The Belize Ag Report

Belize's most complete independent agricultural publication

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ISSUE 29

SIRDI Pg. 7

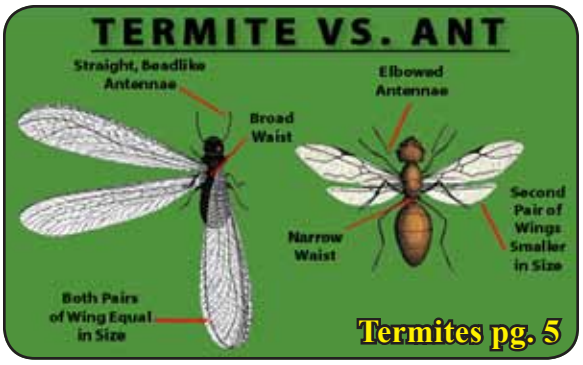
Jaguar Predation Pg. 27

Hugelkultur Pg. 12

Jack Fruit pg. 30

Red Ring Disease Pg. 37

Feathers pg. 3



Termites pg. 5

Madre Cacao pg. 11

Introducing
Circle R Hardware
pg. 20

New Website:

AgReport.bz

Click on Archives for PDF

Forests pg. 35

The Perfect Design Feathers in a Nutshell

By Sarah Moon, Executive Director, Belize Raptor Center

I can still recall the first feather I held in my hands. I was 6 years old, walking down a dirt road with my grandfather when I spotted a feather, its vibrant blues and white reflecting the sun's rays. My new treasure was the tail feather of a blue jay. From that moment on I became one of millions around the world awestruck by birds and the incredible characteristic that grants them the freedom of flight: feathers.

Feathers are the inspiration for fashion fabrics and accessories, for traditional, ceremonial or religious wear throughout the world, and for the beautiful, flamboyant costumes of Caribbean and Central American Carnivals. The beauty of feathers inspiring fashion designers drove several species almost to the brink of extinction. Feather colors vary from vibrant reds of a vermillion flycatcher, bright yellow and green on a displayed yellow-headed parrot to the bald head of a turkey vulture.

Feathers on birds attract a mate, protect them from the sun, repel water and insulate them from the cold. They have the ability to keep harmful bacteria at bay, and most importantly are structurally crafted to give flight, allowing birds to inhabit every continent except Antarctica.

In most species of birds the female chooses her mate. She looks for the healthiest and most vibrant feathers because this means that the male is a top specimen. Feather color is formed in one of two ways: from pigments or light refraction from the structure of the feather, known as structural colors. Birds can have a combination of pigments and structural colors. Pigments are reds, oranges, yellows and can be found both in plants and animals and are independent of the structure of the feathers, unlike blues, greens and iridescence, which are known as structural pigments. Pigments come from melanin, carotenoids and porphyrins. From melanin are black and brown pigments. An example of this can be found on the white pelican wingtips, making the feathers stronger and more resistant against wear. Carotenoids are produced when certain plants are ingested; for instance the bright yellow of a hooded warbler is a direct result of his diet. Porphyrins are produced when amino acids are modified; when exposed to ultraviolet light this pigment causes reds to fluoresce. It produces pinks, browns, reds and greens like the pink feathers of the roseate spoonbill or the bright reds of the vermillion flycatcher.

Structural colors are produced by refraction of light. When light hits feathers, the reflected colors cause shimmering and iridescence. Hummingbirds are a perfect example of structural colors; they appear to have scales instead of feathers. Blue pigments are not iridescent and are actually tiny pockets of air that scatter the incoming light. If you pick up a molted oscillated turkey feather and push on the blue you will pop the air bubbles and the blue will disappear.

A very special color combination can be found on parrots. Parrots do not actually have green pigments in their feathers! Parrot feathers are a combination of red and yellow pigments and structural colors; the green color you see on a yellow headed parrot or the red lored is the result of light scattering and reflecting off the feather structure, giving us the illusion of green. A varied and healthy diet of fruits and vegetables maintain the sheen and glow. Parrots, because they are tropical creatures, have a thin layer of healthy bacteria that live on the feathers that keep the bird healthy. Parrots naturally keep themselves healthy by constant foraging through the trees, but an incorrect diet or mistreatment of a captive parrot can destroy the good bacteria, making way for unhealthy bacteria which weaken the immune system and cause sickness and even death. So the health of a captive parrot is literally reflected in its feathers!

Vultures have no feathers on the top of their heads. As nature's cleanup crew, picking up road kill and rotting meat, their smooth surface keeps blood and rotting flesh from sticking to it.

Woodpeckers' tails are very rigid which enable them to keep themselves flat against trees. Stiff, strong feathers of raptors allow them to soar on thermals looking for prey and maneuver to catch it. The soft feathers of owls give them the ability to hunt silently through the night.

A great man by the name of Muir, once said, "In every walk with nature one receives far more than he seeks". Let's not take for granted what we have today but instead cherish it and protect it so our grandchildren may enjoy it tomorrow.

Editor's Note: Sarah Mann established the Belize Raptor Center in October of 2013. It is hosted by the Belize Bird Rescue in Cayo District and work in collaboration with the Perigrine Fund, the Forest Department and the Belize Zoo. The Belize Raptor Center does presentations for summer camps and schools, at no charge (donations accepted). See ad this page for contact information.

TO THE EDITOR

Dear Editor,

Featured in the full page ad supporting the use of genetically modified organism (GMO) seed that appeared in the Belize Ag Report, issue 27, paid for by the Belize Grain Growers Association (BGGA) was a statement that GMO technology is used to produce animal feed. We must not forget that people eat the animals that ingest the seeds that have been injected with poison. In addition, there are increasing numbers of farmers reporting *better animal health with non-GMO feed*. Cattle deaths due to digestive problems or pneumonia have been cut in half for farmers who have switched back to non-GMO feed.

State-of-the-art technology is already here to provide plentiful healthy and nourishing food and soil, safe renewable energy, clean water,and safe medicine-- without the use of petroleum-based chemicals, seed manipulation and patenting. The technology and science of permaculture, bio-mimicry, bio-char, composting, biodiversity, non-toxicweed/pest management practices,along with other technologies described under Good Agricultural Practices (GAP) in the Farm Management Manual published by the Belize Ministry of Economic Development, are all designed to eliminate pollution, cost, and waste.

The pro-GMO people would have us think that adding a few synthetic vitamins to GMO products makes them healthy,but the best way to get vitamins is through naturally grown food, free of poison. A good example is the moringa tree,which grows throughout Belize,and provides the best source of all vitamins, minerals and most of the enzymes we need.

Regarding the reference in the ad to the production of insulin through biotechnology, insulin was first developed by Eli Lilly and made from the pancreas of animals. Genentech (**not Monsanto**) is primarily a medical/pharmaceutical biotechnology research company and brought us the first biotechnology-produced insulin. Like all technology, it can be used for both good and for bad. Monsanto has a history of producing and selling products such as agent orange, a deadly herbicide used in the Vietnam war negatively affecting the health and shortening the lives of thousands of soldiers and Vietnamese civilians and damaging their offspring. Despite the fact that Monsanto claims there was no link between agent orange and these severe health effects, they have paid out$81 million to soldiers (if they agreed to drop their claims), and in 2012, they also paid $103 million to clean up a site contaminated by agent orange in West Virginia. It is important to note that *Monsanto's glyphosate is now being combined with ingredients of agent orange (2,4-D) to make a special and stronger herbicide for GMO crops*.

Another very serious matter is the negative impact of GM crops on bee colonies. Bees are essential to pollinate 30-40% of our food crops; yet since the introduction of GMO, bees have been declining at alarming rates worldwide. When the leading bee research laboratory implicated GMO seed crops as a culprit, Monsanto simply bought the firm and now has control of the research that previously pointed at its own pesticides for contributing to – if not outright causing – a sharp decline in bee populations.

Voices for Safe Food and Energy

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Mission Statement:

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

Winged Invasion

By Wiley Forrest Tackitt

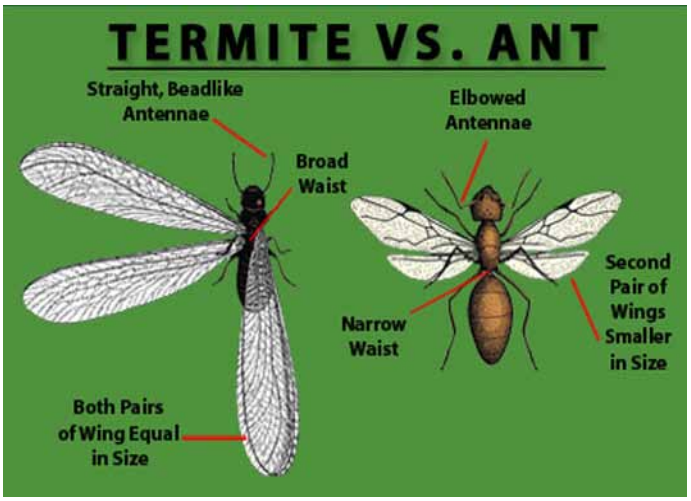
Middle of dry season, hot and dry as expected, but out of nowhere the heavens open and we are blessed with a shower. No matter how small, any amount of moisture at this time of year can trigger something fascinating: clouds of insects emerge from the ground, and disperse everywhere, and I mean everywhere. These delicate, soft bodied insects are subterranean termites called *swarmers* (genus: Reticulitermes), or known as wood lice here in Belize. The swarming phenomenon is seasonal in some parts of the world, but here in the tropics it is usually an environmentally triggered event, with frequency dependent on region, species and colony size.

These clouds of insects fly aimlessly on wings much larger than their bodies and float where the wind takes them, like grains of pollen, with slightly more control. Their extra-large wings serve their purpose for gliding on the breeze, but then pose a problem. Being termites of the reproductive caste (alate, meaning winged), swarmers search for small cracks in the soil to start new colonies, and try to squeeze in. To better enable the termites to go in search for their new home underground, they shed their wings and start their own form of cave exploration, except this is for survival of the species, so it is serious business. If they end up trapped in your home they crawl around in search of that special place to call their home until their bodies finally give up the ghost, but that can take days and you can be left with the task of sweeping up wings and bodies.

Termites are social insects that live in colonies in the soil, (hence the subterranean part of their name), although here in Belize there is enough moisture in the air to support aerial colonies, the round, dark-colored nests we see high in trees. The termite colony is made up of three castes: reproductive, workers and soldiers. After 2-4 years a subterranean termite colony is mature. The number of swarmers produced is proportional to the age and size of colony. Only a small percentage of swarmers survive to develop colonies; most fall prey to birds, toads, other insects and my favorite, fish food. The swarmers are only for reproduction of colony, but the workers which make up the bulk of the colony are the most destructive insect pest of wood. Although they cause billions of dollars of damage to homes each year worldwide, in nature termites are beneficial as they break down cellulose into usable nutrients that enrich the soil. The biomass resulting from this process is recycled to the soil as humus, making the termite one of the most important decomposers in nature.

Termites have a voracious appetite and get their nutrition from wood or any material containing cellulose (paper, cotton, burlap or other plant products). Most termite species cannot digest this cellulose directly and depend on single celled protozoans and bacteria living in their hind gut for help. Termites must also protect themselves from temperature extremes and attacks from ants above ground with mud or shelter tubes. These are made from bits of soil, wood debris held together by salivary and fecal material. No comment.

Termite reproductives vary by species from black to pale yellow, with most ranging from ¼ - 3/8 inch in size. They are often mistaken for ants, which can be a costly mistake. Ants and termite reproductives usually swarm under similar conditions, but control of these insects is very different, so proper identifications is critical. Please see Diagram below.



Control methods are many, but inspection and home maintenance help reduce the potential of a termite infestation; we are not trying to eliminate the termites from the environment, just keep them out of our homes. Some good practices are to move wood or lumber far away from the home, especially making sure there is no wood-to-soil contact. There should be several inches of space between your siding and the soil line. Keeping shrubs pruned back from your home and eliminating any moisture accumulation in and around your home are beneficial as well.

Frequent inspection around the structure looking for their mud shelter tunnels should be a constant activity; if tunnels are found, spray them with Citrus Power or brush them away and apply a simple solution, such as a 20% mixture of bleach and water. Although a properly labelled insecticide is a longer-lasting solution, I find that frequent application and constant inspection are a more environmentally friendly solution. Remember, don't stop inspecting; they will try another entry point, but with enough agitation, they will seek other food sources that you did not pay to build.

Editor's Note: Wiley Forrest Tackitt, a Texas A&M trained entomologist, first arrived in Belize in 1991. Since then he has guided scientists throughout Belize and works as a consultant here in environmental fields with a specialty in vector control. For the past 12 yrs, he has been traveling across Asia and Africa as an environmental advisor for UN/NATO. In his spare time he assists his wife at her Thai restaurant located at their home in Cayo. Contact him with your comments and questions at: forrestbugmaster@yahoo.com

Soil Profile

By Luis G. Tzul

Knowing your soil profile is essential to good farm management; it can give valuable insight into soil texture and fertility and crops best suited for the soil. A soil profile is made up of distinct layers, known as horizons that run roughly parallel to the soil surface and have different properties and characteristics from the adjacent layers above and below. The soil profile is a vertical section of the soil that depicts all of its horizons and extends from the soil surface to the parent rock material. The five most common horizons are collectively known as the master horizons. Scientists have developed terminology and methods to analyze the various components and characteristics of the soil profile. Technical descriptions of the soil are useful not only for farmers, but for scientists, ecologists, soil engineers, hydrologists and land use planners.

The **regolith** includes all of the weathered material within the profile. The regolith has two components: the **solum** and the **saprolite**. The solum includes the upper horizons with the most weathered portion of the profile. The saprolite is the least weathered portion that lies directly above the solid, consolidated bedrock.

Master Horizons

Not all soil profiles contain all 5 horizons; so soil profiles differ from one location to another. The 5 master horizons are represented by the letters: O, A, E, B, and C.

O: The O horizon is a surface horizon that is comprised of organic material at various stages of decomposition. It is most prominent in forested areas where there is the accumulation of debris fallen from trees.

A: The A horizon is a surface horizon that consists largely of minerals (sand, silt, and clay) and with appreciable amounts of organic matter. This horizon is predominantly the surface layer of many soils in grasslands and agricultural lands.

E: The E horizon is a subsurface horizon that has been heavily leached. Leaching is the process in which soluble nutrients are lost from the soil due to precipitation or irrigation. The horizon is typically light in color. It is generally found beneath the O horizon.

B: The B horizon is a subsurface horizon that has accumulated from the layer(s) above. It is a site of deposition of certain minerals that have leached from the layer(s) above.

C: The C horizon is a subsurface horizon. It is the least weathered horizon. Also known as the saprolite, it is unconsolidated, loose parent material.

The following soil profile was analyzed in a field in Stann Creek Valley. The objective of the exercise was to see how adequate the soil was for establishing a new citrus grove and what impediments exist that would affect the life of the new orchard. The soil profile is adequate for citrus if the following conditions are met:

- A horizon A of more than 30 cm (11.8 inches) in depth and with good texture
- A horizon B with more than 75 cm (29.5 inches) in depth
- A stable water table below 75 cm
- Absence of compacted layers
- A soil pH of 5.5 to 6.5
- Slope of land less than 3 %

Continued on page 15

The Emerging Roles of the Sugar Industry Research and Development Institute (SIRDI) and Sugar Industry Management Information System(SIMIS)

By Gregorio Canto

As Belize heads towards the direction of increasing and maximizing sugar cane production without clearing new land, the need for plant nutrition turns out to be a key study factor. Plant nutrition is important because different sugar cane varieties, soils types and weather conditions dictate types of fertilizer to be used to increase production and at the same time lower the cost of production. The research department of SIRDI has embarked on a mission to use clean seeds to establish nurseries to introduce new varieties of sugar cane. It is also collecting soil samples to verify nutritional needs of the sugar cane, establishing baseline data of different varieties and establishing a seed bank of clean seeds.

The extension department has been designed as a technology transfer section with its primary role to train stakeholders to improve cane yields, be more cost effective and increase net return to sugar cane farmers. Its main objective is to establish an efficient and effective field advisory service network throughout the northern sugar belt. The staff is focusing on conducting training courses on farm trials, doing field demonstrations, holding "field days" and disseminating information. Technical assistance through advice to farmers on *best practices* of cane husbandry include land preparation; use of clean seed; fertilizer recommendations; weed, pest and disease management; water management; harvesting and entrepreneurship.

Increasing productivity is essential to meet the challenges expected in 2017 with the removal of preferential market for the sale of sugar in Europe. The monitoring and coordination department of SIRDI is responsible for the implementation of SIMIS, the information system supporting the productivity of sugar cane fields by identifying areas that need improvement and areas suitable for sugar cane production, determining levels of productivity and the infrastructure and management practices required to bring those areas into production within a given level of productivity. The information system is being built as a collaborative effort from all primary stakeholders of the industry. SIMIS is currently establishing two primary databases: a cane parcel database and a farmer ID database. Up to June 2015 a total of 56,009.14 acres (70%) of sugar cane has been verified from an estimated total of 79,000 acres. From information gathered, results indicate the three most dominant varieties of sugar cane are B79474 (54%), B52298 (19%), and BBZ varieties produced by the local variety evaluation program for the Belize sugar industry (6%); the remaining varieties represent a smaller percentage. Data collection is expected to be completed in July 2015 with five primary sets of information to be generated: acreage under production, variety planted, age of cane field (plant cane or ratoon), last day cut and general condition of cane field (poor, good or very good).

Collecting farmer information and issuing farmer IDs has resulted in visits to all 18 branches and most communities within the sugar belt in June 2015. Approximately 34% of all ID cards have been distributed and expected to be completed at the end of July 2015. The resulting database will be used as the baseline data for SIMIS and the sugar industry of Belize. Other data that is being collected include frog hopper and pest monitoring, weather, replanting, and land preparation and is being stored in the SIMIS database and analyzed by SIRDI technical officers and analysts. The management information system is also tied into all departments of SIRDI and baseline data is being used by all departments for trials, monitoring and evaluation. SIMIS is currently generating maps of sugar cane fields and farmers are being provided with these maps to start keeping records. As part of the ongoing data collection SIMIS is expected to start tracking individual parcels by training farmers to collect field information and also do reporting. After all, a database is only as good as the amount of time it is being used and the quality of information it is collecting and reporting.

ENERGETIC AGRICULTURE
Soil, Carbon, and Microbes
By Bill Lindo

Belize City, June 15th, 2015: The top 2 inches of soil is the source of all living things on planet Earth; it's where all the foods that sustain animal and human life come from. Over the last 50 years as we turned agriculture from being primarily based on biology to an industry based on chemistry, we have been steadily destroying our precious top soil.

Soil begins with rock, sand, or river sediments and when mixed with organic matter becomes soil. It takes several hundreds of years to create soil but we can destroy it in 20 to 50 years with toxic chemicals and bad plowing methods. The good news is that humans can create soil in about 3 to 5 years' time.

Carbon and microbes work together. One needs the other. Good or healthy soil is about 50% solids and the other 50% is water and air.

One very important fact is carbon can never be created or destroyed. It changes form. When we use certain chemical fertilizers, or do bad plowing of our fields, we drive carbon out of the soil. Where does it go? Into the atmosphere as carbon dioxide (CO_2). We need to be careful with CO_2 because it's absolutely necessary for plant growth. In fact if CO_2 is less than 340 parts per million (ppm) plants do not grow. And at 600 ppm, plants grow like crazy, and over 3,000 ppm CO_2 kills plants. But over 400 ppm CO_2 may cause the earth to warm-up causing climate change, so we need a balance. While we hate to admit it, the major cause for excess CO_2 in our atmosphere over the last few years has been our practicing agriculture as an industrial activity, instead of the biological activity that it is.

A very important fact that most farmers don't understand is that when the soil is very low in carbon, the soil will not hold water. The water will run off, causing erosion, sending valuable minerals into rivers and eventually into the oceans. Also, the soil will be hard and compact.

Old leaves, dead animals, compost, and other sources of carbon supply the microbes with organic matter without which the microbes cannot survive. It is said that one tablespoon of soil contains about 50 billion microbes. No microbes, no plants. It is the soil microorganisms which are key in making nutrients available to the roots of plants. Soil microorganisms are crucial to several processes in agriculture. They release essential nutrients and carbon dioxide. They cause nitrogen fixation, the nitrogen and phosphorus cycles, plus denitrification and mineralization.

Not all chemical fertilizers are bad. A commercial fertilizer is really a concentrated form of energy. And remember, energy is what causes plants to grow. However, nitrogen (N), phosphorus (P), and potassium (K) cannot supply adequate energy to plants. Plants need over 80 minerals, some in very tiny amounts, while other minerals such as calcium are needed in large amounts up to over 3,500 lbs. per acre. The key is the amount and the ratios between the major 22 minerals. Some natural fertilizers like soft rock phosphate supply over 60 of the necessary minerals in the correct ratios.

A final note: soil breathing occurs when the calcium: magnesium ratio is adequate. This ratio determines the gas exchange in the soil. The better a soil can take in oxygen and then release CO_2 for photosynthesis, the better will be the health and the yield of the crop or plant.

Oregano!

By Mary Susan Loan

Pungent, balsamic, spicy, zesty, slightly bitter, aromatic, tasty and healing describe oregano, an ancient herb with many culinary and healing properties. Oregano, *Origanum vulgare,* is a well-known common species of *Origanum,* a genus of the mint family. Grown as a hardy small shrub and considered to be a perennial herb, oregano grows to be anywhere from about two to over six feet tall. One bush goes a long way, remaining productive for three years or longer, then reseeding itself. Two varieties of oregano are grown and used in Belize. One is the familiar small-to-medium, grayish- to- green-leaved kind that many people associate with pizza and spaghetti sauce. The other variety, grown widely in Belize, known as "Mexican oregano", has larger succulent, fuzzy, pale green leaves, and is actually not considered botanically to be a true oregano. Mexican oregano is a member of the vervain family, V*erbenceae*. It grows easily and is used to add a hint of rosemary with a citrus accent and is used as a substitute for epazote leaves.

Oregano originated in the Mediterranean region. It was a tradition for the early Greek and Roman brides and grooms to be crowned with a laurel of oregano leaves. The translation of oregano means "mountain joy" as the plants flourished with a show of greens and blossoms, white, pink, rosy-to-purple, giving beauty to the mountains. For many generations oregano has been enjoyed as a culinary herb as well as a plant with many healing properties. It grows well in any sunny location as long as its roots are dry. Oregano is not tolerant of cold. It may be grown as an attractive pot-herb indoors or outdoors, but grows best in a sunny open air location.

Oregano is closely related to marjoram and the two herbs are sometimes used interchangeably. All marjoram species are also called oregano. Only a few of the fifty plants called oregano are ever called marjoram. Marjoram is considered by some to have a sweeter and slightly spicier flavour. Many palates cannot tell the difference between the two herbs.

Oregano plants can be started from seeds or cuttings. To plant from seeds, weed and loosen soil, drop seeds about every six inches apart and one-half inch deep and water. To start from cuttings, cut a few woody stems, gently pick off the leaves and place in a sandy-loamy soil for about one month until the roots form and plants start leafing. Thin plants to be approximately twelve-to-fifteen inches apart. Water only when dry. After plants are four inches tall prune them back as you harvest the leaves. Oregano is a good companion plant to peppers and tomatoes and grows well with basil to help repel aphids.

Oregano contains numerous phytochemicals including thymol, caravol and rosmarinic acid, and is a powerful antioxidant with antibacterial, antiviral and anti-inflammatory properties. Other health benefits include omega 3s, manganese, beta carotene, vitamins C and K. A tea made from the leaves is used to sooth upset stomachs and to ease painful menstruation. A few drops of oregano oil may be mixed with coconut oil to help boost the healing of bug bites, skin infections or to treat warts. The recipe for making healing oregano oil is as follows: place one-half cup of finely chopped oregano leaves in a sterile jar and pour one-half cup of olive oil over the leaves. Place the jar in a pot of water that has been boiled, and then turned off. Let it sit for about ten minutes, remove the jar, and place it in a sunny window for a week or two, gently shaking the jar every few days. Strain the oil from the leaves and store it in a cool dark location.

Try adding a few sprigs of oregano along with a few slices of garlic to olive oil and infuse for a flavourful culinary oil. Oregano cuttings can be stored in the refrigerator in a slightly damp cloth; they will keep for at least one week. Dried leaves can be stored for about six months. Add a few leaves to ice cubes to drop into soups and stews.

Oregano can be used in a cut flower arrangement, imparting a warm spicy aroma to the bouquet.

Oregano, easy to grow, beautiful, delicious and nutritious with powerful healing properties is a plant for everyone's garden! It may be viable as a commercial crop to sell as sprigs or plants to resorts, at the open air market or in the form of healing and culinary oil.

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Picture courtesy Phoenix Photo

BAGMO Presents

BREAKING GMO NEWS!

The World Health Organization (WHO) reclassified glyphosate herbicide (Round*up*™) as a PROBABLE CARCINOGEN.

On March 20, 2015 in Lyon, France, The International Agency for Research on Cancer (IARC) convened a meeting of 17 scientific experts from 11 countries to assess five agricultural chemicals. Based upon their summary (published in *The Lancet Oncology*), WHO reclassified glyphosate as a PROBABLE carcinogen. BAGMO calls on GOB to review the registration status of glyphosate in Belize. Our health must come first.

BAGMO calls on GOB/BAHA to enforce Part VI (pg 31) of the BAHA Act, Chapter 211, wherein any and all GMO crops, including Round*up* Ready™ and Bt are not allowed, and "Any person who contravenes this commits an offence… liable to a fine not exceeding $10,000. or imprisonment… or both…"

JOIN the Facebook group: Belizeans Against GMOs at: **https://www.facebook.com/groups/bagmo/**

BEYOND THE BACKYARD

Paternal Instinct

By Jenny Wildman

It is well-known that a foot long pod was revered and depicted in the pre-Colombian ceramics of the early Incas and found in tombs. But with over 300 species of Inga growing in the tropical Americas, perhaps for the past two million years, many of which are recorded as growing in Belize, how do I know which pod I hold in my hand? It was introduced to me as the ice cream bean; I was told there are three types growing around Dangriga. Searching pictures I found *Inga edulis, Inga punctata, Inga feuillei* and *Inga spectabilis*, all referred to as the ice cream bean. Other names are Shimbillo, Chochoki, Guamo, Joaquiniquil, Pacay; in the market and in Maya back yards it is best known as Chelel, BriBri or Paterna. This is a majestic tree in the mimosa family: white pompom flowers, pale colored bark with zig zag markings, found on riverbanks and moist forests reaching to a height of fifty feet. It is easy to start and fast growing; in fact, as it has no dormant stage the sprouted bean can grow ten centimeters in just two weeks and produce pods in as little as three years.

Ya'axche Conservation Trust at Golden Stream is one of the organizations working with communities, introducing farmers to the use of Inga trees to protect and increase their corn and other crops. In their publication, *Integrated Farming Manual,* they refer to Inga edulis for Inga alley cropping, explain its benefits and how it is done -complete with informative illustrations. This manual also shows how agroforestry is used as a cultivation strategy for raising crops within a rainforest, allowing leaves to naturally compost and attract plants and insects thus creating an integrated and diverse ecosystem. Planting more trees stimulates a diverse ecosystem on lands previously used for mono culturing crops and is a valuable addition to waste lands.

The Inga tree requires little maintenance when planted in its preferred full sun with warm moist ground, sheltered from high winds. It can grow in poor soil and is employed to restore soil fertility, fix nitrogen, prevent erosion and shade crops such as coffee, cacao and vanilla. The fallen leaves break down slowly and can be used as a good mulch to prevent weeds and regular coppicing will provide green manure and mulch. The tree is relatively disease and fire resistant and does not appear to be unduly bothered by pests. It has a nectar gland between each leaflet which attracts ants which, in turn, cut down pest invasion, yet does not attract the leaf cutter army. The flowers are a magnet for nectar-seeking bees. The Inga tree is a successful guardian to timber trees such as the mahogany which is plagued by the dreaded shoot borer Hypsia. So we see how it gets its name as the protective father. There is some evidence that it can contact the same viral diseases of the trees it shades and I would guess that closely related species could be prone to the same diseases so should not be bedded together. A high plant diversity protects host plants from outbreaks of diseases which is what agroforestry teaches. Plants that are at greater risk are those outside their native habitat. That is like the tourist visiting Placencia beach and becoming fresh meat for the sand flies.

The Inga tree has other uses. The trunks make good house posts as they are not inclined to rot and the branches are excellent firewood and low-smoke fuel for cooking. It makes a grand living fence - so much cheaper than wire. In Amazonia the sap from the tree is used as a mordant to set dye.

This article was intended to bring attention to the value of Inga as sustenance. When I first heard that the tree gets cut down to 5 feet when used in alley cropping, my reaction was, "Oh no; there goes dinner." Edulis means edible but I doubt that it has much future commercially as the fruit spoils quickly; but it has a promising future for sustainability. Yet Inga may be an under-estimated edible. I have seen the beans bottled in brine in gourmet stores, roasted and served as street snacks in Mexico and South America. The Inga paterno is referred to as one of Costa Rica's best fruits. Opening the pod is a wonderful experience. Children love this. Inside are rows of seeds wrapped in furry white jackets. This raw pulp, the aril, is a tasty sweet surprise rich in vitamins. It can also be boiled for a few minutes in salty water, drained and served with a squeeze of lime and a dash of chili molido. The aril is used to make alcohol and a fermented beverage called "cachiri". To add to the excitement of the pod opening the bean starts germinating, popping out a root and shoot right before your eyes. If you wish to plant these, they need to be potted upright in good soil within 48 hours. You can soak them overnight in water with ground up Inga root to inoculate them and give them a healthy start. If you want to eat them you must boil or roast them and that takes about 35 minutes. They are delicious as a snack or vegetable alone or the star of sour bean soup. Beans provide a good source of protein; 110 g of seed will give you 10.7 g of protein, 0.7 g fat, 24.0 carbohydrate, 1.6 g fiber, an abundance of minerals and 118 calories, in case you're counting. The seeds of the Inga come in several colors but these of the paterna are green.

Apart from food value and culinary delight, there are some medicinal uses. A decoction of leaves, bark and root can be used for diarrhea, rheumatism and healing wounds. A syrup can be made from the aril to relieve coughs and bronchitis. According to the boys swimming in the Macal, the leaves are good for cleaning your diving mask. What a strange discovery!

I bought paterna in Belmopan market at the end of April but I am pretty sure it has a second crop. Each pod has a retail value of 75 cents. I purchased 10, ate half, planted half and added the pods to the compost.

While we see that Inga has a great value as a protector of crops, it should be a welcomed addition to any garden as a handsome formidable tree and a humble delicious vegetable.

Farming and gardening are complex subjects and only by exploring both traditional and scientific knowledge can one make informed decisions. I am thankful for the steps in the direction of becoming organic and pesticide-free where possible and halting the destruction of our rainforest. This is a very real problem. Many thanks to the British tropical ecologist, Mike Hands, for his tireless efforts to find the answer to failure of tropical soils and for introducing Inga alley cropping to Central American farmers. I encourage everyone to view the Inga Foundation movie, "Up in Smoke" and help stop the denuding of our mountains and forests. Thanks also to Ya'axche for their part in the educational campaign to stop slash and burn and for the promotion of agroforestry. Link to www.yaaxche.org for information on their work and the importance of biodiversity and an excellent video on why we humans need to take care not to break the links in the forest ecosystem. And to obtain the *Integrated Farming Manual* go to

www.yaaxche.org/files/Agromanual2014.pdf

Good luck with your Inga and as always we welcome your input.

Jenny Wildman
bayshorelimited@gmail.com

Pictures courtesy Xen Wildman

BEYOND THE BACKYARD

"Mother, May I?"

By Jenny Wildman

In March 2015 more than 100,000 visitors flocked to Washington,D.C. USA to see the cherry blossoms. Every year visitors fly from around the world and join the feeding frenzy sucking up the sight of these marvelous trees. They marry under the confetti of petals, dancing and reveling in delight, taking shots with their i-phones and sharing their joy on Facebook.

In Belize there is a blossom that momentarily takes my breath away, as I am stunned by its beauty, every bit as impressive as the cherry blossom but with much more versatility. It is the blossom of the Madre de Cacao (*Gliricidia sepium*) tree. It has a fairly humble position as it is used mainly as a living fence and nicknamed "quick stick" because it is really that easy to grow in any type of soil. Its deep roots and quick growth make it a good windbreak.

Gliricidia sepium, derived from the Latin meaning to kill a rat, is well named; killing rats is just one of its many uses. It is a good insect repellent and used on dogs and livestock for fleas, ticks and scabies or to get rid of termites and bed bugs. There are many folkloric medicinal claims and it is known to be antipruitic, antioxidant, antifungal and antimicrobial. In Mexico there is a antibacterial soap made from the bark. It is also a leguminous nitrogen-fixer suitable for alley cropping. Cut branches are used for firewood and lumber. We know the tree as Madre de Cacao as it has been utilized as a guardian companion for shading and protecting cacao trees from pests. Other names are Mexican Lilac, Madreado and in the Philippines, Kakawate. The only part that is edible to humans is the flowers whose pollen greatly attracts bees. The leaves can be sun dried for fodder for ruminants and farmed fish and to improve production of laying hens. It does seem that if given the choice, livestock would not choose this feed. Given its name as a rodent killer who would? It is also said that the leaves are toxic to horses and have capability to stun fish. So caution is recommended. By lining an earthenware pot with the leaves you can ripen fruits such as banana, avocado, and papaya as they trap the ethylene gas that softens the fruit. There are endless uses and possibilities. Here are mothers' potions.....

Rat poison: grind up bark and mix with cooked corn.

Pets- for ticks and fleas and preventative: grind up the leaves and mix with water, bathe the animals once a week but do not rinse off.

Ointment for dermatitis, boils, diaper rash: mash fresh leaves make a poultice or add to melted white candle wax and coconut oil.

Trees are being felled to make way for supposedly needed crops

of coconuts, citrus, corn and pineapples, etc. They should live in harmony, the trees providing much needed nutrients and taking their rightful place as they really do bring important tourist dollars. Visitors come to see our sights, our wildlife and our beauty. The trees are essential to the wildlife and crop pollinators. When the Madre de Cacao drops its leaves, it is replaced by an abundance of showy pink flowers at the start of the dry season going through March. Now this also happens to be our tourist season. So imagine our roadways alive with colour! Let's get planting.

Pictures courtesy Phoenix Photo

Hugelkultur

By Karin Westdyk

Hugelkultur, pronounced hoo-gul-culture, is an ancient way of gardening or farming. Practiced for hundreds of years in Germany and Eastern Europe, hugelkultur is now receiving widespread attention and interest by farmers worldwide. The word hugelkultur is a German word meaning *raised mounds or hill culture* and is constructed on top of decaying wood debris and other compostable material. These growing mounds hold moisture, build fertility for the plants, maximize growing space, and provide nutritious soil for growing fruits, vegetables and herbs. They are particularly useful in places where water is scarce, allowing farmers and gardeners in the tropics to continue to grow during the dry season.

Instead of burning wood debris, pile it up for hugelkultur mounds; they can be any size, using wood stumps, branches, and twigs in different sizes and decomposition stages as the base. One of the main benefits of hugelkultur is that little irrigation is needed because the wood beneath the soil holds a concentration of moisture acting much like a sponge. For farmers and gardeners who believe they cannot grow fruits and vegetables in the dry season due to lack of water, building hugelkultur mounds allows them to harvest more often and have fresh produce year round. Another benefit is that no fertilizer is needed; the wood and other compostable material within the pile release nutrients slowly as they decompose. Also, there is no need for tilling because the decomposing wood creates pockets of air and there is lots of beneficial fungal activity within a hugelkultur mound.

Hugelkultur mounds last for many years and are not easily moved, so it is important to choose locations wisely. Mounds should be built in shady areas for plants needing shade and in sunny areas for plants needing lots of sun. Mounds can be built level, but there are benefits to curving them to take advantage of the lay of the land. The mound in these photos has been built on contour to absorb more water from surrounding swales.

Plants needing drier conditions can be placed at the tops of the mounds while plants needing more moisture can be planted near the bottom -- closer to the sponge-like wet decaying material.

To build a hugelkultur mound you can either build it directly on top of the soil, or dig a trench 6" to a foot deep in the shape you desire. Use about 30-40% wood material for the mound, laying it directly on the ground or in the trench. If you use the trench method, turn the removed sod upside down directly on top of the wood. With either method, it is good to place smaller sticks and twigs wedged between larger branches to hold the pile together. The dirt removed from the trench can be added to the top later. If you do not dig, you must find topsoil elsewhere to add to the top of the pile; so either way, you must dig. The width at the bottom of the mound should be 2 to 3 times wider than the ultimate height. Add layers of filler using various compost materials such as dried leaves, grass clippings, or other organic matter. In the hugelkultur pictured here, cow manure and sea wood were added. To the top of the pile, add a healthy layer of soil mixed with compost (about 6 inches) taken from the trench or, if you placed the wood directly on the ground, from elsewhere.

Continued on Page 13

Hugelkultur...
Continued on Page 13

Plant seedlings immediately. If you are not ready to plant, put in a cover crop such as beans to hold the soil together and help build greater fertility in the mound. Place mulch around your plants. In the photo below, fibrous material from coconut trees is held in place with small sticks. Watermelons and squash will wind their way down the hill and cucumbers and some tomatoes will latch onto the strings suspended overhead. Plants to discourage insects are planted around the seedlings, such as marigolds near tomatoes.

Be creative! Combine art with science by choosing various types of plants and shapes and sizes for your mounds using material you have on hand.

Food Safety Testing In Belize

By Dr. Natalie Gibson

The Central Investigation Laboratory (CIL) is a food testing laboratory that operates under the Food Safety Services of the Belize Agricultural Health Authority (BAHA).It is housed at what was originally in the 1970's the Veterinary Laboratory of Belize City. While the archaic structure is where one would least expect to find the country's only official food testing laboratory, the work that takes place on these premises is of vital importance to Belize. For example, when a panic-stricken public needed answers during the "pink potato"scare it was in the Chemical Analysis Laboratory (CAL)that operates at CIL that the adulterant was identified as a food dye.

CIL houses both the CAL, and the Food Microbiology Laboratory (FML). The FML is a biosafety level 2 laboratory that tests food products for pathogens that cause food borne illness such as *Salmonellosis (from the Salmonella bacterium)*, *Staphylococcus aureus*, and *Vibrio cholera*; it also provides testing support to the Ministry of Health in outbreak scenarios. This laboratory had its origins in the Fisheries department, and was relocated to the BAHA facilities in order to support export certification of the fish and fishery products, and particularly aquaculture, after the founding of BAHA in the year 2000. Since that time the lab has expanded to encompass testing of other food matrices as well.

The necessity for Belize to develop testing capacity for contaminants and pesticide residues in food resulted in an investment in liquid and gas chromatography systems, and thus the fledgling Chemical Analysis Laboratory was born. The focus of this lab is the analysis of contaminants and chemical residues which pose a danger to human health and life such as pesticides, heavy metals and veterinary drugs.

Food safety surveillance programs are essential for the protection of our nation's health. Both labs that comprise CIL provide support for BAHA's food safety programs through testing for biological and chemical hazards in food. While BAHA's food safety laboratories are quite young in comparison to their more established counterparts in the region, their planned scope is quite ambitious. In the coming year alone, Food Safety Services plans to implement pesticide residues monitoring for fruits and vegetables, a quality assurance system for veterinary drugs in meats and poultry, and a prevalence study for Salmonella and Campylobacter bacteria in poultry. The laboratory testing required to support these programs is very costly. Fortunately, BAHA has been able to benefit from funding and assistance from various international agencies.

CIL's Chemical Analysis Laboratory will take a major step forward this year with the establishment of a fully equipped sample preparation lab, the lack of which has hitherto been a limitation to the lab's performance and testing capacity. In the area of microbiology, some infrastructural improvements are also being undertaken which will facilitate expansion of the testing scope of this laboratory as well; in the future the need for a more modern facility for microbiological testing is foreseen as both labs continue to develop and expanding pursuit of international standards of performance. Advancements will be measured by the laboratories' success in achieving accreditation to ISO 17025, a benchmark standard for laboratory competence. Achievement of this goal will not only improve the lab's credibility locally and internationally, but also enable greater protection of public health in Belize, supporting the motto of Food Safety Services: *Your health, your food, your life.*

Considering Lime and its Use for the Best Crop Response

By Neal Kinsey

It is likely that failure to lime low producing soils and a lack of understanding about the proper use of liming materials on most soils throughout the world has cost agriculture more yield loss and quality than any other lack in terms of soil fertility issues. But if you just stop with that knowledge and start using lime as it is normally determined to be needed, in the end it can cause far too many farmers, ranchers and growers to have a new set of nutrient deficiency problems with their crops.

For one thing, how many who advocate the use of several tons of lime per acre understand that the land will generally continue to be more and more affected by that added lime over a full three years from the time it is applied? Too little lime, or too much, and sometimes even the proper amount – if it adversely affects some other critical nutrient that is already borderline in terms of availability - can hurt crop quality and yield. You cannot manage what you cannot measure.

Good soil has pore space for water and air which provides the proper environment for biological activity. The amount and type of lime you use or fail to use determines this air and water relationship. And this same land is subject to the laws of chemistry that determine whether each element will adequately remain available in the soil for use by the plants that grow there. The *combined effects* of liming must be considered in order to have good soil for growing the best crops.

By testing the fields each year it should become evident over the next three years after liming just what happens for every ton of lime that is added to the soil. It can tie up the equivalent of copper in 5 pounds of 23% copper sulfate, and the equivalent of zinc in 10 pounds of 36% zinc sulfate per acre for each ton of lime applied. Specific amounts of available potassium, magnesium, iron and manganese will also be lost. For those using manure or compost, the exact losses may not be as easy to determine, but it still happens.

On soil that has plenty of all these nutrients, needed lime will just make it better. But on soils that have barely enough of one or more of these needed nutrients, the first year's results may look good, but not the second or third year. There are several factors to consider when determining the need for lime and how much is enough: the nutrient-holding capacity of the soil, the calcium and magnesium content of the liming material, how much is needed to supply what each soil lacks and the fineness of grind of the lime to be used. All of these factors must be considered for each *different type* of soil and the lime to be used must be properly measured and managed accordingly. For example, if one ton per acre is required for sandy soil, then the equivalent need for the heavy clays just a few miles away would be five tons per acre. This is because the exchange capacity (CEC) of the sand is 6.0, but for the clay it is 30.0, or five times higher.

Another factor that can be misleading is the number of tons of lime required to give the best response. First, remember that if lime is used correctly, the soil and crops should get better over the next three years. Farmers should always know the amount of calcium and magnesium in the lime being spread. For an average calcium carbonate lime that is finely ground, for every ton applied, 600 lbs. per acre or more of calcium should be provided once it is completely broken down. Yet that same lime, having the same calcium content, but due to a coarse grind, may supply only one-half that amount of calcium to build up soil levels.

Sugar beet lime is a good example. There are two sources not far apart, but it requires three tons from one to get the same results as one ton from the other. If a farmer did not know the difference and used the one that requires three tons and got the correct response, then switched and used three tons of the other one, then he would get the optimum response the first year, and more likely cause himself big problems by the second or third year. The point is that calcium content can be measured and the lime applied accordingly based on the determined needs of the soil and the ability of the lime to supply that need.

Soil Profile... Continued from page 6

Two bores were made on the site to study the underlying properties of the soil. The first profile was made about 650 feet from the southern end of the project site. The first three inches were dark brown clay loam with plenty of roots and organic matter.

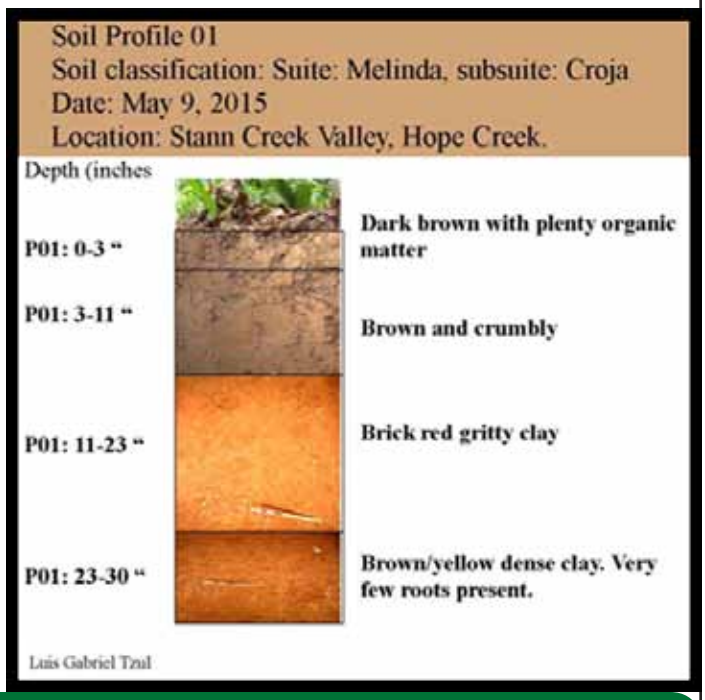
The second layer consisted of a light brown clay loam with crumbly structure and plant roots. The third layer, a brick red, gritty clay, course and easy to break up, was 23 inches in depth. Under the red clay layer the soil color changed to a light red, brown and yellow mottle dense fine clay layer for another 30 inches. (See Figure 1)

The second soil profile was done on the northern end of the property. The first two inches of topsoil were a light brown clay loam with crumbly structure and plenty of roots and decomposing organic matter. The second layer, also a brown clay loam with crumbly structure and roots, had good drainage. The third layer, a dense fine clay of red, brown and yellow color, was hard and compacted with almost no roots. It was very difficult to dig and drainage was poor.

The slope of the land was less than 3% from the western end to the eastern end. The higher land was located on the western border with dense forest canopy including cohune trees. As the slope of the land decreased the forest cover changed and on the eastern portion there was a mixture of pine trees with sedges and cutting grass typical of low lying areas.

The soil profiles showed that there is a dense clay layer at 24 to 30 inches. If the required root depth for citrus is four feet then cambered beds have to be made to raise the soil level above the natural level of the land by at least 18 inches. This will allow for drainage of the soil and provide ample soil depth needed for root development. The compacted subsoil should be ripped to loosen this layer and permit better drainage. The land has very little gradient and at least 2 deep drainage canals are needed to channel excess water. These modifications are necessary to make the land suitable for citrus production.

Figure 1. Soil profile for citrus orchard.



Soil Fertility Workshop at UB's College of Agriculture Declared a Resounding Success by Participants

Shortly after Neal Kinsey's articles started appearing in the August 2014 Belize Ag Report issue 26, growing numbers of readers opined that it would be beneficial to bring him to the University of Belize's College of Agriculture (UB CF) to present his introductory 3 day Albrecht-Kinsey Method Soil Fertility Course to Belizean students, teachers and farmers. This was realized at UB CF on May 11, 12 and 13th, 2015.

About a third of the 65 participants were 2nd year students at the College of Agriculture or teaching staff from UB CF and other Institute for Technical and Vocational Educational Training (ITVET) schools in Belize. The diversity of Belize's agriculture sector was expressed with attendees from other public and private sectors representing most of Belize's commercial crops.

Although Neal pointed out at the start that all the subject matter of the course is covered in his book, *Hands-On Agronomy*, it was soon apparent why he is in such high demand around the world for his presentations. Photos, charts and opportunities for questions helped to clarify concepts including soil composition and chemistry, techniques for taking proper soil samples, understanding soil analyses, pH, and macro and micro nutrient needs of crops in general and in particular. Every attendee received a bound workbook with much of the presentation information, eliminating the need for strenuous note-taking. Whether attendees were from conventional or organic farms, the information was applicable.

A survey was done at the conclusion of the course; workshop attendees all rated the course as very useful and definitely worth the registration fee. Several gave suggestions for other short courses they would like to see offered to the public at the College of Agriculture.

The course was made possible by sponsorships and donations from local and international businesses and individuals. (See thank you to donors, this page.) College of Agriculture Administrator Dr. Gordon Holder, David Thiessen of Thiessen's Liquid Fertilizer (now Agro-Base) and Beth Roberson of the Belize Ag Report coordinated these efforts.

Neal Kinsey is scheduled to return to UB Central Farm on February 8, 9 & 10, 2016, for a repeat of this introductory soil fertility course, with an added Row Crop Field Day on February 11. UB CF hopes to host the advanced course here in 2017.

Contact either David Thiessen at 670-4817 (thiessenliquid@gmail.com) or Beth Roberson at 663-6777 (belizeagreport@gmail.com) for information about the 2016 course.

The College of Agriculture of the University of Belize at Central Farm wishes to thank the following sponsors and donors who contributed to the success of the Neal Kinsey 3 Day Soil Fertility Course held at UB CF May 11-13, 2015.

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Dottie Feucht
Belize Ag Report

Avian Influenza in Belize

Belize implemented its active surveillance programme for avian influenza (AI) in 1999 as a result of the high threat arising from the avian influenza H5N2 outbreaks which started in 1994 in the neighbouring country of Mexico. When Guatemala and El Salvador reported low pathogenic avian influenza H5N2 in 2000 and 2002, respectively, the active surveillance for avian influenza was strengthened. In 2009, through the implementation of the Belize Poultry Improvement Plan (BPIP), AI monitoring of chicken broiler and layer breeder flocks commenced with breeder flocks being tested three times in their lives. 2014 was no different from other years in avian AI surveillance activities including active and passive surveillance and monitoring of breeder flocks.

All blood samples collected from active and passive surveillance for AI in 2014 tested negative. All blood samples collected under BPIP in 2014 also tested negative except for samples collected in Spanish Lookout, Cayo District from an 8000 chicken broiler breeder flock 39 weeks of age, in early December, 2014. The sera that tested positive as well as swab samples from AI antibody positive birds were sent to the National Veterinary Services Laboratory in Ames, Iowa, USA, a reference laboratory for the World Organisation for Animal Health (OIE). Thus, by 22 January 2015 the Belize Agricultural Health Authority (BAHA) had confirmation that there was an exposure to avian influenza H5N2. As there was great uncertainty as to the nature of the exposure particularly as antibody-positive birds were not showing any clinical signs of disease, sentinel birds were placed in known exposed flocks. PCR confirmation was obtained on the 14 February 2015. The virus was sequenced as:

> North American LPAI H5N2 98.8% similar to A/CK/Mexico/55-12/2012 H5N2

The Belize viruses are highly similar to low pathogenic avian influenza (LPAI) H5N2 viruses isolated in Mexico. The Mexico LPAI viruses have circulated in poultry in Mexico since 1995 and are well adapted to poultry. Virus characterization results received the 12 March 2015 identified the virus as LPAI by cleavage site analysis as well as in vivo assay.

There have never been any clinical signs associated with the LPAI H5N2 virus in Belize; producers are, in fact, reporting better performance of their poultry but this is probably due to the enhanced management and biosecurity measures implemented.

BAHA responded swiftly to the serological detection of avian influenza by the immediate implementation of quarantine and movement control,enhanced biosecurity at farm and community level and the testing of all long-lived poultry in Spanish Lookout, surrounding villages and communities considered high risk. Country-wide surveillance has been strengthened with at risk communities having commercial poultry being periodically tested. The epidemiological surveillance showed that the outbreak was localized in a hot zone in Spanish Lookout and in two nearby villages, Buenavista and Billy White. Additional control measures were implemented: stamping out of infected flocks and cleaning and disinfection. (Vaccination was considered as a control measure but it has not been approved.) Movement control at six designated checkpoints considerably reduced the movement of risk poultry and poultry products. Security surveillance in the area has led to confiscations of spent hens smuggled out of the infected area; BAHA responded swiftly to these confiscations, testing, destroying and disposing of the smuggled birds.

The source of the virus is unknown. Possible entry points include illegal importation of AI vaccine, illegal importation of poultry vaccine contaminated with AI virus, wild bird and horizontal transmission through contaminated fomite used in the trade of live spent hens.

Public awareness has been continuous. At first frequent meetings with community leaders, first responders, producers and the media were held; over time these have decreased considerably. Now the chief veterinary officer holds biweekly planning meetings with the Belize Poultry Association and Spanish Lookout representatives. BAHA has maintained its OIE notifications.

The avian influenza outbreak affected the most progressive and poultry-dense Mennonite community of Belize. Given the economic power of this community and support of the Government of Belize through the Ministry of Natural Resources and Agriculture (MNRA) and BAHA, control measures have been effectively undertaken. As a result of the outbreak, the BAHA laboratory capability has been strengthened and is now able to perform PCR and HI analysis in addition to AGID. The Spanish Lookout community installed ELISA testing capability to assist in the surveillance work and established new standards and guidelines for raising poultry within the community; all farmers are now very aware of the importance of strengthening their biosecurity measures.

BAHA does a three week cycle "sweep" of testing of all long-lived birds in Spanish Lookout and satellite villages for AI. These sweeps have detected 26 positive flocks to date, the last infected flock being detected on the 5 June 2015 and disinfected on the 9 June 2015 in Spanish Lookout. A total of 82,145 birds were destroyed through depopulation. Under OIE guidelines a country may regain its free status three months after disinfection of all affected establishments along with the appropriate surveillance in accordance to OIE guidelines. BAHA hopes to regain its AI free status on the 9 September 2015 after completing a total of 7 sweeps, the last sweep being conducted on the 23 August 2015.

Report submitted by BAHA/BPA.

BEL-CAR Update
Blackeye Peas (BE's)

By Dottie Feucht

RK's are now a part of the coop program at BEL-CAR along with corn and blackeye peas. That means the farmers who grow RK's receive equitable payments based on the prices BEL-CAR receives when they sell them. That will take care of the problems that arise when price fluctuations due to supply/demand variances in the market place result in different prices paid to farmers whose harvests and deliveries vary during the season.

Blackeye peas are graded according to their quality which is determined by detailed export standards, including appearance (color, spots/markings caused by insects), moisture, and presence of non-BE beans, splits or foreign material, e.g., stones. Weather can adversely affect bean quality. For example, weather that is too dry during the growing season causes BE's to have a yellowish color; however, BE's should be harvested in dry weather (no rain the previous 2 weeks) to maximize quality. Spotting also comes from weather conditions; but weather is not the only factor affecting quality. Farmers have to be careful for pre-harvest fungus and insect damage, which can mean brown spots on the beans, as well as post-harvest storage where beans can develop fungus or insects can bore holes in the beans. Beans in storage usually have to be treated regularly for insects. However, the better the storage facility the higher the bean quality.

This season's BE's in Spanish Lookout were adversely affected by the weather for the most part. For some period of harvest time it rained every 2 weeks – just as the farmers were trying to harvest their BE's. The farmers had a 30 – 40% loss of high quality this season.

The selling price is determined by the buyer's quality criteria. For example, beans sold to canneries do not have to be the highest quality in appearance; scars on beans are not noticeable in a can of beans. The European and Middle-Eastern buyers demand only the highest quality and have their own standards. BEL-CAR sends sample of beans to buyers prior to sales and export. The price is determined from the buyer's quality standards and BEL-CAR's sample.

BEL-CAR has a lab where they can check for moisture and other quality factors. The picture shows one half of a blackeye bean under the microscope. The formation of the bean sprout is already noticeable. The blackeye bean is not as hard as other beans; it is the only bean that can be cooked without having to soak it prior to cooking for best results.

BEL-CAR buys its seed from the US, mostly from companies in Texas and California.

Soils of Belize – Eastern OW District, Northern Belize District

By Harold Vernon

My last article addressed the western/southwestern portion of the Orange Walk district. This article looks at the eastern portion of the district and its association with the northern part of the Belize District. The major agents of the formation of these soils are the two rivers, the New River in the north and the Belize River in the south; these form the two associated drainage basins further south. The principal geophysical feature is the flat land that intersperses with many large and small water bodies such as lagoons, lakes and ponds. These watersheds have substantial areas of marsh lands and swamps (peat) as well as areas that are old leached alluvial pine ridge soils and younger soils lying on top of limestone, and further south, lying on top of clay hard pans. Drainage is usually a problem causing anaerobic soil conditions.

Anyone who has travelled the course of the New River readily appreciates the estuarine nature of the main course of the river as it passes east and then north into the Corozal District. The occasional top gallon floods expose the nature of the flood plains. The youngest soils near the permanent water courses are entisols or inceptisols with significant water regimes and so are called aquaent or aquaept. There are significant areas of shallow soils sitting on top of clay that have become compressed and although of the same two classifications, exhibit behaviours that make them spodosols or podzolic soils. As one drives south along the Phillip Goldson highway one witnesses elevated areas that have substantial oak, palmetto, calabash and other colonizing plants and trees (broken ridges)but also other areas that have broadleaf forest. The sand is siliceous or mostly derived from quartz and comes from the water movement over many eons of time. These areas extend south into the Crooked Tree system of drainage lagoons and slow moving creeks. The soils here are generally poor in nutrients; nitrogen is most deficient. These soils are also acidic and should use basic residual fertilizers as well as liming materials if cultivated in the few areas available.

On the outer fringes, the soils are too low in elevation or are sitting just a few feet above sea level and in contact with the saline groundwater. This area adjacent to the sea does not have a true coastline and in fact is a settling area for the mud that is transported during the flood times. The soils in these areas can be said to be in formation. There is almost no commercial value from an agriculture point of view and aquaculture has been attempted with limited benefit.

There are a few large lagoons such as the Honey Camp lagoon system and other smaller drainage reservoirs or ponds. Mangrove swamps predominate with occasional outcrops of limestone rocks. Coming south at the Carmelita junction on the old Belize Highway, one travels in an east by southeast direction and the sandy pine ridge and broken ridge gives way to more broadleaf species and the human settlements/villages of St. Margaret, Bomba, Maskall, Corozalito and Boston utilize these lands for truck farming. These soils have a bit more nutrients and are much higher in elevation and organic matter. This better nutrient status explains why the ancient Maya established themselves at Althun Ha.

Pasture is the primary land use in almost all these areas but due to the nutrient status and the fibrous types of grasses that predominate, the stocking rate can be as high as 3 or 4 animals to the acre. There are a few sugar cane farms with the biggest one located at Caribe Farms (mile 40 or thereabouts). The effectives and yields have not been properly documented for sugar cane. Coconuts and some fruit trees such as craboo, mango and cashew do well in some areas. There are no large plantations of these crops.

Quality Planting Material from University of Belize

Sugarcane, Citrus, Banana

By Stephen Williams, Micropropagation Laboratory Manager, University of Belize

The University of Belize (UB) has established a commercial-scale plant micropropagation laboratory at its Central Farm campus. This much-needed service had not been previously available in Belize but is now supplying Belize's agriculture sector with high quality planting material. UB's micropropagation facilities are fully equipped with media preparation area, plant transfer room (laminar flow room), plant growth room and a plant-hardening nursery facility where the plants are "hardened" in preparation for field planting. There is a full-time staff of ten.

Sugarcane plants are sub-cultured once a month in a sterile environment.

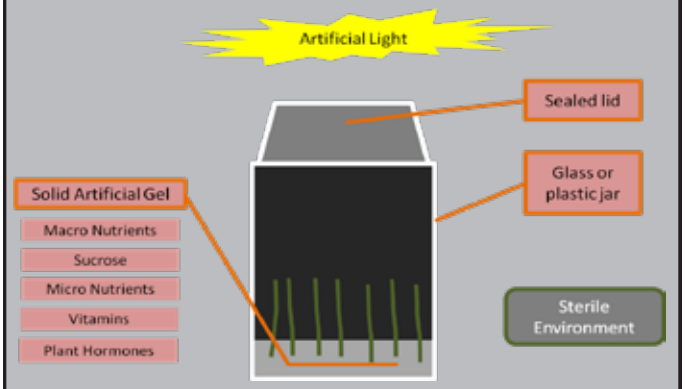
By using micropropagated plants farmers can produce better crops with higher yields. This technology can also be used to (1) rapidly introduce new varieties into the country and distribute them to growers and (2) provide farmers with large quantities of plants for use at a specific time of year permitting them to take greater advantage of weather patterns and market opportunities.

What is Micropropagation?

Micropropagation is a tool for producing large numbers of plants in a relatively short time period. For example, one sugarcane shoot from the field can be used to produce, in 12 months, 10,000 plantlets. This compares to a maximum multiplication rate of x30 in the field. The plants can also be certified free of specified diseases—once correct procedures are following.

Plants are grown in jars in a sterile environment on a specially formulated semi-solid gel/agar which contains the nutrients, plant hormones and sugar required for rapid growth. The jars are kept on shelves in a controlled temperature growth room under artificial light.

Every month laboratory workers take the plants out of the jars, divide them and place in new jars—thus multiplying the plants through the sub-culturing process.



Sugarcane cultures on media to stimulate root production. This is the final step in the lab before plants are transferred to seedling trays for the 2-month hardening process in the nursery. After hardening, plants are ready for field planting.

Continued on page 21

Quality Planting...Continued on page 21

Sugarcane

Most sugarcane industries use micropropagated plants to establish cane seed nurseries. Belize is using plants from UB's micropropagation lab to establish a similar system that will provide quality seeds (or setts) for cane farmers. As these setts will be of a higher quality (known variety and free of specified diseases) than those previously available they will allow more farmers to produce higher yields. Through UB, Belize's cane industry is also using micropropagation to introduce cane varieties from North and Central America that are relatively new to the country.

Sugarcane Varieties
in current production at
UB's micropropagation lab

B79-474	BBZ80-240
CP72-2086	CP70-1133
CP72-1312	CP88-1165
RD75-11	BJ72-62
Mex69-290	

The lab's work so far has produced 55,000 plants for the sugarcane industry for demonstration plots. Officials in that industry were pleased with the plants' field performance and have made requests for more plants. For 2015, the distribution of 100,000 plants to industry stakeholders - Sugar Industry Research & Development Institute (SIRDI), Belize Sugar Industries and Santander Sugar - is well under way.

Citrus

HLB / greening disease is causing a citrus seed shortage in Belize. To address similar problems in Florida and California officials are exploring the potential of producing citrus rootstock seedlings through micropropagation. To begin the same exploration in Belize UB has signed a Memorandum of Understanding with International Regional Organization for Agricultural Health (OIRSA), Citrus Growers Association (CGA), Taiwan International Cooperation & Development Fund (ICDF), Ministry of Natural Resources & Agriculture (MNRA), Belize Agricultural Health Authority (BAHA) and the Ad-hoc Committee of Citrus Nurserymen to develop procedures for micropropagation of citrus rootstock seedlings for use in certified plant nurseries and develop the capability of shoot tip grafting (STG). STG is used to make diseased field material free of specified diseases. The growing point (or meristem) from the field material is micro-grafted on to a rootstock plant in a test tube. The method is used to produce disease-free "parent material" for use by citrus nurseries. Work began in March 2015 with OIRSA providing a laboratory technician to work in UB's Central Farm laboratory. He is currently developing the protocols for the STG technology and rootstock multiplication, focusing on sour orange and Cleopatra mandarin. UB is working closely with CGA on this project.

Banana

Members of the Banana Growers Association currently import around 500,000 micropropagated plants a year from a laboratory in Honduras to replant plantations that have passed their production peak. Using these plants, farmers have reported increased production because of the significant reduction in nematode pest infestations. There are clear advantages for Belizean banana farmers to acquire their planting material in Belize; so they have asked UB to develop the technology here. Funding for the project will be from EU and ICDF.

For more information contact lab staff:
Manager, Stephen Williams:
swilliams@ub.edu.bz Tel: 610 2737
Senior Laboratory Technician, David Guerra:
dguerra@ub.edu.bz Tel: 605 6677

Agriculture Prices at a Glance- $$$$$

AUGUST 2015

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

BELIZE CATTLE - BLPA By District							
	T	Dist.	Per lb	Dist.	Per lb	Dist.	Per lb
Steers/Bulls	H	Czl	3.10	OW	3.10	Bze	2.75-3.00
750-1100 lbs	H	Cy	3.10	SCr	3.10	Tol	2.60-2.90
Weaner Steers	H	Czl	N/A	OW	3.25	Bze	N/A
" "	H	Cy	3.20	SCr	N/A	Tol	N/A
Breeding Heifers	H	Czl	N/A	OW	3.25	Bze	N/A
" "	H	Cy	3.15	SCr	N/A	Tol	N/A
Cull Cows	H	Czl	N/A	OW	2.10	Bze	1.80
" "	H	Cy	2.20	SCr	N/A	Tol	1.75

U.S. CATTLE		
U.S. price - corn fed - 1000-1200 lbs	L	US$ 1.49575
U.S. price - feeders 600-800 lbs	S	US$ 2.1403

BELIZE HOGS		
Weaner pigs - 25-30 lbs - by the head	S	100.00
Butcher pigs 160 - 230 lbs, per lb	S	2.00

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

BELIZE CHICKEN			
Whole sale dressed (Sp Lkt)	S	2.48	
Whole sale dressed (Bl Crk)	S	2.50	2.46
Broilers - live per lb (Sp Lkt)	S	1.23	
Broilers - live per lb (Bl Crk)	S	1.30	
Spent hens per 4 lb bird (Sp Lkt)	S	N/A	N/A
Spent hens per 4 lb bird (Bl Crk)	S	3.00 (20 + Birds) - 4.00	

CITRUS		
Oranges per lb solid	H	1.7195
Grapefruit per lb solid	S	2.5210

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

GRAINS, BEANS & RICE	T	A	B
Belize yellow corn, bulk (Spanish Lookout)	H	N/A	.28
Belize yellow corn, bulk (Blue Creek)	H	N/A	.28
Yellow corn/local retail (low volume)	H	.33	
Belize white corn, bulk (Cayo)	H	.30	.25
Guatemala yellow corn price	H	(Q151 /quintal) Bz$.4576	
Guatemala yellow corn price/Peten	H	(Q147 /quintal) Bz$.4455	
US Corn	L	US$4.1127 /56 lb bushel	
US organic, yellow corn feed grade	H	US$12.00-14.00/56 lb bushel	
Belize soy beans (Spanish Lookout)	S	.50	N/A
Belize soy beans (Blue Creek)	S	.55	N/A
US soy beans, #2 yellow	L	US$10.1525 /60 lb bushel	
US organic, feed grade soy	L	US$22.50-24.30 /60 lb bushel	
US organic, food grade soy	L	US$27.00-29.50 /60 lb bushel	
Belize milo	S	N/A	
Red kidney beans (Spanish Lookout)	S	.80 farm price	
Black eyed peas (Spanish Lookout)	S	.95	.72-.80
Paddy rice per pound (Spanish Lookout)	S	.40-.53 farm price, dried	
Paddy rice per pound (Blue Creek)	S	.45-.50 farm price, dried	

SUGAR/HONEY		
Sugar cane, ton	H	$70.45
Bagasse	S	pending agreement
Honey per lb (Cayo)	S	2.50 (approximately 12 lbs/gal)
Honey per lb single source/varietal (Cayo)	S	3.75 (approximately 12 lbs/gal)

SPECIAL FARM ITEMS		
Eggs - tray of 30	L	5.415 farm price
WD milk per lb to farmer	S	contract .57; non contract .57
Raw milk (farmer direct sales)	S	8.50 gal (5 gal + 8.00 gal)

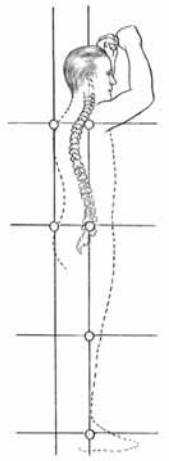
CACAO		
Cacao beans (TCGA) /lb	S	3.00 dried fermented
Cacao beans (TCGA) /lb	S	1.10 wet beans
US Cacao beans, metric ton, New York	H	US$ 3,181.59

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

Homemade Health

Chronic Pain

MARGUERITE FLY BEVIS, RN, BSN



Those who suffer from chronic pain related to the muscular-skeletal system will attest that it can be debilitating and miserable. One may think the pain is inescapable and rely on pain medication or resort to surgical intervention to escape. This article will introduce you to a revolutionary method that has worked for thousands of people. The cost to you will be about Bz $18, which is the cost of the book I recommend you purchase for complete step-by-step instructions. The caveat is that the responsibility for your health is on you. If you're in a hurry, just go to Amazon to download the book, "Pain Free: A Revolutionary Method for Stopping Chronic Pain" by Pete Egoscue with Roger Gittines. You can download a free version of Kindle on your telephone or computer and start right now.

Our bodies are wondrous things. They have the power to heal themselves. We can see this as we watch a simple cut or bruise heal up and disappear over a period of time. However, when we experience pain in our muscles and joints, we wrongfully assume there is little we can do and we turn to medication or more aggressive treatment. What we forget is that "the human body is designed to maintain health throughout a long lifetime," says Pete Egoscue.

Early man used to run and move constantly to find food and evade danger; modern man no longer has to do these things. In fact, today many people spend the majority of their days sitting at a desk or in the car, or sprawled on the sofa. Yet even fit athletes can suffer from chronic pain which develops as our bodies lose their natural design either because they are unused or misused.

Think about the design of the body. A healthy body is a series of parallel lines. The shoulders should be parallel with the hips. Knees and ankles should be parallel to each other and point forward. The only part of our body that is not designed to be straight is the spinal column. It's perfect S-curve holds all the ninety degree angles together. Look at yourself in the mirror. Are your shoulders parallel? Or is one higher than the other, or even set more forward than the other? Is one hip higher than the other? Turn sideways. Is your head jutting forward over your body? If you see these symptoms, your body is out of alignment causing the muscles to improvise and adapt to try to correct the condition. One set of muscles pulls and another set lies unused. The body "borrows" muscles to do the work of unused muscles. This constant pulling and tension result in pain. The borrowed muscles lack the design and power to do their own job plus the work of the main posture muscles. Over time, these muscles lose their own designed functions and they become comprised.

The good news is that it is possible to realign these muscles with a system of daily exercises designed to gently move the muscles back into alignment, reducing, if not completely eliminating pain. These are not rigorous exercises; they are more like gentle positions which allow the hips and other joints to realign. Within the confines of this short article I can only introduce you to the concept. There are many exercises or menus for any particular malady: menus for back pain, another for knee pain, yet another for shoulder pain. But all these pains result from the same thing: misalignment in structure. A hip that is not parallel can cause pain in the knees or feet. Wrist pain may be a result of a misplaced shoulder. All these problems can be addressed with a simple program of exercises designed to move the bones and muscles back into their natural alignment.

All the exercise menus are designed to pinpoint specific musculoskeletal functions that have been compromised. It is important to do the menus in a specified order so that you do not interrupt the sequence. Make sure that any exercise you do on one side is repeated on the other. The idea is to achieve balance and restore function. One exercise that is common to almost every menu is what Egoscue calls his "Silver Bullet" for pain. It is called the Static Back. It is designed to settle the hips to the floor and release the compensating muscles that are interfering with the gait-pattern of the foot and ankle.

Static Back. Lie on your back, with both legs bent at right angles on a chair or block. Rest your hands on your stomach or on the floor, below shoulder level, with palms up. Let the back settle into the floor. Breathe from your diaphragm (do stomach breathing). The abdominal muscles should rise as you inhale and fall as you exhale. Hold this position as long as is needed. It may take thirty minutes or longer. If back pain lingers, your body is telling you to stay down there until it works.

Find more online including videos, books, DVD's and even online therapy sessions at http://www.egoscue.com/

The purpose of this column is to share useful information about health that is relatively inexpensive and generally readily available for everyone. The information is not meant to be a substitute for health care, i.e., regular visits to a healthcare provider and as necessary when you are ill.

Belize Livestock Producers' Association

By Alistair Macpherson, CEO

How things change in such a short time!

With the price of cattle reaching record level over the last couple of months and no downturn in prices likely in the foreseeable future the public has been in an uproar at having to pay high prices in the stores for ground meat and stewing beef. Farmers and processors are being accused of gouging the public; this is simply not true. Discussions on the TV and newspaper articles are fueling this fire and while it is understandable, there are many folk that are either not fully informed or misinformed.

It would appear that there is a growing informal trade once again developing between Belize and Mexico with cattle being moved across the border at several points. However, these numbers are very small in comparison to what is being sold to Guatemala.

What we do know is that many of the cattle being sold to Guatemala through the informal market are being re-exported from Guatemala to Mexico. This is despite the border at Benque being opened up for this trade. We at BLPA and some individual farmers have been trying diligently to sell directly to the slaughter houses in Guatemala, but as yet we have not been able to open up this formal trade, despite continued support from the Ministries of Agriculture and Foreign Trade Directorate. It appears that there is reluctance from the buyers there to deal directly with Belizean farmers because of internal issues in Guatemala.

The market continues to be very strong with prices especially for young feeder cattle hitting a high of Bz$3.10/lb. the first week of July. Fat steers are currently at +/- $3.00/lb live wt off the farm. It is envisaged that current prices may still continue to rise in the short term before stabilizing and remaining steady at the current or slightly higher levels for the foreseeable future. With the global demand for beef now rising at 6%, a higher rate than last year's estimations of 4%, and with an estimated 1.5 million head of cattle heading into Mexico from all of Central America last year to feed their demands for both local consumption and re-export to the USA, both Mexico and the USA have depleted their own breeding herds. This has created shortages for them, and with their own herd numbers not increasing at any discernible rate, BLPA opines that the market for Belizean cattle will remain very strong for some time to come. We are cognizant of the fact that as a very small player in this market and with currently only around 20,000 head available annually for export, we must ensure that we remain a preferential source of quality animals. As we cannot compete in this market in terms of quantity, we must improve the quality of our herds and create a niche market within the overall beef trade.

To further explain the processes which affect retail beef prices, consider the following:

Continued on Page 26

BLPA... Continued from Page 25

If a farmer is offered $3.00/lb live wt at the farm for a 1,000 lb fat steer the farmer receives $3,000. The butcher then has to pay transportation costs for the animal to the slaughterhouse +/-$0.05/lb =$50/head, plus $8.00 cess (sales tax)/head. So we are at $3,058.00 as it reaches the slaughterhouse. Then add approximately $100/head for slaughter costs = $3,158.00. After the steer is slaughtered the butcher reclaims only about 52 -54% of the live wt as dressed weight, the rest being thrown out as guts, hide, head etc. So at 52% of the live wt this equals 520 lbs; so the $3,158 expenses for 520 lbs = $6.07/lb for the carcass. Then reduce about 25% of this weight to account for bones etc, and the price for the boneless meat rises to $7.59/lb. Additional costs include refrigeration, more transportation to the stores and butchering into retail cuts and packaging. Naturally, the butcher and the retail store must be allowed to make a profit as well. At the end we are probably looking at a true average price close to $10.00/lb. The majority (approx. 80%) of the beef carcass is made up of cheaper cuts. The remainder (approx. 20%) is prime cuts (steaks, tenderloins, etc). The prime cuts are sold at a higher than average price (tenderloin, etc. at $20.00/lb or more) which enables the cheaper cuts to be sold at a less than average price (ground beef at $7.00/lb). There may be several missing costs (inspections and the like), but the figures above clarify somewhat that there is no gouging at $7.00 - $8.00/lb for ground or stewing beef.

The Belize Livestock Registry (BLR)

So far, I would not say that the BLR has had any effect in increasing the numbers of cattle sold into either the Mexican or Guatemalan markets. It will, however, become increasingly important as Guatemala itself embarks on its own traceability system, which we are told they must have up and running by 2020. Once this is working, the Guatemalans will become much more stringent in allowing only registered cattle to enter their country. It is therefore imperative that we maintain and further develop our own traceability system, the BLR. The same applies to Mexico.

We also have plans for a breed registry in Belize, to tie in with our drive for better quality animals. The BLR will form an integral part of this project and thus enable us to prove bloodlines and improve genetic sources. This should and will help us to enter and maintain our position in the niche markets mentioned above. We also hope that we can become a marketplace for the region to buy pedigreed animals. This is a market that is virtually untapped and could prove very beneficial to our breeders, as currently all pedigreed animals are imported from the USA or Mexico. Cattle ranchers from countries south of Belize have already indicated that they would support this initiative to purchase breeding stock more acclimatized to their local conditions (climate/diseases/parasites).

The registry is absolutely paramount in maintaining our place in the current market and securing our place in this new emerging market. We must not allow the actions of a few misguided individuals to downplay our chances of competing and benefiting from these markets. The Ministry of Natural Resources and Agriculture (MNRA) and the Belize Agricultural Health Authority (BAHA) have already begun to take action by quarantining and prosecuting farmers who are not in line with the law, thereby putting the integrity of the BLR at risk.

Rustling

Unfortunately as the prices of cattle have risen sharply, rustling has reached epidemic proportions in most parts of the country. From Corozal to Toledo and all points in between, BLPA receives reports of widespread theft occurring. BLPA has been lobbying with the police in many areas to help protect our members. Much of this crime is not being reported for various reasons, ranging from the feeling that the police will not act, or are too slow to act, or plain fear, as there is strong evidence that there are organized gangs of miscreants involved in what is becoming a wholesale blight on our industry. We beseech the authorities to act forcefully now and stop this crime before it develops into a culture within the rural communities. The public can help by ensuring that all the meat they buy has been stamped by either public health or BAHA and that they are buying only from a recognized and reputable outlet. The chief market for this stolen meat is informal meat shops which source animals often killed in unsanitary conditions, "under the tree". Know where your meat is coming from and if it has been handled in a safe and sanitary fashion.

Please call BLPA at 822-3883 or email admin@belizelivestock.org with any questions or comments. Visitors are welcome to stop by at the BLPA offices at mile 47 ½ on the George Price (Western) Highway, just east of Belmopan.

BLPA – Moooooving forward!!!

Jaguar Predation

Ranchers and Researchers Strive Together for Answers

Toledo's Ya'axche Hosts Experts from Panthera


Y. Urbina, R. Foster, R. Hoogesteijn, K. Cal, E. Correa

There are no current estimates as to what the countrywide jaguar and puma losses to the livestock industry are, as many ranchers have been reluctant to discuss the predation issue. More information is needed on cat predation of livestock in Belize to enable creation of the best strategies to minimize these losses. However, it is definitely an issue in every district and enough is already known to identify several predation hotspots, including rural areas in both Belize and Toledo Districts. The Belize Livestock Association (BLPA) will shortly begin coordination with Panthera, the world leader in wild cat research, to collect cat predation feedback from ranchers.

For over five years, Panthera has been working in partnership with the Forest Department's Wildlife Program and the University of Belize's Environmental Research Institute at the (UB-ERI). Recently, Panthera's Belize Jaguar Program invited their (Panthera's) Brazilian-based Jaguar-Cattle Conflict Director, Dr. Rafael Hoogesteijn, to meet with ranchers in both Toledo and Belize districts. Ya'axche Conservation Trust hosted the Toledo presentations at their Golden Stream headquarters on June 5th. Rafael has worked for over 30 years as a beef cattle and Asian water buffalo veterinarian in South American areas with cat predation problems. His work has enabled him to sympathize with the ranchers' challenges in protecting their livelihood and to understand what drives ranchers to shoot "problem" cats. Sharing first-hand experience of implementations of many anti-predation strategies, he believes ranchers and big cats can co-exist and that sometimes "even small adjustments in the way we live in these landscapes can make a difference".

Acknowledging that every situation needs individual assessment, the group discussed:

- **Stopping the hunting of jaguars and of their prey.** Injured cats are often unfit to hunt their wild prey and then turn to domestic livestock. Identification and protection of the cats' natural food sources will reduce the jaguar's need to rely on domestic livestock. Jaguars in Belize hunt gibnut, deer, peccary, armadillos and quash. When these are unavailable, cats hunt livestock.
- **Knowing how to identify kills from various predators.** Being sure with which predator species you are dealing is important to your plan. Jaguars kill by "canine bites to the head, often fracturing the base of the skull. Often, they eat the flesh of the chest ribs shoulder blades and neck first. Pumas usually kill by biting their prey in the throat and unlike jaguars, tend to cover their prey with vegetative material." Packs of dogs (feral or domestic) may attack indiscriminately; they often mutilate the victim with bites/rips on multiple areas of the body. Coyotes generally kill more efficiently than dogs; they often kill animals by a bite to throat behind the lower jaw, or sometimes may pull the animal down by attacking the side, hindquarters and udder.
- **Proper disposal of carcasses (e.g. burial, burning).** This will prevent predators from scavenging on carcasses and becoming habituated to a free-supply of food and acquiring a taste of your stock.
- **Using night enclosures or corrals**. Locating them close to residences, using lights and **electric fencing** can reduce predation. These strategies can also decrease rustling incidence. Right now Panthera is developing plans for testing electrified calving paddocks /night enclosures and potentially "critter-gitters" (motion sensitive devices that make siren noise and flashing lights when a large-bodied animal passes by).
- **Moving water sources away from the bush.** Drinking water which is away from/not in the bush reduces predation as cats prefer to stalk while protected by the forest.

Continued on page 28

PROTECT YOUR LIVESTOCK AGAINST PREDATOR ATTACK!

There are many simple ways to improve the management of your livestock to reduce risk of attack by predators.
For more advice, please contact:
Jaguar Officer, Wildlife Program, Forest Dept., Belmopan
Ph. 822-1524 or 664-4550 Email. jaguar.officer.fd.bz@gmail.com
and visit: http://www.panthera.org/antipredation

YA'AXCHÉ CONSERVATION TRUST

PANTHERA
LEADERS IN WILD CAT CONSERVATION

FOREST DEPARTMENT BELIZE

Jaguar Predation...Continued from page 27

- **Fencing off forested areas.** While not always feasible, this reduces potential contact between the cats and your livestock. Having a clean buffer zone between the forest and your pastures forces cats out of their comfort zone.
- **Using limited breeding seasons.** Since calves are an easier prey, limiting the calving season will reduce time required for the extra vigilance. Keep cows with small calves away from all forested areas if possible.
- **Keeping (by not culling) experienced older animals - bulls, steers or older cows with horns.** They will teach defensive behavior to the younger animals.
- **Using stainless steel bells.** On large calves as well as cows this appears promising, and is being tested in Costa Rica and Belize currently.
- **Using donkeys as guards.** Donkeys (*Equus asinus*) are being used in Belize to scare off predators by their braying and this appears to be successful in reducing predation.

Donkeys should be raised with cattle, so that they feel that they are a member of the herd.

- **Using Asian water buffaloes or cattle breeds with strong defensive behaviors to defend cattle.** Buffaloes handle easily if treated kindly. Water buffaloes are known to remember unkind treatment and to exact revenge and they must be tended regularly to preclude them 'going feral'. Although some *Bos indicus* such as Nelore, protect their calves, mainly the zebu type cattle "will stampede and run off in the presence of a predator, leaving the calves alone, disoriented and prone to attack." Work is being done in S. America to restore and develop some of the Creole breeds such as the San Martinero and Criollo Casanareno in Columbia and the Caracu, Curraleiro and Pantaneiro in Brazil, which have an inherent disposition to defend themselves. However, at present, these breeds may be lacking in some meat carcass characteristics.

As top predators, jaguars and pumas play an essential role in maintaining balance in a healthy ecosystem. In Brazil a tourism market has emerged– Jaguar/Wildlife Tourism, where "the presence of jaguars on ranches functions as a tourism magnet, which compensates for predation losses." Rafael opines, "night time boat and truck spotlighting can be huge attractions. This activity educates and creates awareness of the existing wildlife which is not conspicuous during the day, but that coexists with humans and cattle; this usually is the biggest surprise of all to visitors." Ideally this jaguar tourism would directly involve and benefit the ranchers who bear the costs and losses of co-existence with the large cats.

To quote Panthera: "the most important factor in success [of anti-predation strategies] is the development of a partnership approach with the ranching community, without criticism, collaborating with a sector of society that lives primarily of and works for the production of livestock..." Panthera is coordinating with BLPA in efforts to bring Rafael Hoogesteijn back to Belize to speak at either the next BLPA AGM in February 2016 and/or at a series of rancher meetings throughout the country.

Prior to the *Anti-Predation Strategies* presentation, Belize's Director for Panthera, Dr. Rebecca Foster, a UK born jaguar expert with over a decade's research in Belize, made a spell-binding introduction to the wild cats of Belize. Rebecca can be reached at rfoster@panthera.org .

All quotes are from: ***Anti-Predation Strategies for Cattle Ranching in Latin America: A Guide***, by Rafael Hoogesteijn and Almira Hoogesteijn, 2014, ISBN: 978-85-912016-2-4. http://www.panthera.org/sites/default/files/Anti-Predation-Manual_English.pdf

Find Panthera's website at panthera.org and Ya'axche's at yaaxche.org

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Reported by B. Roberson

What Happens to Belize's Bananas and Sugar after 1st January 2017?

By Dwight Neal,

Belize Enterprise for Sustainable Technology

To have an appreciation for what is happening or will happen with Belize's sugar and bananas after 2017 it is important to understand a bit about the World Trade Organization (WTO), Common Agriculture Policy (CAPS), African Caribbean and Pacific States (ACP), Contonou Agreement, Everything But Arms (EBA) treaty, Doha Round (DR) and Bali Ministerial Declaration. International trade is a very complex business that has to do more with politics than actual trade. So that while governments never buy or sell agricultural products themselves they have a tremendous impact on access, price, form and quantity of goods moved. In the case of Belize it is important to understand how these agreements, treaties and decisions affect our trade with the EU. While banana and sugar are the largest exports to the European Union (EU) they are by no means the only ones. Citrus, cacao and marine products are also on the list.

The Cotonou Agreement is an agreement signed in 2000 between the EU and African, Caribbean and Pacific (ACP) countries. Under Cotonou, ACP countries are exempted from paying tariffs for most of their agricultural primary exports to the EU. Most ACP countries also have special trade privileges under the EBA treaty with the EU. Under this treaty all Least Developed Countries (LDCs) have tariff-free access to Europe's markets for all their goods except arms.

On the other side of the coin there are several subsidies that protect EU farmers. If all tariff barriers were removed European farmers would be at a tremendous advantage. European farming methods are much more expensive than ACP agricultural producers'.

The EU subsidies result in the governments' maintaining high prices to farmers while controlling and guaranteeing a "fair" price to consumers. This system has been in place since 2000. These support mechanisms can and sometimes do wipe out any benefit that ACP producers gain from not having to pay tariffs when their products enter European markets.

In 2001 the WTO Ministerial Session met in Doha, Qatar to develop a mechanism that would lower trade barriers and facilitate global trade. However, the issue of banana imports into the EU precedes the DR by about seven years, when five Latin American countries, Colombia, Costa Rica, Guatemala, Nicaragua, and Venezuela, initiated the General Agreement on Tariffs and Trade (GATT) disputed settlement proceedings. The GATT panel ruled that the EU regime was illegal under GATT rules. The EU negotiated a Framework Agreement with all of the complaints except Guatemala. That agreement increased and guaranteed the value of their export quotas in exchange for withdrawing their complaint and refraining from any further challenge until 2003. In 1994 the US entered the fray as American companies with operations in Latin America lobbied the US government to challenge the agreement that was reached between the EU and Colombia, Costa Rica, Nicaragua and Venezuela. That initiated a long process of negotiations and law suits that ended in 2009 with a new EU banana regime whose main points are:

Continued on page 30

Bananas & sugar...Continued from page 29

- A reduction of maximum tariffs on bananas from non-ACP countries from 176 €/tonne in 2009 to 114 €/tonne 1 January 2017. Under WTO agreements these tariffs are "bound" at maximum levels (bound duties), although countries may choose to set tariffs at lower rates than these bound maximums. However, countries are not allowed to discriminate in the tariff rates they set between their trading partners except in the instances where they have preferential/free trade agreements.
- A single tariff system will be introduced in 2020 at which time the price will 75 €/tonne
- ACP bananas would continue to enter the EU market quota-free and virtually tariff free.
- The EU would make a one-time 200 million € payment to its ACP partners in the form of Banana Accompanying Measures (BAMs)
- The US-Latin American countries would not continue to pursue their WTO case

The agreement was formally delivered to the WTO and came into force in October of 2012. Why is the tariff of 114 €/tonne so significant? That is because it is the price at which the Latin American bananas start to become competitive due primarily to economies of scale, among other things. The mechanics cannot be adequately explained in an article of this length but essentially it is the point at which the effect of the tariffs begins to approach zero. Based on production and pricing, it is the point at which the two groups (ACP and Latin America) meet. The implications for Belize in bananas (and also sugar) are straightforward: become more efficient in production and shipping/or find new markets. Defining and explaining these options will require another column. However, the one thing that Belize has in its favor is the fact that it has always focused on quality. This focus will have to be emphasized going forward since the country can never compete on quantity.

Similar changes will affect sugar. However, the changes in tariff structure will affect the two differently. The EU produces approximately half the sugar but only 10% of the bananas it consumes. Therefore, the situation for sugar will be much more complex because it will include competition from domestic EU sources that are protected through the CAP. In the case of bananas the competition will be almost entirely from external EU sources, and primarily Latin America at that. Additionally, sugar prices tend to be more volatile. So the change in tariff structure does not automatically mean that Belize will be at a disadvantage. However, after 2017 most of the props will be removed and both industries will need to find a way to be more efficient and competitive if they are to continue to exist.

Editor's Note: Dwight Neal is a technical officer at BEST assigned primarily to the Promoting Sustainable Natural Resource-based Livelihoods" (SNRL) Project that is funded through the World Bank and implemented by BEST on behalf of GoB. The project targets 25 communities that are adjacent to key protected areas with the goal of reducing the impact of extractive activities on these protected areas. Mr. Neal has extensive experience in rural development, particularly in the southern districts and with fishers. He is currently overseeing the implementation of 10 projects in various parts of Belize that are part of the SNRL project. These projects include apiculture, MD2 pineapple production, pig rearing, agroprocessing (dried fruit and preserves) and sea weed cultivation.

Contact him at: dwightneal@gmail.com .

Tilapia Hatchery Centre

"UnBelizeable taste; I'm lovin' tilapia"

By Dottie Feucht

Almost two years after the first shovel of dirt was ceremoniously turned over at the ground-breaking ceremony for the Tilapia Hatchery Centre in Cayo, the grand opening was held on May 20th with over 100 people in attendance. Dignitaries included Deputy Prime Minister and Minister of Natural Resources and Agriculture (MNRA) Hon. Gaspar Vega, Ambassador of R.O.C. (Taiwan) Mr. Benjamin Ho, MNRA Director of Extension Mr. Belarmino Esquivel, extension officers from the other districts and Taiwan Technical Mission (TTM) project personnel. With funding from the Taiwan International Cooperation Development Fund (ICDF), the project is to remain under development and management by TTM until February 2017 at which time it will be turned over to Belize. TTM project manager is Mr. Luis Jou and MNRA project coordinator is Mr. Miguel Sosa.

Ambassador Ho

The primary objectives stated at the ground-breaking ceremony included producing one million high quality tilapia fingerlings to assist the development of small-scale tilapia farming operations in Belize. Although the 16 earthen ponds, 16 fingerlings concrete tanks and 12 nursery concrete tanks built at the hatchery over the past two years can handle 700,000 fingerlings, this first year production was 400,000, 80 – 90% of which are being sold to farmers. The farmers in attendance were able to see the fingerlings as part of the tour of the facility. For "back yard" farming a farmer needs approximately 300 fingerlings; however, small-scale farmers who plan to sell and make a profit need about 3,000 fingerlings. The recommended and less expensive habitat for the production of tilapia is natural earthen ponds in which soil content is 30-50% clay to prevent water filtration. If there is no other option to retain water, the solution is the utilization of plastic liners as the hatchery has done. It is not recommended to raise tilapia in fenced off creeks because during heavy rain falls tilapia can escape. The mortality rate of fingerlings can be as high as 25 - 30% due to easy preying (dragonfly larvae, carnivorous fish, birds, turtles, small crocodiles) and stress related to sampling, etc. Farmers who are interested in raising tilapia can receive training in proper pond management, water quality, fish sampling, feed and nutrition and record keeping. Training is being conducted at the different districts as well as in the hatchery facility. One training session is scheduled every three months to cover the 6 districts in Belize.

Another objective stated at the ground-breaking ceremony was to reduce the cost of commercial feed with the use of locally-sourced ingredients. TTM personnel are working on developing good quality feed with vitamins, minerals and local ingredients such as corn, soybeans, rice bran and meatmeal (meat, bones, etc. from chicken or cattle) to meet specifications of 55% protein, 9.5% fat, 20% ash, 8% calcium, 4% phosphorus. In the meantime floating feed (small particles of high protein content) can be purchased from Alianza (Guatemala) through Recinos Imports in San Ignacio and Alcon (Honduras) through Femagrain Belmopan.

One of the reasons for establishing a tilapia hatchery center was to provide a low cost source of meat protein to supplement the Belizean rural family diet. An adult tilapia can reach up to 24 inches in length and 9.5 pounds, 92.7% of which is protein when cooked with dry heat. The white-fleshed fish has a mild flavour and taste and combines well with Belizean spices. Its culinary versatility provides a number of ways to cook and serve: BBQ, deep fried, cooked with orange juice, made into tacos with corn salsa, stewed, or soup with coconut milk, plantain and vegetables. The Hatchery Centre has prepared a cook book for those who are new to tilapia. Stop in to see the hatchery and pick one up. The Hatchery Centre is located on Baking Pot Road near the ferry between Spanish Lookout and Central Farm on the banks of the Belize River.

Over 80 nations currently produce farm-raised tilapia. Soon Belize will be a part of them.

Growing Jackfruit in Belize

By Marc Ellenby, Tropical Agro-Forestry

Considering that the giant ripe fruits of the jackfruit tree range in size from 10 pounds to more than 70 pounds, this is one of the largest tree fruits on the planet. A large family or a small village may feast on a fruit of this enormous size!

Jackfruit trees are reasonably well adapted to Belize growing conditions. They thrive in Belize's rainy wet season, but they are stressed and may defoliate in the dry season months. Over the years, we have introduced many seedling varieties of jackfruit, scientific name *Artocarpus heterophyllus*, family Moraceae, to our farm on Spanish Creek in the Belize District. This tree is closely related to the tropical breadfruit, *Artocarpus altilis*.

Jackfruit is native to India and Malaysia and other areas of Southeast Asia in lowland tropical forests. The fruit has been carried by man throughout the tropics; it was introduced into Jamaica in 1783 and is commonly grown there, and its seeds have been planted throughout the tropical Americas.

Tropical Agro-Forestry, Ltd. is always in search of new fruit varieties for the forest edges and cultivated areas. The Belize Agricultural Health Authority (BAHA) determined that the introduction of jackfruit seed would pose no risk to other crops in Belize. Jackfruit plants from fresh seed sourced in Florida were planted in our nursery in grow bags of native soil amended with rice hulls and composted wood sawdust. The seedlings are fast growers with a deep taproot that is orange in color, resembling a carrot. Therefore, a deep grow bag and careful planting in the field helped to establish the young jackfruit trees when planted in 2006. Alongside the tropical clumping bamboo plantings, our agro-forestry project now includes jackfruit seedlings that are large, productive trees.

The trees planted in the field are vigorous growers and the seedling trees are very precocious, meaning that they will flower and begin bearing fruits from a young age. Both male and female flowers are on the same tree, and pollination is assured by wind and by insects of many kinds. As the tree grows rapidly in size, it is easily pruned for tree height control and for a good selection of sturdy horizontal limbs. Our experience is that a larger tree produces larger and better-quality fruits, and a weaker and average size jackfruit tree limb produces smaller- to- medium-sized fruits.

Mature jackfruits exhibit a yellowish color break as the sections, or eyes, seem to spread open. Fruits may be "thumped" like a watermelon and a deep sound may indicate maturity on the tree. The fruit ripens and softens at room temperature 3-9 days after harvest. Ripe fruit emits a sweet aroma and tastes similar to a melon-pineapple-banana blend. The edible interior portion consists of large "bulbs" of sweet, crunchy fruit around large, smooth seeds. Some varieties have a soft and mushy fruit texture, but very sweet, yet the more crunchy fruit varieties are preferred by most consumers. The large, edible seeds may be boiled or roasted; they are both starchy and delicious.

Jackfruits may also begin ripening on the tree – much to the delight of the many coatimundis (quash) often observed feasting on the fruits. Our lambs are also quite fond of the fruits, and our small group of eight devour a ripe fruit quickly and in an entertaining manner. However, we have found few local markets for the fruit, as it not yet a well-known local Belizean fruit. As sustainability remains important on our farm, we will continue to explore new outlets and value-added products for our delicious jackfruits. We are now considering dehydrating the bulbs as an organically produced export product from Belize, and perhaps parboiling the seeds and vacuum sealing them.

Try this special fruit the next time you come across one, and be sure to plant the seeds (or boil and eat them)!

Editor's Note: On Spanish Creek Rainforest Reserve's website, www.BelizeAbility.com, you will find a video where you can meet their staff, including Belize Ag Report contributor Marc Ellerby.

Cassava Value Chain Participants

By Teresita Balan

MNRA Research and Development Officer

From May 10 to 15, 2015 Ms. Patricia Biermayr-Jenzano, a consultant for the Food and Agriculture Organization of the United Nations (FAO), visited Belize to conduct a survey on participants in the cassava value chain, focusing on the processing and marketing aspects. The objective of the survey was to understand the informal food systems, determine men's/women's participation and needs along the value chain, the main points of entry, road blocks and best practices to support women/men entrepreneurs and also to determine whether food safety guidelines are followed, highlighting the importance of safeguarding public health.

The survey was conducted as a series of visits to households, farms, women's groups, processors and local markets, meetings with public and private stakeholders and a workshop where findings were shared with invited guests. Public and private stakeholders that participated in the survey were the District Agriculture and Cooperative Department, Ministry of Health Belize and Belmopan, Institute for Technical and Vocational Education and Training (ITVET), Young Women's Christian Association (YWCA), farmers, women's groups, processors, Belize AgReport, the National Garifuna Council, Agriculture Research Unit and senior technical staff from the Ministry of Natural Resources and Agriculture.

The survey findings showed that 1. Most of the people interviewed belong to informal groups (not registered as cooperatives) of producers and processors. 2. Cassava is produced as a subsistent crop in very small plots (one acre or less and backyard production) with one exception: Sabal's Farm with 16 acres in Stann Creek District. 3. Cassava processing is time consuming and this responsibility falls on women's shoulders. 4. There is a lack of access to improved technologies and industrial equipment; processing is mainly manual and homemade. Few exceptions are ITVET and YWCA for cooking and selling; SABAL's and Basto's for processing. 5. There are few credit options for small producers (men and women) and no access to micro-credit or financial services. 6. There is a lack of access to extension services; that is, training needs are not satisfied in financial literacy and marketing strategies. 7. There is irregular enforcement of health regulations including permits and health cards for food handlers. 8. Cassava nutritional standards (nutritional contents) and labeling are not enforced. 9. There is a lack of communication among relevant government bodies: Ministries of Agriculture, Health and Social Services to work closely, supporting rules and regulations related to informal food production, processing and marketing. 10. Cassava is considered ***"poor people's food"*** and there is a misperception that its consumption is restricted to cultural ethnic groups, such as the Garinagu people. 11. Cassava products have a potential to substitute other commodities if marketed and adopted through food networks, tourist fairs and events (festivals, etc.) 12. Cassava is a good source for animal feed and it's under-utilized at present.

Continued on page 42

Cassava Baseline Survey August 2015

The Research Unit of MNRA at Central Farm requests Cassava Farmers and Producers to register with MNRA to facilitate information sharing within the industry.

Kindly fill in form and mail to Agriculture Research Unit, Central Farm, Cayo District, or to submit online, email teresita.balan@agriculture.gov.bz and request digital survey form.

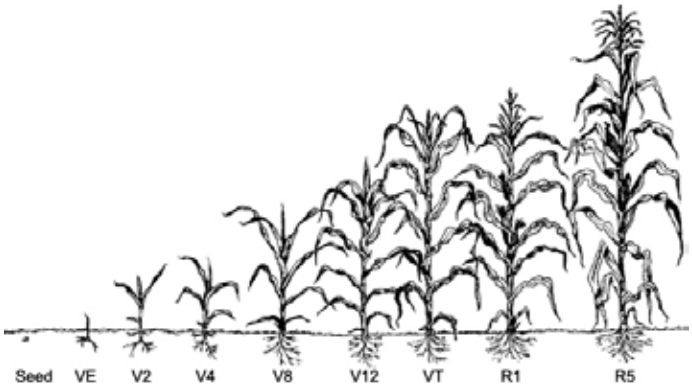
Name:	**Age Group :**	**Gender:**
	18-25 ( ) 26-35 ( ) 36-45 ( ) 46-55 ( ) 56-65 ( ) Over 65 ( )	Male ( ) Female ( )
Home Address :	**District:**	
Farm Address:	**District:**	
Telephone:	**Email:**	
Are you a farmer? ( )No ( )Yes		
Farmer Group Affiliation: ( ) No ( ) Yes, state name of group?		
How long have you been planting cassava?	( ) less than a year ( ) 1-3 yrs ( ) 4-6 yrs ( ) 7-10 yrs ( ) 10-15 ( ) over 15 yrs	
Number of acres available? (< less than)	( ) <2 ( ) 2-4 ( ) 5-6 ( ) 7-8 ( ) 9-10	
What varieties of cassava do you grow? 1. 2. 3. 4. 5. 6.		
Do you produce cassava for home consumption only? ( ) No ( ) Yes **Do you produce cassava for home consumption and the market?** ( ) No ( ) Yes		
Do you process cassava? ( ) No ( ) Yes		
What products do you sell? ( ) Fresh cassava ( ) Grated cassava ( ) Cassava Flour ( ) Chips ( ) Pudding ( )Starch ( ) Farina ( ) Cassava Bread ( ) Porridge **Other-specify:** _____		
Where do you sell fresh cassava or products? ( ) Informal market (street food) ( ) Local Market ( ) Shops ( ) Restaurant ( ) Community ( ) Gas Station **Other-specify:** _____		
Do you plan to grow cassava? ( ) No ( ) Yes		
Do you plan to process cassava? ( ) No ( ) Yes		

The Public is asked to contribute cassava recipes for use in the *Caribbean Cassava Recipe Book*. Kindly mail to Ms. Teresita Balan, Agriculture Research Unit, Central Farm, Cayo District or e mail to teresita.balan@agriculture.gov.bz

Please send your recipes soon! Thank you.

Corn Growth Stages

This identification system divides plant development into vegetative (V) and reproductive (R) stages. The (V) stages are designated numerically as V1, V2, V3, etc. through V(n) where (n) represents the number of leaves with visible collars. The first and last (V) stages are designated as VE (emergence) and VT (tasseling). The six reproductive stages are simply designated numerically.



Vegetative and Reproductive Stages

Each leaf stage is defined according to the uppermost leaf whose leaf collar is visible. Loss of the lower leaves will begin about V6 due to increased stalk size and nodal root growth. To determine the proper leaf stage after lower leaf loss, split the stalk lengthwise and inspect for internode elongation. The first node above the first elongated internode is generally the fifth leaf node. This fifth leaf node can be used as a reference point for counting the top leaf collar.

Vegetative Stages	
Stage	Description
VE	Emergence
V1	One leaf with collar visible
V2	Two leaves with collars visible
V(n)	(n) leaves with collars visible
VT	Last branch of tassel is completely visible

Reproductive Stages	
Stage	Description
R1	Silking - silks visible outside the husks
R2	Blister - kernels are white and resemble a blister in shape
R3	Milk - kernels are yellow on the outside with a milky inner fluid
R4	Dough - milky inner fluid thickens to a pasty consistency
R5	Dent - nearly all kernels are denting
R6	Physiological maturity - the black abscission layer has formed

"How A Corn Plant Develops", Special Report No. 48, Iowa State University, Reprinted February, 1996.

And found on Purdue University's website http://extension.entm.purdue.edu/fieldcropsipm/corn-stages.php

Adaptation of Soybeans to Belize

By Anil Sinha, Belize CARDI Country Representative

Soybeans, a major crop in Belize, come in hundreds of varieties. In 1983 the Caribbean Agricultural Research and Development Institute (CARDI) began to evaluate a large number of soybean varieties in Belize. Seed samples of those varieties were acquired from international centres where the seeds were produced by using traditional breeding procedures. We were able to select a few varieties which were adaptable to Belize (not genetically modified and also not hybrid). CARDI released a number of varieties based on evaluation in Belize and produced annually a limited amount of seeds of those selected varieties.

The major factor of adaptability was the amount of daylight in Belize. The soybean is sensitive to day-length (photo period). Belize has shorter days even when we plant in June compared to large producing areas of the US and Canada. Soybean varieties selected for longer day-length conditions would grow shorter in Belize environmental conditions; this means that the plants tend to begin producing flowers earlier and plants remain shorter due to shorter day-length. In November/December the day-length is shorter than June/July in Belize. There are differences in growth of soybean varieties planted in June/July and November/December. Normally the growth of soybeans is longer and taller when planted in June/July compared to those planted in November/December.

Forests and Agriculture for Human Well-being

By Tanya Santos

At approximately 60% intact forest, Belize has the highest rate of forest cover in Central America. Forty percent of these forests are protected under the National Protected Areas System (NPAS) (Cherrington, 2014). As a biodiversity hotspot, these forests provide habitat for over 100 globally-threatened species, including 4 critically endangered, 21 endangered and 30 vulnerable terrestrial species. With about half of the population residing in rural areas, many Belizeans depend on forests for livelihoods, including the provision of food such as game meat and freshwater fish, timber for housing and shelter and firewood for cooking. The forests' contribution to GDP and national development often go unnoticed.

Apart from important ecosystem services such as climate regulation, protection from flooding and pests and disease mitigation, our national forests also provide a lifeline for human well-being: water. The Maya Mountains Massif, one of the country's Key Biodiversity Areas (KBA) with intact forests, contains 14 watersheds which provide water to over 128 communities in Belize (including 18% of Belize's population along the Belize River watershed) and more than 180 communities in Guatemala, resulting in over 300 communities that depend on the forests of the Maya Mountains for water. The value of hydroelectric power generated from the Chalillo Dam system and the Hydro Maya combined, has been estimated at BZ$17.5 million per year, based on 2008 figures. Potable water has been estimated at between BZ$0.6 and BZ$4.6 million, and, like the supply of electricity from the dam systems, is highly dependent on the maintenance of forest cover.

The Statistical Institute of Belize estimates that in 2013 the GDP contribution of growing crops/horticulture and livestock farming was BZ$196.6 million and BZ$44.8 million, respectively. It can be concluded therefore, that in 2013 the forests of Belize provided a consistent supply of water to the agriculture industry, resulting in BZ$241 million contribution to GDP that year, a demonstration that forests play a complementary role alongside conventional agriculture. Manufacturing of food products and beverages activity in 2013 was BZ$128.7 million, while electricity and water supply were BZ$127.4 million. The consistent provision of uncontaminated water is essential to maintaining these industries. Although the service of water provision from forests is not accounted for directly in GDP, is evident in the industries that it supports.

As a best practice, the maintenance of forest cover on steep slopes provides protection against erosion and reduces the potential of landslides. Forest cover on steep slopes in Belize is largely responsible for the limited number of catastrophic landslides such as those experienced by neighbouring countries during tropical storms. Likewise, riparian buffers in agriculture areas provide erosion control and filter against agrochemical contamination from runoff. Upstream erosion of cleared riparian forests and riverbanks can adversely affect downstream bridges and roads. This was observed in 2008 when intense rainfall from Tropical Depression 16 resulted in flooding of the Sittee River which moved massive loads of forest debris. The force of the flood waters pushing forest debris against the Kendall Bridge was sufficient to wash the bridge away. In addition to the tragic loss of human lives was significant economic loss, including the cost of replacement of the bridge. The loss highlights the importance of maintaining riparian forests that have the capacity to attenuate the force of flood waters, protecting lives, economic interests and livelihoods downstream.

Today there is increasing global recognition of the links between forests and conventional agriculture. The most evident link is the provision of water, but other important services that forests provide to agriculture include pollinators and climate mitigation, where large scale crops are vulnerable to extreme weather events. The integrated landscape management approach offers options to implement best land use practices based on the multi-functional nature of the broader landscape. A recently published report,*Forests, Trees and Landscapes for Food Security and Nutrition, IUFRO, 2015* of the International Union of Forest Research Organizations (IUFRO), makes the case for "...thinking more about the landscape as an integrated production system rather than the current and conventional view that often places agriculture and forestry in opposition to each other." As the Belizean population continues to grow in the face of inevitable climate change, the importance of food security cannot be overemphasized. It is then necessary to consider the integrated landscape management approach in which the entire productive landscape is covered in recognition of the strong links between agriculture, forest ecosystem services and human well-being.

Editor's Note: Tanya Santos Neal holds a BSc. in Watershed Science from Colorado State University and a MSc. In Environmental Socio-economics from Centro Agronomico Tropical de Investigacion y Ensenanza e Investigacion (CATIE). She has over 15 years of experience in forestry and protected areas management, having worked in various capacities at the Belize Forest Department. Her passion is to improve the governance and management of natural resources in Belize in order to ensure the long term environmental, social and economic benefits to all Belizeans.

Coconut Production and Market Opportunities

Formation of Stakeholders Platform Committee

Since the 1980's there has been a decline in coconut production worldwide including Belize, due mainly to the loss of international market resulting from the promotion of negative health impacts and problems from pests and diseases. However, the market situation has changed in recent years. Coconut and its derivatives are now regarded as being beneficial to human health and wellness. Between 2008 and 2014, there was a 700% increase in world demand for coconut products, especially green coconut water, milk, cold-pressed virgin oil, fibers and cosmetics. Belize and the other CARIFORUM countries are keen to meet some of those market demands.

The European Union (EU) has contracted the International Trade Centre (ITC) to oversee the implementation of a 4 year, 3.5 Million Euro project for increasing coconut production in the CARIFORUM countries of Belize, Dominica, Dominican Republic, Guyana, Jamaica, St. Lucia, St. Vincent & the Grenadines, Suriname and Trinidad & Tobago. Caribbean Agricultural Research and Development Institute (CARDI) is partnering with ITC in these efforts. CARDI is especially responsible for the agricultural productivity component of the project. One of the first phases of the project was to engage with national stakeholders to develop market-led strategies for products and agree on implementation plans. To achieve this CARDI and ITC hosted value chain development workshops in the various project countries including Belize. Mr. Ian Sayers, Head Product Sector Development, of the ITC traveled from Geneva, Switzerland to oversee and facilitate discussions on the targeted revival and expansion of Belize's coconut industry, assisted by Mr. Maurice Wilson, Head Resource Mobilisation Unit from CARDI's head office and Dr. Compton Paul, Coordinator of the CARDI/ITC Coconut Program.

The attendees at the consultation held in late May, 2015, vigorously voiced their opinions and concerns, which were recorded on wall charts, aimed at exposing the known and anticipated strengths, weaknesses, risks, needs and directions of producers and processors of both current and future coconut industries. With the professional facilitation of ITC and CARDI, the giant charts slowly fleshed out and appeared on the walls of the George Price Centre venue to give participants a comprehensive snap-shot of the coconut value chain from markets to supply. Broad participation of the private sector, government of Belize (GOB), various non-government organizations (NGOs) and statutory bodies at this critical planning stage, will ensure that the actions and decisions for policies, priorities and strategies will be tailored to specifically suit Belize's directions and needs.

Every district in Belize has coconut producers and processors, and the opportunities in this sector are large for both domestic and export products. A coconut growers and processors association is expected to be formed shortly. Tasks for that association will likely include identifying current coconut farmers/processors and setting up a communications framework, encouraging new farmers and processors to join the sector, identifying and locating financing, transmitting market intelligence and business model information, extension assistance in partnership with the Ministry of Natural Resources and Agriculture (MNRA) in identification and selection of commercial coconut varieties, nursery standard setting and expansion and training in many areas including commercial agronomic practices, changes to working practices and processing for value-added products, marketing and lobbying for supportive GOB policies.

The 50 participants at the stakeholders workshop selected people to join a Coconut Industry National Development Platform (CINDP), which will coordinate and communicate with farmers, value added enterprises, support services, NGOs and GOB. Mr. Anil Sinha of CARDI will serve as the focal point for the project and serve as the liaison between the MNRA and CINDP. Elected members of CINDP include: Mr. Eden Pop, Mr. Manuel Trujillo, Mr. Simon Willacey, Mr. Lester Muralles Cabral, Mr. Jose Trejo, Mr. Gabriel Flores, Mr. Victor Castillo, Mrs. Elsie Ellis, Mrs. Beth Roberson, Dr. Dowlat Budhram, Mr. Efrain Rejoni, Mrs. Dona Dougall Sosa, Mr. John Rivero and Mr. Francisco Gutierrez.

ITC will coordinate the sector development priority activities mentioned above with the platform, starting with association-building, market intelligence and an integrated database/Internet and mobile applications tool to improve communications with rural coconut farmers and processors. The platform will also join a network of industry development platforms from the other 8 coconut countries of the project to share in the sector development information and experiences.

For more information, contact:

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

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

Red Ring Disease in Coconuts

By Wiley Forrest Tackitt, Entomologist

Coconuts are not just for shipwrecked island survivors anymore. In the past five years, world demand for coconuts and coconut products has increased over 800%. Recent interest from the European Union to invest large amounts of grant money to help increase production to meet the world's increasing demand provides Belize with a great opportunity to expand its growing capacity and export what already grows naturally. Plans for a growers and processors association are already in the works, and one of the top priorities will be education about the world's most destructive wilt disease in coconuts: Red Ring disease.

Red Ring disease is caused by the tiny Red Ring nematode (Bursaphelenchus cocophilus), first described on coconut palms in 1905. The vector of this nematode is the palm weevil (Rynchophorus palmarum), in whose gut the nematode resides until transmitted by feeding. The nematode causes serious damage to palms, which are stunted and eventually killed by nematode infection.

The host range of this disease is confined to family Palmae, where nematodes are known to affect 17 species and cause up to a staggering 80% loss, although 15-20% annual loss is more the norm. The two most economic species affected are the coconut palm (Cocos nucifera) and African oil palm (Elaeis guinesis). The host range of the disease is from Mexico to Central and South America and some Caribbean countries.

The first clear internal symptom in coconut palms appears in the transverse section: a **discrete brick to brownish-red ring** that is 2-6 cm (.8 – 2.4 inches) wide and 2-6 cm within the stem periphery beginning 2-3 weeks post –inoculation. The first external symptom occurs at about 4 weeks post-inoculation and includes leaf yellowing in the older leaves and premature death in the oldest leaf. Yellowing of leaves usually starts at the tips of the pinnae and moves inward to the rachis and then to the base of the petiole. Several of the dying or dead leaves will often break close to the petiole and remain hanging from the stem. The onset usually beginning in palms 2-5 years of age.

In C. nucifera the disease can be confirmed by examining stem tissue extracted with a coring device for evidence of discoloured tissue or nematodes. Any palm showing evidence of Red Ring disease must be destroyed, but palms with heavy infestation of weevils should be cut, sectioned and treated with an insecticide such as Methomyl, Trichlorfon, Carbofuran or any insecticide properly labelled for weevil control.

The most effective method of control is phytosanitation. This strategy is directed at reducing the vector population by removal and destruction of infected plant material which could harbour future generations of weevils.

BAHA Plant Protection reports that weevil vectors are present in Belize, and do considerable damage during feeding activity, but signs and symptoms of Red Ring disease have not been observed. Lethal Yellow is still the major disease concern of coconut palms in our region, and the practice of importing new plants from registered nurseries in Mexico helps to control disease in our country. With increase cultivation of coconuts throughout Belize, BAHA has plans to develop programs to educate farmers on the symptoms of Red Ring disease, monitoring practices and management practices. Mass trapping with traps baited with sugarcane or synthetic aggregation pheromones, will reduce the number of palm weevils and help monitor and prevent future outbreaks.

Comments and questions to: forrestbugmaster@yahoo.com

For more information about Forrest Tackitt see pg 5.

Pro-Organic Belize and the San Antonio Cayo Organic Growers Association = Fresh Organic Produce for the Cayo

By Mary Susan Loan

Pro-Organic Belize (POB), a group of persons committed to sourcing healthy food in the Cayo district in Belize, have joined together with the San Antonio Cayo Organic Growers Association (SACOGA) to form a successful buyers and organic growers organization. A transitional organic three-year contract has been signed by POB and SACOGA.

Each week a list of available produce is sent to the list of customers. Once orders are received, produce is packaged and delivered to the San Ignacio Saturday open air market for customers to pick-up from 7:30 – 10:30 am. Produce from the weekly harvest is also available for sale from the SACOGA booth. The customer base is 50 and growing with orders from around Belize. A popular addition to the weekly produce is the addition of freshly grown organic sprouts. Despite a spate of bad weather the farmers are rallying to keep their customers satisfied with organically grown produce.

POB is introducing a labelling system with the San Ignacio market vendors to help buyers know which produce is imported with agro-chemicals, grown in Belize or grown in Belize organically.

POB and SACOGA had a booth at the National Agriculture and Trade Show in early May which featured some cassava and chaya sticks to plant, produce, kombucha made by POB members and literature about Pro-Organic Belize and latest negative findings about glyphosate.

Abdias Mesh, coordinator of SACOGA, attended a three day soil fertility workshop, led by soil expert Neal Kinsey from May 11-13 at Central Farm. The SACOGA is working on an improved compost system to help grow familiar and new varieties of crops.

Pro-Organic Belize has initiated a campaign to provide assistance to help the SACOGA rebuild a greenhouse which was destroyed by the recent storms and to build an improved system of compost. Donations are welcome and can be made at the market.

POB and a representative from SACOGA meet on the first Tuesday of each month at 2:00 pm at Maya Mountain Lodge outside Santa Elena. All are welcome to attend. Please e-mail pro-organicbelize@gmail.com for more information. Pro-Organic Belize is also on Facebook. To order produce from the San Antonio Cayo Organic Growers Association, please see details in the advertisement on this page.

Maya Forest Garden
Agave

By Dr. Anabel Ford

What may look like a wild jungle is really a welcoming garden, one made by the ancient Maya. Maya gardeners chose and tend plants that are useful. Their forest gardens are a 2,000-year-old gift, but a living gift that we must care for, use and learn about, and share. I have worked with traditional Maya forest gardeners over the past four decades and will share a story of plants of the Maya forest garden.

This article on the Henequen (*Agave fourcroydes)* is the first of a planned series of articles on Maya forest plants. The Maya relied heavily, both directly and indirectly, on plants and trees of the bush - for food, water, medicine, tools, cultural rituals, and clothing. The Henequen, also spelled Henequin and Heniquen, is a native cactus of the Maya forest here in Belize as well as Mexico and Guatemala. It can be found among monocot shrubs (leaves with parallel veins and flowers arranged in threes). It is reportedly naturalized in Italy, Canary Islands, Costa Rica, Cuba, Hispaniola, Cayman Islands and the Lesser Antilles. The Henequen leaves yield a fiber which was used by the Maya for producing rope, handbags, gunny sacks, hammocks, and other useful products that are completely biodegradable.

Do you have a relative who came to Belize because of the Caste War? The Maya who did not escape to Quintana Roo and Belize after the Caste Wars were conscripted to work on the henequen plantations that grew to meet the enormous demand for ropes for ship riggings. Only after World War II, when synthetics came to replace the natural sisal fiber, were the Yucatan haciendas put out of business. However, Henequen is still grown in eastern Mexico; among the products from the cactus is Licor del Henequen, a traditional Mexican alcoholic drink. The Henequen is still used to make rope but makes a beautiful ornamental plant as well.

Continued to page 39

Agave...Continued from page 38

The sword-shaped leaves of the Henequen are in the form of a rosette, a circular arrangement with all the leaves at a similar height 1.2 to 1.8 meters (3.9 to 5.9 feet) long; they growing out of a thick stem, resembling a pineapple, that may reach 1.7 meters (5.6 feet). The leaves have regularly spaced teeth .3–.6 cm. (.11 - .24 inches) long, and a terminal spine 2–3 cm (.79 – 1.2 inches) long. The Henequen is a sterile hybrid; that is, the plant does not produce seeds. It produces bulbils (small bulbs) that may be planted but commercial growers prefer the use of suckers which develop more quickly.

This article is extracted from the plant coloring book *The Maya Forest Garden of El Pilar* available at the Belize Zoo.

FARMER?
CONSUMER?
GMO Impacts YOU!

You owe it to yourself to look at the evidence.

You Tube: Web sites:

The World According to Monsanto; responsibletechnology.org

Seeds of Death; A Silent Forest; thefutureoffood.com

GMO Poison: Ticking Time Bomb; nongmoproject.org

Cracking the GMO Code -wrm.org.uy

Dr. Russell Blaylock, amazinghealth.com

Back to Eden; GMO Sophie Co RT

Comments to: paulrev1118@yahoo.com

National Agriculture Trade Show 2015

By Mary Susan Loan

The fairgrounds in Belmopan came alive from May 1st to 3rd with over 40,000 attendees at the National Agriculture and Trade Show (NATS), the single largest event in Belize.

The main objective of NATS is to educate the public on the importance of agriculture and its contribution to the Belizean economy and food security. It is an annual event sponsored by the National Agriculture and Trade Show staff in collaboration with the Ministry of Natural Resources and Agriculture (MNRA).

The first NATS fair was held in 1937, and has steadily grown since. Starting in 1970 the annual event has been held in Belmopan. The venue now covers over sixty acres. The theme of the 2015 NATS fair was "Stimulating prosperity in agriculture and food production through renewed public-private partnership." The 2015 NATS fair was expanded to include participants from other countries in Central America who were invited to attend and become involved.

The 2015 NATS fair offered free admission for all on the opening day, Friday, May 1st.

Each year awards are given to the best farmers of the year. The 2015 awards went to Esmeralda Escobar, the best woman farmer; Din Tzib, the best junior farmer; and Jose Uk, the best senior farmer.

The NATS fair has hundreds of exhibits, music, rides and food; it is divided into sections for those seeking rides and a party atmosphere or those preferring the agriculture exhibits and events. There is always something for everyone to enjoy at the NATS fair.

AG BRIEFS

Joe L Friesen Brahman Breeding Stock Auction, will be held on Sept 5, 2015 at Joe Friesen Jr's Iguana Creek Farm. For details see ad on pg 17.

Sustainable Harvest International (SHI) will hold their Annual Organic Fair on Friday Oct 30 and Saturday 31, 2015. For further information contact SHI as per their advertisement on pg 37.

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

The College of Agriculture of the University of Belize at Central Farm will again host the 3 day **Soil Fertility Course with lecturer Neal Kinsey** on Feb 8, 9 & 10 of 2016. A Row Crop Feld Day will additionally be held on Feb 11th. For details see pg 16.

BAHA has begun enforcement of the livestock movement/quarantine laws which came into effect with the cattle sweep. In early July a truck/trailer from the north heading to a slaughter facility was checked and held for breaking quarantine and improper paperwork. Fines and fees exceeded $4,000. and the 26 head of livestock were put into quarantine at Central Farm for retesting.

In May of this year Belize received **a new country representative for Inter-American Institute for Cooperation on Agriculture (IICA) for a 2 year term. Dr. Dowlat Budhram**, a native of Guyana, who studied in Guyana, the UK and the USA, has held various positions for IICA over the past 27 years. He is no stranger to Belize and its agricultural sector as his first trip to Belize was in 1993 when Belize became a member country of IICA and he has been visiting the country ever since about 3 or 4 times per year to work on specific projects and special missions. He coordinated the first IICA mission to Belize in 1993 and assisted in the establishment of the IICA office in Belize in 1995. He also worked on the design of the Belize Agricultural Health Authority (BAHA) along with an Inter-American Development Bank(IDB) mission, and has been active in Belize's sugar industry (review of legislation and design of the AMS program) and the institutional strengthening project of the Sugar Industry Research and Development Institute (SIRDI), both of which were funded by the EU.

Pending USA legislation: Rep Mike Pompeo, sponsored House Bill # 1599 of 114th Congress, 2015-2016, Safe and Accurate Food Labeling Act of 2015, which has passed the US House and awaits Senate vote (https://www.congress.gov/bill/114th-congress/house-bill/1599/). "This bill pre-empts state and local restrictions on GMOs or GMO food, non-GMO food, or 'natural food'." If this bill is passed into law, it would void all existing and pending state and county laws/legislation dealing with GMO labeling and GMO growing restrictions, effectively removing all control of GMO and food labeling in the USA from the states and delivering that power to the US Federal Govt.

Plant-e, a spin-off company from the Department of Environmental Technology of Wageningen University of the Netherlands, has **found a way to harness electricity from living plants**, using them to power Wi-Fi hotspots, cell phone chargers, streetlights and even the company's headquarters. Patented by Wageningen in 2007, Plant-e's plant microbial fuel cell technology is based on natural processes and safe for both the plant and the environment. The bio-solar cell can be used anywhere plants can grow and enough water is available. The plants transform solar energy into organic matter which is transformed into electricity by electrochemically active bacteria in the fuel cell. It is anticipated that the prototype will evolve into a commercial system in 2016. 100 square meters of "garden" is enough to generate up to 2800 kW per year.

For Information on the status of the

IGUANA CREEK BRIDGE

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

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

Local and Regional Fuel Prices

	Cayo, Belize	Quintana Roo, Mexico	Peten, Guatemala
REGULAR	↑ $9.25 Bz/Gal	↑ $7.13 Bz/Gal	↑ $8.78 Bz/Gal
PREMIUM	↑ $10.27 Bz/Gal	↑ $7.56 Bz/Gal	↑ $9.08 Bz/Gal
DIESEL	↓ $7.24 Bz/Gal	↑ $7.47 Bz/Gal	↑ $7.33 Bz/Gal

AG BRIEFS

Water Facts: Aquifers fill up from rains and snowmelt. Worldwide, in normal weather, people source an average of 35% of their water from underground aquifers. In California now aquifers are now supplying 60%, and some predict it may rise to 100% there by the end of 2015.

NASA scientists believe that 21 of the world's 37 largest aquifers have 'passed their sustainability tipping points', and 13 are classified into their 'most troubled' category.

NASA charted reservoir levels between 2003 to 2013, by calculating the "changes in the earth's gravitational pull" as areas with "heavier weight of water exerted a greater pull on the orbiting spacecraft". Jay Famiglietti, senior water scientist at NASA's Jet Propulsion Laboratory states that "the water table is dropping all over the world. There's not an infinite supply of water."

A Japanese study in 2012 found that up to 40% of agriculturally used water does not filter back down to aquifers; rather their theory is that this 40% either evaporates or travels via rivers to reach the sea. They believe that is one of the causes for rising seas.

70% of world's fresh water is used for agriculture.

Belize is thought to have the highest per capita fresh water reserves in Central America. Two-thirds of Central America's people live on the west side of the Central American divide, while 2/3rds of the water are on the east side.

Southern Mexico expands pitaya production: In 2014 approximately 800 hectares in Quintana Roo produced nearly 400 tons of pitaya. A company in Yucatan purchased almost the entire crop for export. The Ministry of Agricultural and Rural Development (SEDARU) anticipates that by mid-September, there will be over 1,000 hectares in Q.R. in pitaya production. Higher production volumes will improve marketing and create higher profits for the farmers.

ACRE: The word "acre" originally meant a field - any field. But in the reign of Edward I of England an exact definition was set as the amount of land a team of oxen could plow in a day: 40 poles long by 4 broad, or 2824 square yards.

Notice: *The Belize Ag Report* invites the ag sector to submit information about agricultural events which are open to members of the agricultural sector and/or the public. This information will be shared in our printed quarterly issues if received in time and on our new website calendar, at no charge. Contact details on pg 4.

PRESS RELEASE

Mediterranean Fruit Fly Detected in Southern Belize

Belmopan. 21st July, 2015. The Belize Agricultural Health Authority (BAHA) hereby informs the public, especially in Southern Belize, that the Mediterranean Fruit Fly (or Medfly) has been detected in the village of Hopkins in the Stann Creek District and in the Sapodilla Cayes in the Toledo District. As a result of these detections, eradication activities such as fruit stripping, ground spraying, and delimitation trapping are underway in these areas. These activities are important to ensure that the outbreak is contained and that the Medflies are eradicated quickly.

BAHA reminds the public that Belize is the only country in the region that is free of this pest and it is only when infested Medfly hosts, such as fruits and vegetables, are brought into Belize illegally that this pest is introduced. The Medfly is a very devastating pest and Belize could lose its export markets if the Medlfy becomes established and spreads into areas that are producing fruit for export. In addition, the Medfly also causes loss to small entrepreneurs who are unable to sell their fruits such as mango, craboo or guavas locally when areas are placed under quarantine restrictions. It also deprives the population in infested areas from consuming fresh fruits that is a valuable source of nutrition.

BAHA is asking all Belizeans and visitors to respect the law and ensure that fruits or vegetables that are brought into Belize are done so with a valid BAHA import permit.

Help us to maintain Belize Medfly free!!

End.

Cassava...Continued from page 33

Gender Gaps:

1. Low level of association (few women's groups/ cooperatives vs. more established men's associations)
2. Processing workload mostly by women
3. Lack of access to credit by women
4. Lack of access to services (transportation/processing facilities)
5. Lack of technology or devices adapted to women's needs (important for saving time and enhancing productivity).
6. Minimal attendance at training events by women because of conflicting time schedules
7. Less revenue for women than for men because women lack mobility and sell locally (community/village level) while men sell across districts and in open markets
8. Women's earnings from the sale of processed foods invested in family nutrition, health and children's education; men's earnings invested (mostly) in new machinery, transportation/ cars and electronic devices

Final recommendations and actions for Belize: 1. There is a need to develop or adapt technology for producing cassava products for fresh consumption, processed food products, and animal feed. Cassava is presently known only by local names. Sweet varieties are very limited and should be the only variety used for human consumption. Bitter cassava has a high cyanide content and very toxic; therefore it should not be consumed unless it has been processed in some form. 2. There is a need for adoption of adequate technology and training to help small producers/ processors (women) improve the quality of products. 3. There is a need to collect sex disaggregated data (i.e.,Who does what?). Women's and men's roles and participation in the value chain are different and need special attention. 4. Conduct systematic gender analysis over time to determine the use of resources and responsibilities. 5. Promote collective action and organize work in women's groups or cooperatives. 6. Develop marketing skills and financial literacy (commercial and entrepreneurship). 7. Engage young people in marketing strategies/new products/ value added products, e.g., programs sponsored by the Young Women's Christian Association (YWCA) and Institute for Technical and Vocational Education and Training (ITVET). 8. Enhance adult education/extension programs with focus on food processing and also women's food preservation training, nutrition safety guidelines, etc.

Feedback from the invited guests expressed that the National Food and Security Nutrition Commission, Ministry of Education, Ministry of Human Development, the Women's Department, Ministry of Health, Pan American Health Organization (PAHO), FAO and the private sector could join forces to improve the present health and nutrition situation of Belize.

To jumpstart the efforts in creating national awareness of including cassava as part of our daily diet, it was suggested that cassava can be included in the meals of the school feeding programs countrywide. It was also suggested to host a cassava cooking contest or a cassava festival with the support of the Belize Tourism Board and to maintain alliances with regional and international institutions with the objective of exchanging information, learning more about the cassava value chain and identifying adequate technology to drive the industry in a more competitive direction.