitrogen fertilizers, a major pollutant and contributor to the greenhouse effect. At Rothamsted Research in the UK scientists are working on GM plants that will need even less insecticide than Bt crops. The key is an 'alarm pheromone' that some species of wild plants have evolved to mimic the chemical warning signals put out by aphids when they are under attack. Putting the genes for this defense into crops could trick the insects into thinking that they are in peril and drive them away.

Joining many new GM crops under cultivation are two crops that are of great importance to the Belizean economy. Indonesia's Biosafety Commission recently approved the first commercial plantation of a drought-resistant GM sugarcane variety. Dr. Erik Mirkov, a plant pathologist at the Texas AgriLife Research and Extension Center, has transferred two genes from spinach into citrus trees, providing resistance to citrus greening disease in greenhouse trials. Field trials of these transgenic trees are now being planted in Florida and Texas.

With scientific evidence behind GMOs, the big question remains "Why don't we embrace this technology in Belize?"

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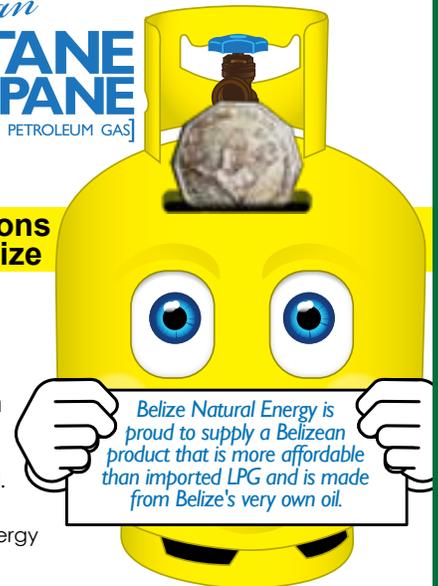
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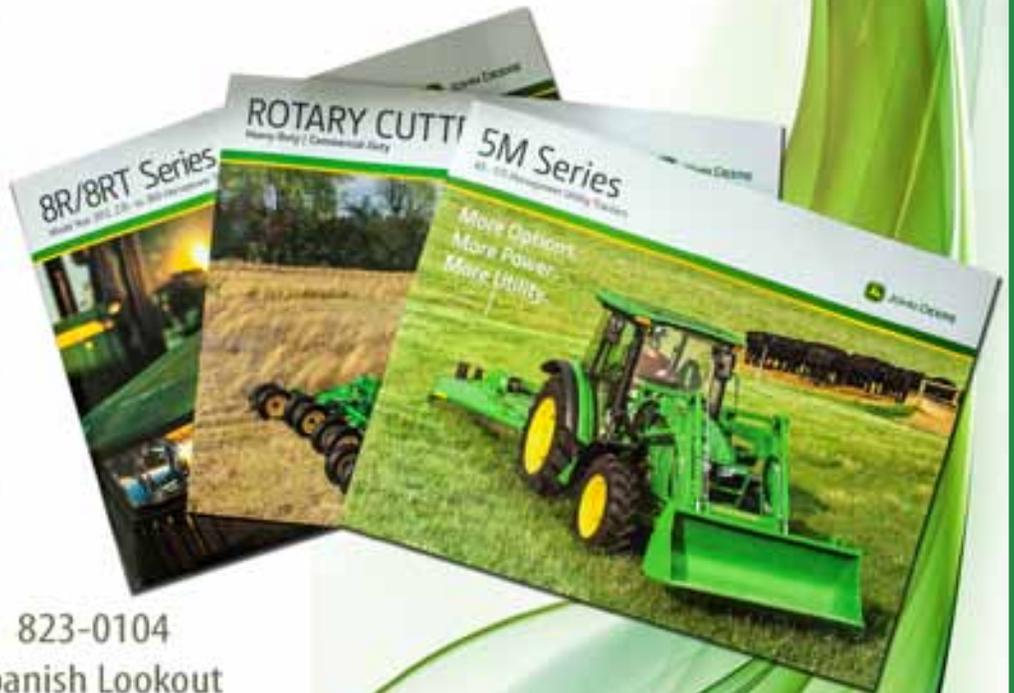
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