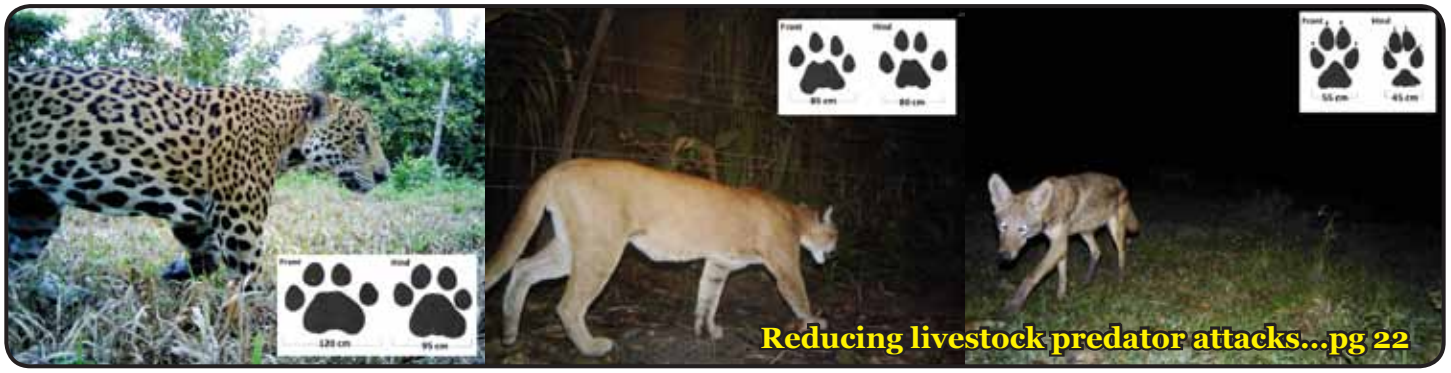
The Belize Ag Report

Belize's most complete independent agricultural publication



Industrial Uses of Hemp
By Karin Westdyk

A Short History of Cannabis Hemp

Since ancient times, until this century, hemp was used throughout the world to provide food, fiber, paper, medicine, shelter and fuel. In the early 1900's Henry Ford used fuel made from hemp to run the first cars, and believing that hemp would play an even larger role in the automobile industry, he built a car body made from hemp fiber that was stronger than steel, yet only a fraction of the weight (see https://www.youtube.com/watch?v=srgE6Tzi3Lg). Ford's engineers found ways to extract methanol, charcoal, tar, pitch, ethyl acetate and creosote - all from hemp and all of which are fundamental ingredients used throughout industry. But since the prohibition of hemp in the 1930's, these ingredients have been provided synthetically by the petro-chemical industry, its growth having been "fueled" by big money invested in fossil fuels. Though it had little to do with recreational use in the 1930's, hemp was demonized by those who benefitted from its prohibition. It can now be said that the ban on hemp was historically the result of an industrial war – natural vs. synthetic. It was the people from Standard Oil, Gulf Oil and DuPont Chemicals who had the most to do with hemp prohibition, and the most to gain from it.

Car body made from hemp, stronger than steel

Hemp and Marijuana – Different Strains

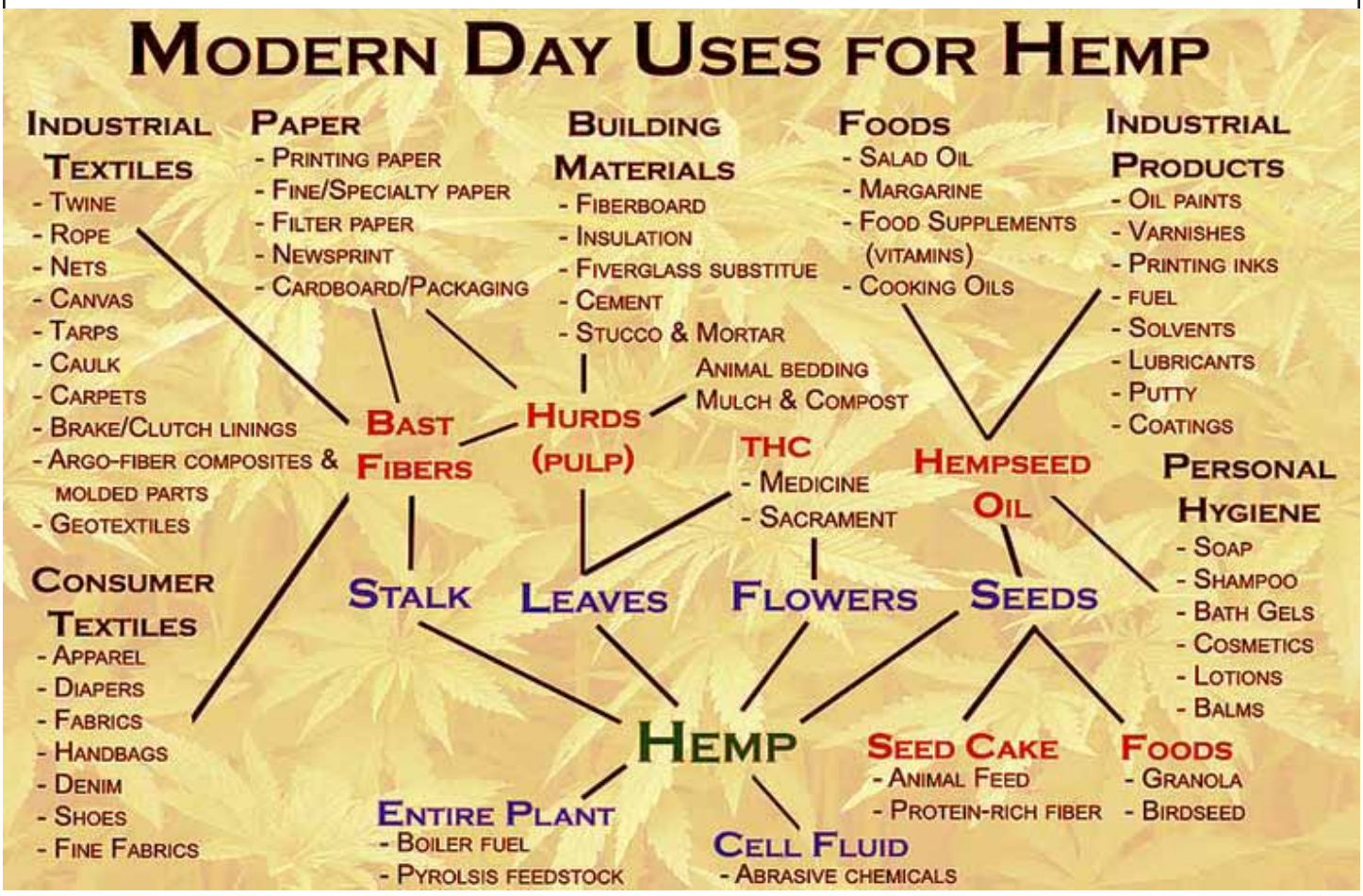
Hemp, as marijuana, was not widely known until the 1960's when Viet Nam veterans returned from Southeast Asia with pockets full of seeds of a different strain of hemp. Industrial hemp and marijuana are very different breeds of *Cannabis*. (Industrial hemp that is used for fiber, medicine, food, and fuel will not get you high). Also in the 1960's, Rachel Carson's book, Silent Spring, challenged the notion that humans could obtain mastery over nature by using synthetic chemicals. A half century later, her warnings have all come true. Global warming, and increased health risks linked to pollution of our air, water, soil and food, are all associated with the mining and burning of fossil fuels as well as the processing and manufacture, use and disposal, of the synthetic chemicals we use today.

Producing Fuel

Scientists and researchers are looking once again to nature for solutions and industrial hemp appears to hold the greatest promise in the area of agriculturally produced sustainable fuels and chemicals.

There are several methods of producing fuel from biomass. The most widely used method converts plant sugars into ethanol, most commonly from starches in corn, sugar cane, or sweet sorghum. But growing these crops for fuel have major drawbacks. For example, nitrous oxide emissions are produced from growing corn. Also corn, cane, and sorghum take up space on land suitable

Hemp...Continued on page 34



FROM THE EDITOR

Fruits and Vegetables in Belize's Markets Tested for Pesticide Residues?

Currently Belize has no regular testing system for pesticide residues of fruits and vegetables sold in our stores and markets. Belize law does not mandate any pesticides residue testing of our foods, so there is no way to declare that they are safe or not. Belize products sold for export must meet the demands of the importing country, usually including pesticide residue testing. Importers bringing produce into Belize however, do not need to have any pesticide residue testing done. Under World Trade Organization (WTO) rules, a country cannot impose restrictions on imported goods which are not required for the same domestic goods. Thus, in order to mandate pesticide residue testing of imported fresh fruits and vegetables, Belize would need to have mandatory residue testing for domestic produce.

Pesticide residue testing is very costly and time-consuming. Belize Agriculutural Health Authority (BAHA) has the competency and willingness to perform these tests. Many pesticides used for produce have a waiting period between application and harvest time. The Belize Pesticides Control Board (PCB) has one of the best regional systems in place for licensing and training pesticide handlers. However, without regular market testing we have no way to insure that best management practices are followed by growers. Pesticide importations into Belize continue to rise. Do Belizean consumers want to know if their fresh fruits and vegetables are uncontaminated? Maybe it's time for Belizeans to express their concerns to vendors and ministers of agriculture and health.

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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.

TO THE EDITOR

Dear Editor

SUBJECT: Lack of thinking hinders ag development

Agricultural development has a future. Scientists in Kenya at the International Centre of Inset Physiology and Ecology (ICIPE) and Rothamsted Research, UK in collaboration with other partners developed a natural method for controlling the corn-borer moth. A ground-cover plant, *silverleaf desmodium*, dissolves moth eggs laid on it; planted in fields between rows of corn, desmodium gives off compounds that *repel* the stem borer moth. Its roots suppress weeds including *striga*, a serious parasitic weed of corn. *Napier grass*, planted at the edge of fields, *attracts* stem borers out of the field to lay their eggs on it instead of the corn. The sharp silica hairs and sticky exudates on the Napier grass also kill the stem borer larvae when they hatch, breaking the life cycle and reducing pest numbers. The Napier grass is progressively cut and fed to cattle for high protein feed. Over 40,000 smallholder farmers in East Africa have adopted this farming system. Their yields tripled as a result.

There is a growing movement in agriculture toward a better way of farming. These agriculturalists ask "What if" questions about common problems farmers face and seek logical and optimal solutions to them. They are often associated with "organic farming". And they are succeeding in producing higher yields than high-volume toxic-chemical farming. Yet many farmers and their suppliers are slow to change. Two analogies illustrate this.

It was only early last century that the importance of a germ-free surgical environment was appreciated by those who understood the new germ theory of disease. If all surgeons were eager truth-seekers instead of being mired in old habits and misconceptions, then the change to sterile operating rooms would have been made in a matter of a year or less. Instead, surgeons wearing their street suits, moving from one patient to the next without washing, continued the harmful practice of septic surgery for decades. Why? They weren't doing two things:

1). Paying attention to research facts and investigating them.

2). Thinking (for themselves) about the consequences of the facts.

Today agriculture is no different. Harmful practices to humans, the soil, and the rest of the ecosphere continue by those oblivious to the long-term consequences. Some who do not have scientific training and experience have been duped into believing *sales science*. A salesman drinks glyphosate on the sales floor, and because he does not fall dead then and there, the farmers observing the demonstration conclude that it is safe. It would be like a tobacco company representative in the 1950s lighting up a cigarette to show that smoking was safe.

Basic facts are being overlooked. Agriculture is primarily biological, not chemical. It involves plants and animals as both products and pests. All are biological organisms. Would it make sense for an engineer to try to solve an electronics problem by building a refinery? Or a machine? Or pounding a nail in a piece of wood? Yet that is what "modern farming" tries to do; it uses chemical solutions to try to solve organic or biological problems.

Dennis Feucht,

Cayo ag observer

"If you can smell a chemical, you're ingesting it."
Mark Smallwood

Dear Ag Report:

RE: Belize a future bee sanctuary for region?

I'm sending you this info because you will know what to do with it in Belize. It's pretty much a lost cause already in the UK - but there's still hope for Belize.

Future bee sanctuary of Central America and the Caribbean?

Bees pollinate roughly seventy percent of the roughly 100 crop species that we use for food. They have already started hand-pollination of some crops in China because of the loss of bee populations.

30-50 per cent of the bee population of the US is now dying every year.

Clothiadinin and Imidacloprid are two of the insecticides that are chemically similar to nicotine. The EU banned them about three years ago after some really good studies (especially one in Germany) showed that neonicotinoids disrupt the bees' direction-finding abilities. The bees become unable to find their way back to their hives after they have found food. They are also unable, with their "message-dances," to tell the other bees in the hive where to find the food.

The EU (and the Brits) have just renewed Monsanto's (and other companies') licence to sell and use neonicotinoids.

The chemical companies claim that these insecticides do not kill bees. At normal usage levels, they don't kill the bees, they just make them lose their minds!

They lose their ability to learn and to memorise. Bees associate colour and smell with good food sources. You can teach them to remember and identify smells that will lead them to food. They are so good at this that the military are now using bees to sniff out explosives like landmines or IEDs. They will cluster around the explosives. The neonicotinoids make the bees unable to remember the colour, smell, or the way to and from the food ... so they can't communicate this info to the rest of the hive. So the hive diminishes and dies.

See attached link: https://www.permaculture.co.uk/articles/neonicotinoids-garden-centres

Thelma Disch

Potato Research in Peru
By Sam Vigue


Urubamba Valley with Water Conduit

Of all the countries in the world, Peru is one of the most interesting in agricultural history. The diversity of plants and climates from rainforests to snowy mountains to hot deserts are all in a place about 1/8 the size of the United States. The origins of many important food crops such as potato, sweet potato, and certain peppers are here. Researchers in Peru and around the world are aware of the great importance of this region and many are devoting their life's work to improving agriculture for the country's people.

I wanted to learn more about this curious place of so much diversity. The potato, for example: many thousands of varieties grow only in Peru - nowhere else. I wanted to learn about the research, the farmers, and the farms that are thriving in a country that isn't highly developed, but seems to have a lot of potential. A fellow graduate student from Peru who is working on plant breeding in the U.S. connected me with some people he thought I should visit and I set out not knowing what to expect. Arriving in early May, I first stopped in the Cuzco region, the south central part of Peru. I traveled to the Urubamba valley area where I spent several days in the towns of Urubamba and Pisaq. This area is about 9,000 – 12,000+ foot elevation and has cool temperatures even in the summer. Somewhat near to the famous Inca ruins called Machu Pichu, this valley is a productive agriculture area. The most important crops here are potatoes, barley, corn, and quinoa.


Quinoa Harvesting

There is also a great diversity of vegetables grown here supplying the local population. The small farm field plots are 5 – 10 acres in size with decreasing field sizes with elevation into the surrounding mountains. Some tractors are used but they are few in number and mainly in the lower valley area. Various types of cows, pigs, and chickens are abundant as well.


Peruvian Sweet Corn

During the time I was there was the peak of the corn harvest. The corn grown here is different from anything I have seen elsewhere. The most popular type of corn has giant white kernels almost 1 inch across. It is harvested both as "sweet corn" and as mature dried corn. The "sweet corn" ears are called choclo and are boiled fresh and eaten on the cob. There are also other colors and types of corn that are grown for the dried kernels. Different types of corn are grown at different elevations with the highest elevations having the greatest diversity of different corn types.

The local farm markets which occur in greatest extent on Sunday mornings in the Urubamba valley are an amazing site of diversity of fruits, vegetables, fresh meat, cheeses, and many other products. Thirty different varieties of potatoes were being sold. A person can buy both local produce and that which is brought in from other parts of Peru, such as bananas and avocados. Others come to the markets and set up tents to prepare cooked food for people to eat during the market times.

From Cuzco, I traveled to Lima to visit the International Potato Center also known as CIP. CIP is the largest potato research organization in the world. CIP's goals are to serve as a germplasm bank for Andean roots and tubers for researchers around the world and work on research to improve farm production in Peru. At CIP I was shown many types of roots that can be eaten that I have never seen before. Of course, the greatest efforts there are the scientists working on potato research for the country. I visited the entomology lab and the processing lab. At the entomology lab, a researcher discussed various methods being discovered to reduce the damage of different types of insects. Their goals are to reduce the amount of toxic chemicals that are being sprayed on the potato fields. Since potatoes are the chief income crop,

farmers tend use insecticide in an attempt to achieve maximum yield. The processing lab cooks potatoes and makes chips to analyze various quality characteristics of the varieties being developed. They also complete taste tests by a group of judges that rank various aspects of flavor on a scale of 1 – 5.

Next, I took a bus up the Peruvian coast to the agricultural town of Casma. The area around Casma provides a large quantity of produce for export. These farms are much larger than in the Andes and are mechanized with many laborers who work for the farm owners. I was greeted here by an avocado grower who grows the fruit for export to several countries in Europe. This area is an irrigated desert, but the soils are very fertile and many crops, especially avocadoes, grow well here. Much asparagus is also grown here as well as papaya, watermelon, sugar cane, and corn. A principle source of fertilizer for these farms is guano, which is bat manure that is harvested from caves.


University Potato Display

My final stop was as the Agriculture University of La Molina which is near Lima. The climate here reminded me of the Southern California coast: dry air and low rainfall. The university is quite extensive in size and I did not have time to explore everything. Professors here are engaged is many aspects of research on many different Peruvian crops and students are busy studying to be the future's best agriculturalists. I met with professors working with legumes and potatoes. Dr. Camarena introduced me to his work with legumes. One of the most interesting legumes is a type of bean called a pop bean that is said to grow only in Peru. When heated, the beans pop open similar to popcorn. I also learned about Andean lupins called Chocho that grow in the mountain area. Dr. Egusquiza discussed the challenges and ongoing research with potatoes that he is involved in and gave me a copy of his book, "Papa en el Peru"


Squash Varieties

Next I visited "el huerto". This is the part of La Molina University where many gardens are tended by the students. I was amazed to find out that everything grown in these gardens is organic. On the day that I arrived, the school was having farmers' market day and the locals were busy purchasing vegetables and herbs that had just been harvested by the students. I was greeting by several students who showed me the farm. First, we visited the university pepper research plots. Researchers gathered over 300 pepper varieties, both hot and sweet, from local gardens around Peru to grow and evaluate them. Next, I learned about the tomato research that the graduate students are working on. Experimentation is being done with several varieties of tomatoes both inside hoop houses and outside using different production methods. In contrast to the abundance of local pepper varieties, most tomato varieties grown in Peru come from the U.S. I was also surprised to find that the university is having success growing apples here. They do this by spraying a chemical called Dormex on the trees that replaces the required chill hours needed for flowering.


Mountain Corn Varieties


Corn in Urubamba Valley

My visit to Peru was an experience I will never forget. The helpfulness and kindness of the people were much beyond what I have experienced anywhere else. The investment being made to make real improvements in agriculture rather than looking for short-term chemical solutions was especially exciting. The food production in the Urubamba valley really shows how fragile much of the world must be, depending on imported food. The amount of underutilized plants in the country shows that there is still a frontier of science that has yet to be discovered.

Cover Photos: Quinoa, Cabbages in Urubamba Valley, Urubamba Market and many types of potatoes at Market.

BEYOND THE BACKYARD

Ghosts of the Graveyard

By Jenny Wildman

They stand erect and tall as guardian soldiers, swords at the ready, ever on duty in our cemeteries. The dagger like plants of *Draceanaa fromontana* and then Yucca were planted at the headstone or in place of one at unmarked graves to ward off evil and keep restless spirits from wandering. They are profoundly significant as a symbol of eternity and mourning in the cultural beliefs of tropical Africa. The tradition continued throughout the Americas and the Caribbean settlements, the Yucca becoming our sentinel.

The name Yucca applies to more than 50 species that have mostly adapted to all types of terrain and share characteristics of appearance and chemistry. They are evergreens, drought tolerant, spread rapidly, fire adaptive, prefer full sun and are pollinated by small nocturnal moths, each species by a different genus of moth whose young feed upon the new seedlings. Our most common Yucca is the spineless *Yucca elephantipes*, so called as the base of the trunk resembles the foot of an elephant and the tree can grow up to 30 feet in height. However officially its binominal name is *Yucca gigantea* (1859 Lemaire) often referred to as *Yucca guatemalensis*, Pasqui in Belize, Itabo in Costa Rica, Izote in San Salvador, Spanish Bayonet and Ghosts of the Graveyard.

They look similar to the northern *Yucca brevifolia*, called the Joshua Tree first by the Mormon settlers after a biblical passage where Joshua reaches his hands to the heavens in prayer. Yuccas are seen as protectors of the earth and the spirit world. Indeed they are often planted to protect from erosion and also to mark boundaries. Yucca trees all contain saponinglycosides which are soap-like foaming agents that protect the plant against fungus and harmful microbes. This is poisonous to fish and was used by Native Americans to stun or kill the fish making them easy to gather. This practice is now outlawed but whilst harmful to fish the saponins enhance animal nutrition. The saponins of the Mojave Yucca are used commercially as flavour and for foaming carbonated drinks.

Saponins create suds and can be used for soap, shampoo and toothpaste. The tips of the leaves are not as sharp as agave but make efficient toothpicks and the leaf fibers, dental floss. The dagger-like leaves are pliable and contain stringy fibers. Leaves are woven into simple sandals, head-rings to balance pots and baskets and when pounded to extract the fibers you can make string, rope, brooms, brushes, pot scrubbers and cloth. During the first and second world wars when jute was in short supply the yucca fiber was used as a substitute to make burlap sacks and millions of tons met that need.

The Flor de Izote, the national flower of San Salvador, blooms in April, May and June. The blossoms can be eaten raw and make attractive decoration for cakes and salads. However they are best cooked or blanched for a few minutes and have a taste somewhat like a mixture of green beans and globe artichokes. Remove the hard centre, the pistil and stalks,which are all bitter. Wash the petals, boil for 5 minutes then set aside. Meanwhile chop and sauté onions and tomatoes, and finally stir in whisked eggs. There you have a favourite dish of Salvadorans. Other suggestions: for tempura Izote grab a small amount of chopped blanched petals, dip in tempura batter and drop into hot oil for 3 minutes; or chop and add to pancakes; or soup. To make blossom jam add blanched petals to lime and beetroot juices, then add sugar and cook over heat until jelly forms.

Nutritionally the petals are high in calcium, potassium, niacin, thiamine, ascorbic acid and vitamins A, B and C. Clinical evidence shows that Yucca may be effective in the treatment of arthritis, blood pressure and cholesterol. The leaves can be dried to make a healthy tea; for earache roast on a comal, cool and squeeze into the ear canal.

Please remember that Yucca is **not** Cassava Yuca (*Manihot esculenta*) whose root we use for flour, bread and pudding.

I could imagine the root of the *Yucca gigantea* is way too soapy for eating although it is said you can. If you do dig up the root to attempt any of its many uses, please plant back the leafy top ... and so the new cycle begins.

For recipes and information you would like to share please email jenniferjanewildman@gmail.com

Pictures courtesy Xen Wildman

Belize´s First International Beekeeping Symposium

By Montse Casademunt
Cayo Quality Honey Producers Cooperative


Biol. Darwin Jesus Pech Pool of Melitzaak Coopertive and Margarito Leiva

Beekeeping is an agroforest activity that protects the environment, contributes to food security through the pollination of crops, and represents an important, albeit underdeveloped, industry that could provide employment to many Belizeans. In time, beekeeping has the potential to become a source of foreign exchange through the exportation of honey and other hive products such as beeswax, propolis, pollen, bees and manufactured products such as soaps, creams and shampoos.

On May 27th and 28th, 2016, the beekeeping community met at the Cayo Welcome Center in San Ignacio to address the potential of beekeeping in Belize and its present challenges. The two-day event was organized by Cayo Quality Honey Producers Cooperative (CQHPC). CQHPC is based in the Cayo District and was founded in 2006. Its 28 active members produce premium honey for the Belizean market. All our members are trained on ecologically sound honey production practices, including the natural control of pests and diseases. The cooperative has signed an agreement with the Ministry of Agriculture to have its honey bottling operation housed at the ministry's agro processing facility in Central Farm.

This first International Beekeeping Symposium brought together over 70 stakeholders in the beekeeping industry including beekeepers from across Belize. Other attendees included the chief agricultural officer and chief executive officer from the Ministry of Agriculture, registrar of Cooperatives, district Cooperative officers, representatives of BAHA, Bureau of Standards, Pesticide Control Board, Development Finance Corporation and Atlantic Bank as well as representatives from Inter-American Institute for Cooperation on Agriculture (IICA), GIZ/Selva Maya from Guatemala and Belize. Other representatives from Guatemala and Mexico included the Ministry of Agriculture (SAGARPA), and Melitzaak Honey Cooperative from Carrillo Puerto, Quintana Roo, Mexico.

The first part of the morning session was dedicated to presentations by our international invitees who gave overviews of beekeeping in their respective regions. It was interesting to note the considerable support this industry has attracted in the form of properly planned government programmes; both countries are well ahead of us in their beekeeping development. The second part of the morning focused on the status of honey production by Ms. Fay Garnett, Cayo District Agricultural Officer, and the traceabililty of agricultural products and its importance to the beekeeping industry was presented by Mario Howe of the Department of Agriculture.

The afternoon session was dedicated to an analysis of the situation of beekeeping in Belize; it was moderated by Ms. Jennie Garcia Sacqui, Director of GIZ/Selva Maya Programme in Belize. The concerns raised during the afternoon sessions included the need for the beekeeping industry to be a part of a national development plan that recognizes its potential in the conservation of our forests as well as the production of a commodity for export. Many topics were addressed by the participants including the need to raise the profile of beekeeping and the beneficial uses of honey and other hive products such as pollen, propolis, and royal jelly for the health of Belizeans, the need to update outdated beekeeping laws, the lack of technical assistance to beekeepers, the need for formal training, the limited resources for expansion of apiaries, the need for honey standards and the importance of traceability, the destructive nature of forest fires to beekeeping, and insecticide poisoning of bees. Of special concern was the contraband of honey from Peten and Quintana Roo and the threat to public health, (especially to diabetic persons) posed by the sale of adulterated honey by unscrupulous beekeepers.

One key outcome of the symposium was the formation of a beekeeping task force that will seek to develop a profile of the industry at the national level and develop a strategic plan for its development. This task force was created on the recommendation of Mr. Jose Alpuche, CEO for the Ministry of Agriculture. The initial working group was selected and included beekeepers Iliana Ayuso (Northern Belize), Miguel Mendez, Belize District; Bartolo Teul, Yaaxche Conservation Trust (YCT) Toledo; Montse Casademunt, Cayo Quality Honey Producers Cooperative; Margarito Leiva, technician and beekeeper; Hugo Miranda, Cooperatives Department; Max Ortega, IICA representative; Mario Howe and Ricardo Thompson from the Ministry of Agriculture.

(The good news is that a first meeting of the task force took place on June 8th with full representation. A work plan was developed and responsibilities assigned to every member of the task force. A national beekeeping survey was identified a priority, as information on the number of hives, number of beekeepers and honey production is sketchy.)

Honey Day, a family-oriented event, followed the International Beekeeping Symposium and was celebrated on Saturday May 28,

Beekeeping...Continued on page 16

Optimizing Corn Yield With Nitro Xtend+S

By Edwin Gomez, Axel Hidalgo, Wilbert Ramclam, Eddie Friessen and Albert Reimer

The increase in productivity corresponds to the increase of total dry matter as a result of nutrients absorption (Karlen *et al*, 1987). Furthermore, the adoption of best management practices for the use of fertilizers is necessary to increase and stabilize yields and promote agricultural sustainability (Ciampitti *et al,* 2007). With these important factors in mind we conducted trials to evaluate the effect of a new product called NITRO XTEND that inhibits the enzyme *urease* which is responsible for breaking down nitrogen into ammonium. A crop of corn yielding 10,688 pound per acre would need to absorb approximately 219, 42, and 42 pounds per acre of nitrogen (N), phosphorus (P) and sulphur (S) respectively. Application of urea nitrogen sources to the soil are susceptible to volatilization in gaseous form (ammonia) and in the majority of cases, levels of nitrogen into the plant are not achieved. Our results show that the combination of NITRO XTEND with sulphur can significantly increase corn yield if applied in the appropriate phenological stage required by the crop.

Our agronomic objectives were:

- Increase corn yield in the region matching nitrogen levels applied with the NITRO XTEND 46%
- Prepare a cost benefit analysis to compare production versus cost of NITRO XTEND + S.

The evaluation was done in Barton Rammy Spanish Lookout, Cayo District. Trials started on the 19th June, 2015 and ended September 16th, 2015. Hybrid corn seed used was Pioneer P4226. Fertilizer blend used at planting was 16-27-9 at 198 pounds per acres; that is N-30, P_2O_5 - 51 and K_2O - 17 pounds per acre.

TRIALS DESIGN

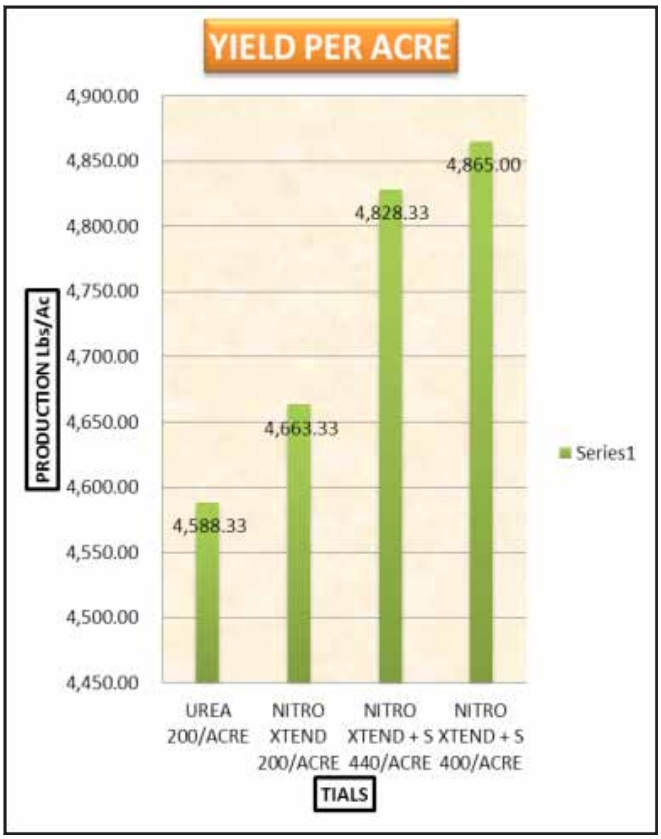
TRIAL	FERTILIZER	DOSAGE (Lbs) /ACRE	APPLICATION
T-1	46-0-0	100	V-6
	46-0-0	100	V-10
T-2	NITRO XTEND 46-0-0	100	V-6
	NITRO XTEND 46-0-0	100	V-10
T-3	NITRO XTEND 46-0-0	210	V-6
	NITRO XTEND 46-0-0	210	V-10
T-4	NITRO XTEND 38.5-0-0+7.2 S	200	V-6
	NITRO XTEND 38.5-0-0+7.2 S	200	V-10

[1] *Design of Trial with one repetition*

FIELD BLOCK DESIGN

T-1 (1.5 Acres)
T-2 (1.5 Acres)
T-3 (1.5 acres)
T-4 (1.5 acres)
Repetition T-1 (1.5 acres)
Repetition T-2 (1.5 acres)
Repetition T-3 (1.5 acres)
Repetition T-4 (1.5 acres)

As shown in the chart below, NITRO XTEND+S (T-4) applied at 400 pounds per acre yielded better than T-1, T2 and T-3; that is, 4,865 pounds per acre. NITRO XTEND applied at 200 pounds per acre yielded more than regular 46-0-0 applied at the same dosages and same phenological plant development; that is, 4,663.33 versus 4,588.33 pound per acre.



The cost of fertilizer per treatment is shown below:

COST OF FERTILIZER PER TREATMENT

TRIAL	FERTILIZER	PRESENTATION (Lbs)	COST/UNIT	DOSAGE/ACRE	COST/ACRE
T-1	46-0-0	110	$ 55.00	200	$ 100.00
T-2	Nitro Xtend 46-0-0	110	$ 57.50	200	$ 104.55
T-3	Nitro Xtend 46-0-0	110	$ 57.50	420	$ 219.55
T-4	Nitro Xtend 38.5-0-0+7.2 S	110	$ 53.50	400	$ 194.55

As shown in the chart below, Nitro Xtend clearly has a significant impact on increasing yields. This trial shows that increased nitrogen impacts yield at a threshold of economic gain as indicated in the T2 treatment line of the chart. The increase use of nitrogen to increase corn productivity can be managed with the use of Nitro Xtend to minimize impact on the environment.

COST BENEFIT ANALYSIS

TRIAL	YIELD/Lbs/Ac	PRICE/Corn/Lbs	GROSS INCOME	FERTILIZER COST	FERT/COST/DIFF	PROD/DIFF	RETURN
T-1	4,588	$ 0.27	$ 1,238.85	$ 100.00			
T-2	4,663	$ 0.27	$ 1,259.10	$ 104.55	$ 4.55	$ 20.25	$ 15.70
T-3	4,828	$ 0.27	$ 1,303.65	$ 219.55	$ 119.55	$ 64.80	$(54.75)
T-4	4,865	$ 0.27	$ 1,313.55	$ 194.55	$ 94.55	$ 74.70	$(19.85)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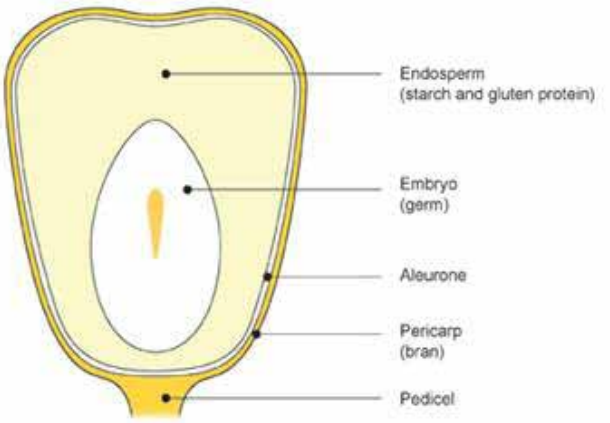
FERTILIZERS FORMULATED TO SUIT YOUR CROP NEEDS.
NITRO XTEND is a slow-release fertilizer, that prevents nitrogen loss caused by volatilization.
Contact information: Tel: 523-2003,2236,2166 Email: agro@bigcreekgroup.com

BEL-CAR Updates

Those who study the *Ag Prices at a Glance* page in the Belize Ag Report's centerfold, will have noted that it has been a good while since Class A corn has been even priced. (It has been marked N/A for not available). Bel-Car refers to Class A corn as dark yellow high quality type which is most desirable for their corn meal, rather than strictly feed corn. Class A has more endosperm and less germ and has high vitreousness. High endosperm kernels are usually brighter orange color, rather then yellow. Hard vitreous kernels have better nutritional, dry milling, breakage resistance and pathogen resistance qualities than soft opaque kernels. After Spanish Lookout's trials of a new hybrid variety of a Class A corn from Advanta were challenged by un-cooperative weather, Bel-Car took the plunge and ordered a half container (approx. 20,000 lbs) of hybrid seed from Advanta of Thailand. This should cover approximately 1500 acres.



When the corn is processed into corn meal at Bel-Car, the hull and germ are separated and dried. Locally this by product is known as gluten, and it has about a 6-8 week shelf life. Most is used locally as pig feed, with some export to Guatemala and Jamaica.

At this time, there remains a low but sufficient corn inventory at Bel-Car to last domestic needs until the new harvest, but their regular posted price has been removed from the front office, reflecting low motivation to sell at the current low prices.

Winter black eye peas yielded large quantities but at suboptimum quality due to the rains at harvest time. Red kidneys were not as bountiful, but Belize is still exporting to both the Caribbean and to the Middle East. Belize remains the 4th largest exporter of black eyes in the world. For 2015, the *International Food Trader* indicates that Myanmar is the largest exporter, having exported 30,600 MT, mainly to India and Pakistan; 2nd place Madagascar shipped out 19,000 MT; Peru holds 3rd place with export of 5,000 MT and Belize in firm 4th at 2,685 MT export total.

Normal storage losses for crops are about 1.5 -2% per year. To mitigate this, Bel-Car is making improvements in their storage silos; for example, lowering the elevator unloading positions will reduce breakage cracks because of the shortened fall distance.

Bel-Car has recently received their Pesticides Control Board (PCB) registration as agents to sell QuikPhos, also known as phostoxin. This is traditionally used for small and bulk storage of corn, beans and rice. This high quality aluminum phosphide, imported from India, is available in any quantity from Bel-Car's Spanish Lookout office.

Errata: Issue 31, page 14: The tonnage of export shipment mentioned in paragraph should have been 3,000 MT and not 300,000 T as printed.

Pictures Courtesy Rosando Thiessen

21st Meeting of the Coordinating Group of Pesticides Control Boards of the Caribbean 6 – 10 June 2016

The Pesticides Control Board of Belize is pleased to report that the hosting of the 21st Meeting of the Coordinating Group of Pesticides Control Boards of the Caribbean (CGPC) held in Belize from 6 – 10 June 2016, was a resounding success. The meeting was held at the San Ignacio Resort Hotel in San Ignacio, Cayo under the theme: "A changing climate! A changing world! Responsible pest and pesticide management – our responsibility." Mr. Carlos Fuller of the Caribbean Community Climate Change Centre based in Belize was the keynote speaker during the meeting's first technical session.

The CGPC is comprised of representatives from the Pesticides and Toxic Chemicals Boards or Authorities of the countries of the Caribbean, and associate members representing other stakeholders. The group meets annually in one of the member countries, with the host country assuming the Chair for a one-year tenure.

Funding for the 21st meeting of the CGPC was provided by i) the United Nation's Food and Agriculture Organization (FAO) through the Global Environmental Facility (GEF)-funded project titled *"Disposal of Obsolete Pesticides including POPs, Promotion of Alternatives and Strengthening Pesticides Management in the Caribbean"*, and Phase II of an EU-funded project titled *"Capacity Building related to Multilateral Environmental Agreements (MEAs) in African, Caribbean and Pacific (ACP) countries - Clean-up of obsolete pesticides, pesticides management and sustainable pest management",* and by ii) the Inter-American Institute for Cooperation on Agriculture (IICA)-implemented *10th European Development Fund (EDF) Sanitary and Phytosanitary (SPS) project.*

The 21st meeting of the CGPC saw the participation of delegates from Antigua & Barbuda, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Jamaica, Saint Kitts and Nevis, Saint Lucia, Suriname and Trinidad & Tobago. Meeting facilitators included Ms. Carol Thomas of IICA, Barbados who serves as the CGPC Technical Secretary, Dr. Vyjayanthi Lopez and Mr. Guy Mathurin of the FAO sub-regional office for the Caribbean in Barbados, and Dr. Richard Thompson and Ms. Oxana Perminova of the Plant Production and Protection Division of the FAO in Rome.

Also in attendance was Ms. Therese Yarde of the CARICOM Secretariat. Other participants included representatives from regional organizations such as the Basel Convention Regional Center, Caribbean Agricultural Health and Food Safety Agency, Caribbean Farmers' Network and the University of the West Indies, as well as associate members from the private sector. A joint session for exchange of work experiences was held with the participation of the Project Execution Group of the *Belize Chemicals and Waste Management Project* which is being implemented by the Department of the Environment. Members of the Pesticides Control Board of Belize were among other invited guests at the various meeting sessions.

Major meeting accomplishments include the development of a work plan for all five components of the GEF-funded project to address the disposal of obsolete pesticides including POPs, promotion of alternatives and strengthening of pesticides management in the Caribbean. This included discussions pertaining to the regional harmonization of the pesticide registration process. Among the primary agreements made during technical sessions of the 21st meeting of the CGPC, the countries agreed to develop a regional collaborative exercise for the review of highly hazardous pesticides, and to explore research opportunities related to pesticides management and climate change. Stemming from previous meetings of the CGPC, the development of a regional Pest Control Operators manual was being finalized by IICA with support from the EDF's SPS project.

During its regular business session, the CGPC agreed to conduct activities related to its annual observation of Pesticides Awareness Week under the theme "***Manage Pesticides Responsibly: Adapt to Climate Change".*** The next meeting of the CGPC is scheduled to be held in Barbados in 2017.

In accepting the Chair of the CGPC at the Opening Ceremony, Ms. Miriam Ochaeta-Serrut, Registrar of Pesticides of the Pesticides Control Board, pledged to take on the challenge of improving the level of networking exchange among member countries, in order to fulfill agreements made during the course of the meeting.

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.

Building Life in the Soil

By Neal Kinsey

"How can I improve soil biology or encourage soil life on my land?" From organic to no-till farms, this is one of the most asked questions in agriculture today. Before that question can be answered there are other questions that need to be answered. Will the benefits from following a proposal to build life in the soil be profitable enough to be economically feasible? Will such a program justify the time and effort required? What type of changes may be needed to achieve the goal in a proper manner? The answers to these questions will help determine what may or may not be possible under varying sets of circumstances.

There are no simple one-step plans that will apply to every farm or field. For those who want to keep on doing what they have always been doing and provide some individual or convenient change that will magically make the difference, the best results in terms of yield, quality and economics will not likely ever be realized. Such approaches are like trying to use a band aid instead of cleaning out a wound and applying a larger bandage; the wound may seem to get better, but there are many possible complications that can occur because it was not done right in the first place.

You have to understand what a program requires for specific results. For example, adding lime, manure, compost, cover crops, micronutrients, or even more N-P-K fertilizer may show a positive response for the crop. But it may not mean you have improved the soil and the **quality** of what will be produced there. *The first and most basic foundational principle for building more biological life in the soil is "feed the soil and let the soil feed the plant."* When considering the needs of feeding the soil, first think about the number of years plant nutrients other than N-P-K have been taken out by crops without being replaced. It can become expensive to supply all the needed elements at once to fields that have not been receiving adequate amounts of required fertilizer nutrients for growing each crop over long periods of time. It is not a reasonable assumption that these can be adequately replaced in one year or at very little cost. Many farmers are hammered by supposedly expert advisors with the false claim that this type of approach, correcting a soil's fertility, costs too much. Is it possible that those who have never learned how to use a true soil-building program, or those who stand to profit most to have a farmer continue using their program, may not truly have the farmer's best interest in mind?

Some will maintain that they feed the soil and thus build soil life by use of manure, or compost, or cover crops, etc. However, with a detailed soil analysis it can be determined if any of those other nutrients established as being needed for the soil and the organisms living there are more limiting to biological activity than what is continually being applied to that land. Even compost and manures that came from plant or feeding materials that were grown where soil nutrients were deficient in terms of fertility will still not be adding what they are lacking and thus do not have the capacity to provide all the nutritional value needed for what is to be grown there. The same can be true for cover crops. If the needed nutrients are not there in adequate amounts they do not come magically along.

With regard to the question of whether or not feeding the soil is too expensive to consider, there is no need to take anyone's word. Dedicate a small portion of land to first prove the benefits of a "feed the soil" approach, and after seeing how the economics of it works, then begin using the program on more land. Once the

results are proven to be achievable on a smaller portion of the land, then proceed with the confidence that the program is worth far more than the time and expense involved.

Will the benefits from increasing life in the soil be worth the time and effort required? The first biological aspect of the soil for the most profitable returns should be the effects that a program has on plant roots, that is, maximizing the nutrient levels that provide the sustenance to the living organisms in the soil that support the plants via more root growth and resulting nutrient uptake. Correct fertilizer and soil amendment usage are the primary keys that unlock the door for biological activity to supply better soil and plant response. The nutrients that tend to be most neglected for root growth are calcium, sulfur and boron – sometimes all of them, but not always, and too much of any one of these can affect nutrient uptake adversely.

What type of changes may be needed to achieve the goal of increasing life in the soil? Depending on crops being grown and location, there may be several, but in general there is one good place to begin: identify and correct the needs based on observable differences across each field or farm. One big problem that continues to block progress in biological soil activity is the assumption that all the soil in a wide general area will benefit from the formulation and application of the same program everywhere.

Using one soil sample to fertilize a whole field that has obvious differences is never the means to achieve that land's true potential, let alone - as some tend to promote - using just one sample to determine what should be done to provide all the needed nutrients for the entire farm! If all of the soil in a field were alike, it would all look the same, feel the same and grow the very same way. But that is seldom the case. If the soil has any major differences in texture, color, or plant population – even different weed or grass populations – chances are the fertility needs will be significantly different as well. If there is an observable difference and the area of land is large enough to fertilize separately, then it should be sampled separately and that land specifically evaluated, with fertility needs assessed, formulated and treated accordingly. This program provides the best environment for soil life to flourish.

The goal for those wanting to build life in the soil will generally be quite different from those selling fertilizers and soil amendments. Find a consultant you can trust. Find a consultant who does not sell the fertilizers or other products he recommends. Such consultants only sell advice on what is needed in terms of fertilizer materials and how to properly build up soils. Then you can buy what you need from the fertilizer dealer you choose. Also consider the goals of the company or consultant who provides such advice. Is their goal to become the company who performs the most soil tests or works with the most farmers or growers? For those who give advice concerning building soil fertility to support soil life, achieving such a goal would be hard to attain and still do the best job. That is because a program to optimize the benefits provided by optimizing soil life places the most value on principles that most farmers, consultants and fertilizer dealers reject as being most necessary. Today most companies look at service as being how to provide the greatest speed and convenience. This is a big part of the service many farmers want! They don't want to wait; they need it now. But what price has to be paid over and above the cost of the soil sample for such a quick answer? It is not possible to maximize yields or minimize

Kinsey...Continued on page 16

Kinsey...Continued from page 15

costs without a test that provides the correct answers concerning the fertility needed for the soil. Those answers require far more time and consideration than just trying to guess what the plants need based on the tonnage you want to make. One good test is to determine whether soils that test high in a nutrient still show the same recommended amount of fertilizer as those testing low in that same nutrient.

One of the questions of greatest concern to farmers and growers in terms of building life in the soil is. "How do we improve the life of the soil in order to build more humus?" How much of a chance is there that this will happen with a quick test designed to feed the plant? That kind of concept has been allowed to develop in agriculture based on a false set of premises! Those who sell these concepts want you to believe that all you need to do is just squeeze out as much yield as possible every year by feeding the plant because feeding the soil is too expensive. That is a bunch of hogwash and it is time the weaknesses in such a program be properly considered. A program for soil building to increase soil life is based on completely different concepts. Rather than a rapid turn-around time, a grower should plan ahead to receive the proper advice in a timely manner. Under ideal circumstances, the turn-around time needed for soil recommendations to build soil life and humus can be done in a few days. But once growers begin to learn how well such a program works, they send more and more samples, and then that few days can turn into weeks because of the resulting backlog. The concentration is on accuracy, not speed, and the way to achieve that in individual cases is by evaluating every soil sample specifically, element by element. This takes more time than a program designed to feed the crop based on the desired yield. It is a different approach designed to provide a different program for the planners and thinkers in agriculture, not those who feel they need only quick answers.

With this in mind, the main goal for building a program to most benefit life in the soil should not be to convince farmers and growers they need to take more soil tests, but rather to convince them that taking and using a soil analysis for determining the real fertility needs of each soil is actually possible and the most beneficial approach. Farmers will only learn if that is best for them by doing it, by starting small if necessary. Once they are convinced, they can continue by having their soil tested from samples that are properly collected, and then apply only those materials shown to be needed. If it is too expensive to supply all that is needed for the soil at one time, then it is most important for them to understand how to allocate and apply the most necessary nutrients. Such a program must then express what to use in the proper order, using only the correct amounts of all needed materials to stretch the allocated fertilizer budget which will then accomplish as much in terms of yield and/or quality as possible, while at the same time build the "house" for the best soil biology!

Beekeeping...Continued from page 9

outside the Cayo Welcome Center. Representatives from Melitzaak Cooperative from Quintana Roo were there to display and sell their many honey and hive products. Besides honey sales, the event featured cool honey drinks courtesy of the food processing facility at Central Farm and educational displays including a glass observation hive that attracted a lot of interest especially among children and a display of beekeeping equipment.

Cayo Quality Honey Cooperative looks forward to making an International Beekeeping Symposium and Honey Day an annual event.

Cover photo: Ms. Fay Garnett, Cayo District Agricultural Officer

Persistent Organic Pollutants (POPs) And Green Cane Harvesting

In 2015 the Department of the Environment (DOE) started a national project entitled "Belize Chemicals and Waste Management Project", which aims to manage and dispose of all existing stockpiles of POPs, as well as reducing the release of unintentional POPs (UPOPs) into Belize's environment. In the past DDT was used extensively to control mosquitoes that carry malaria and dengue. Other chemicals continue to be used in agriculture. Now it is being recognized that these chemicals have unforeseen negative effects on human health and the environment. POPs can be transported by wind and water, and affect people and wildlife far from where they are used. They exist for very long periods of time in the environment and can accumulate and pass from one species to the next through the food chain.

UPOPs are certain types of chemicals that are produced and released as a result of industrial processes and from combustion; for example, open burning of municipal and medical waste, agricultural burning, and even backyard burning of trash. The practice of open burning of waste and the slash and burn practices in agriculture (e.g. burning of cane fields) are the main sources of unintentional formation and release of POPs, such as dioxins and furans. Sugar cane harvesting typically includes two burnings. With the elimination of the second burning of sugarcane harvest, it is expected to reduce the unintended releases of UPOPs in the agricultural sector.

Green harvesting (which is the harvesting of cane without the traditional burning of the fields) allows for the leaves and plant trash to remain in the fields covering the ground, protecting the soil from erosion, increasing soil moisture, providing weed control, and reducing herbicide use.

The DOE has partnered with the Sugar Industry Research and Development Institute (SIRDI) to promote farmer-voluntary programs in green harvesting and implement piloted alternatives to reduce agricultural burning in sugar cane farming to reduce UPOPs emissions from the sugar industry. The DOE and SIRDI hosted three field days of green harvesting demonstrations to farmers in Orange Walk and Corozal, using mechanical harvesting. They intend to develop a seed bank of 10 acres with 4 to 5 varieties of sugar cane suited for green harvesting. As part of a "best management practices" (BMP) emphasis, these demonstrations served to encourage cane farmers to decrease burning of cane and to support a clean and healthy environment. Currently, the industry lacks the sugarcane varieties that are well-suited for green harvesting, those that shed their mature leaves and are upright standing varieties, conducive to both manual and mechanical green harvesting. The BMP plan includes the development of a nursery that will provide these varieties to farmers that are interested in green harvesting.

The Department of the Environment (DOE) is responsible for monitoring developments that have the potential to significantly alter the natural state of the environment as well as compliance with international environmental agreements, such as the Stockholm Convention on Chemicals. The Stockholm Convention on Chemicals is a legally binding international agreement that tasks all participating countries to take actions to reduce or eliminate the production, use, and/or release into the environment of POPs.

For further information, please contact: Chief Environmental Officer, Department of the Environment, Ministry of Agriculture, Fisheries, Forestry, the Environment & Sustainable Development
Market Square, Belmopan, Tel: 822-2548/2819 Fax: 822-2860
Email: envirodept@btl.net or envirodept@environment.gov.bz
Website: www.doe.gov.bz

Agriculture Prices at a Glance- $$$$$

AUGUST 2016

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

BELIZE CATTLE by District - Provided by BLPA							
	T	Dist.	Per lb	Dist.	Per lb	Dist.	Per lb
Fattened steers	L	Czl	1.65	OW	1.85	Bze	1.50
750-1100 lbs	L/H	Cy	1.70	SCr	N/A	Tol	1.80
Weaner steers	L	Czl	2.15	OW	2.20-2.25	Bze	2.10
" "	H	Cy	2.20	SCr	N/A	Tol	N/A
Breeding heifers	H	Czl	N/A	OW	1.90-2.40	Bze	N/A
" "	H	Cy	N/A	SCr	N/A	Tol	1.80
Cull cows	L/S	Czl	1.15	OW	1.25-1.60	Bze	1.20-1.25
" "	S	Cy	1.25	SCr	N/A	Tol	1.40

U.S. CATTLE			
U.S. price - corn fed - 1000-1200 lbs	L	US$ 1.13875	
U.S. price - feeders 600-800 lbs	L	US$ 1.4250	
BELIZE HOGS			
Weaner pigs - 25-30 lbs - by the head	S	100.00-120.00	
Butcher pigs 160 - 230 lbs, per lb	S	1.95	1.75
BELIZE SHEEP			
Butcher lambs - live per lb	S	2.75	2.50
Mature ewes - live per lb	L	2.00	1.75
BELIZE CHICKEN			
Whole sale dressed, per lb (Sp Lkt)	S	2.38	
Whole sale dressed, per lb (Bl Crk)	S	2.40	
Broilers - live per lb (Sp Lkt)	S	1.22	
Broilers - live per lb (Bl Crk)	L	1.24	
Spent hens per 4 lb bird (Sp Lkt)	S	4.00	
Spent hens per 4 lb bird (Bl Crk)	L	3.50	
CITRUS			
Oranges per lb solid	S	2.0735	
Grapefruit per lb solid	S	2.520	
COCONUTS			
Green Coconuts, del'd to Cayo, bulk	S	sm .40 med .45 lg .50	
Dry Coconuts, del'd to Cayo, bulk	S	.35 - .40	

GRAINS, BEANS & RICE	T	A	B
Belize yellow corn, bulk (Spanish Lookout)	s	N/A	.2415
Belize yellow corn, bulk (Blue Creek)	L	N/A	.27
Yellow corn/local retail (low volume, Sp Lkt)	L	.30	
Belize white corn, (Cayo)	/H	N/A (bulk)	.45 (low volume)
US Corn, #2 yellow	L	US$4.0675 /56 lb bushel	
US organic, #2 yellow corn feed grade	S	US$7.35-9.15 /56 lb bushel	
Belize soy beans (Spanish Lookout)	S	.45	N/A
Belize soy beans (Blue Creek)	H	.54	.49
US soy beans, #2 yellow	H	US$10.6375 /60 lb bushel	
US organic, #1 feed grade soy	H	US$17.50-18.50 /60 lb bushel	
Belize milo (Spanish Lookout & Blue Creek)	L	.20-.21	
Red kidney beans (Spanish Lookout)	S	.70	.60-.65
Red kidney beans (Blue Creek)	S	N/A	
Black eyed peas (Spanish Lookout)	L	.63	.58
Black eyed peas (Blue Creek)	L	N/A	.50
Paddy rice per pound (Spanish Lookout)	S	.40-.53 farm price, dried	
Paddy rice per pound (Blue Creek)	S	.40-.45 farm price, dried	
HONEY			
Honey, 5 gal (approx 60 lbs)	S	$150.00 (CQHPC)	
Honey, specialty, 5 gal (approx 60 lbs)	H	$150.00-250.00 (Cayo)	
SPECIAL FARM ITEMS			
Eggs - tray of 30, farm price	L	4.60 (Sp Lkt)	5.40 (Blue Creek)
WD milk per lb to farmer	S	contract .57; non contract .42	
Raw milk (farmer direct sales)	S	8.50 gal (5 gal + 8.00 gal)	
CACAO			
Cacao beans (TCGA) /lb	S	3.00 dried fermented	
Cacao beans (TCGA) /lb	H	1.20 wet beans	
US Cacao beans, metric ton	L	US$ 2,931.42	

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

Belize Livestock Producers Association News

By Roberson/Feucht

Belize is now proceeding with cattle sweep 4. Based on our good results indicating a healthy livestock population, and proposals at the World Organization for Animal Health (OIE) we may qualify for some testing reductions. The OIE has drafted changes for the entire world, that, if accepted, would only require 3 tests for brucellosis under some conditions, rather than the currently required 5.

Currently we must test 99.9% of our livestock, but we have applied to test only a representative percent of 22.7% of livestock for the fourth sweep. If those results are clean, they could be accepted and used to declare our official status. Throughout the country, it would then involve selected herds, identified into 6 risk areas: breeding herds, imported animals, herds milking for human consumption, and herds tested only in sweep #3 (not #1 and #2), so categorized as "new" farmers, and those farms involved in trading of animals or other risks.

Another good indication for the cattle industry: in May 2016, Blue Creek Community in Orange Walk was notified by Mexico that they can now export any animals to Mexico that have passed all the sweeps. Mexico states that if the OIE approves the aforementioned reduction in testing down to 3, then Mexico would follow and adjust its import regulations.

Representatives of SuKarne (sukarne.com), one of Mexico's largest cattle finishing and meat processing companies visited BLPA recently; they expressed a desire to purchase up to 22,000 animals per month from Belize, both slaughter animals and weaners. However, current cattle inventories preclude commitments of that level, as our total annual exports fall somewhat under 25,000 head. Also, our agreement with Mexico's SENISICA is for only slaughter animals. BLPA escorted the SuKarne visitors to ranches in Blue Creek and Spanish Lookout, after which SuKarne verbally expressed interest to purchase all of Belize's export animals.

BLPA's 'Implementation of the Surveillance System Plan', continuing with sweeps 4 and 5, will be totally funded by ranchers – a total cost of Bz$1.6M. The BLPA board passed a resolution to charge Bz$10 per head per year for 2 years (until reaching the 5 year mark of the sweep), using authorized collectors in communities. Some farmers have been reluctant to comply with the system so far,

and now they must pay Bz$ only per head to get into the system. If they do not comply with this, then they can apply only for local slaughter, essentially putting themselves out of the cattle business.

Also noted by BLPA is that 3,800 animals, belonging to 54 farmers, have been given notices for non-compliance penalties of Bz $2,000 per farmer. If these farmers elect to go to court and lose, they would be liable to pay Bz$5,000, and then forced to slaughter their animals. There may be several reasons why farmers have gotten into this situation: some just do not want to do, others have 'wild' animals or lack the necessary facilities, or are just not informed. BLPA has requested that Belize Agricultural Health Authority (BAHA) enforce the necessary quarantines mandated since completion of the first two sweeps.

Some suggest that more rigorous testing is needed within the slaughter system. Currently there are no enforced standards and new legislation with penalties could be useful. There is a need for more communal slaughter facilities but at this point, there is no clear indication who would fund these.

BLPA reports that now there are 5 authorized agents in country to handle movement permits for cattle. There is one agent per district, except for Stann Creek, which has a low cattle population and is covered by the Toledo agent. These agents issue permits for cattle to leave the country, at a cost of Bz$10 per head. For movement within the country, there is no cost for the permit. Tagging of newborn animals is done at Bz$10 per animal (plus the Bz$10 compulsory fee for 2 years mentioned above). Branding is also compulsory as a requirement for export sale.

Many cases of cattle rustlers have been solved and animals returned to their owners by utilizing the information available from tagging and registration. Under a memorandum of understanding in 2015, between BLPA and the Belize Police Force, BLPA offers a Bz$5,000 bounty upon conviction.

BLPA reports that they have assisted ranchers to meet new banking regulations for deposits. Formerly, many sold their animals for cash, which the banks have increasingly been reluctant to accept. Now BLPA can certify the amount of animals sold, by issuing a letter which the rancher then provides to his bank. There is no charge for this service for any BLPA member. The association is also working towards supplying member cards with security features and the member's brand, for use in transporting stock and securing discounts from various businesses.

Many individual educational and research projects would be useful to boost the livestock sector, including meat quality assurance, improved sylvo-pastoral and agro-forestry, disease management and bat and tick control. Some ranchers feel the need for GOB to create a *National Policy for Cattle*, which would define where we are heading with the industry. Will we remain with natural grass cattle, or will we aim for intensified (feed lot) system? Will we focus on low-carbon, environmentally friendly production methods? BLPA and GOB are reliant on The Inter-American Institute for Cooperation on Agriculture's (IICA) guidance to assess these.

BLPA announced that Dr. Itza will be leaving his post as CEO of BLPA at the end of July. The association and ranchers countrywide are appreciative for his administration and work organizing baseline data which was and remains critical for the industry to move forward. A new CEO had not been named at press time.

Photos of the Red Angus cattle contributed by Mr. Emile Mena of Cedar Hill Ranch, operated by Cayo Cattle Company in Camalote Village, Cayo District. Contact him at 610-3591 or emilemena@yahoo.com.

Belize Ag Report invites BLPA members to share your livestock photos for use with BLPA articles. Send them digitally in high resolution to belizeagreport@gmail.com.

Working Together To Reduce Predator Attacks On Livestock

By Rebecca Foster, PhD; Panthera

Shanelly Carrillo, Jaguar Officer, deploying camera trap to monitor predators

Livestock production in Belize is common and increasing. Many farms and villages lie in close proximity to the forest, potentially putting their animals at risk of predator attack. Livestock predation is frustrating and economically damaging, particularly for small-scale farmers who may lose a substantial proportion of their herd if they suffer repeated attacks. Understanding how predators, such as jaguars, pumas and coyotes, use the forest and agricultural lands, and how livestock are managed within the landscape, is helping us to identify practical, cost-effective non-lethal methods to deter predators from attacking livestock. Panthera works in partnership with the Forest Department's Wildlife Program and the University of Belize's Environmental Research Institute (UB-ERI). Our applied research combines ecological and social science to understand the causes of conflict between people and predators and to find practical solutions.

The development of a national response network -- Through our partnership with the Forest Department, we have equipped the government with the country's only jaguar officer, who responds to reports of predator attacks on livestock. On receiving a report, the officer conducts a site investigation, collects data on the nature of the attack and the management of animals, and gives advice about how the owner may prevent future attacks. All data collected are maintained in a national database; as it grows we will be able to identify "hot spots" at high risk of livestock predation and answer questions about where, why, and when attacks happen. Often reports are received days or weeks after the attack has happened, by which time it is too late to assess the cause or circumstances of death. Therefore, we encourage livestock owners to report attacks immediately and if possible take photographs of the dead animal, showing injuries (e.g. canine punctures to the head), which body parts have been eaten, and any footprints near the site of attack.For details of how and where to report, please see the end of this article.

With only one jaguar officer to serve the entire country, we are working to expand the program through the development of a National Response Network.Through a series of workshops, we will be training the local rangers at each of the Forest Department's district offices, and other government agencies or local NGOs who wish to get involved. The training will enable them to answer general questions from the public, respond to reports of attacks and conduct productive site visits within their own districts. Ultimately, we envision a network which has the capacity to provide support and advice to livestock owners nationally.

Understanding people and predators –Through our partnership with the UB-ERI, our team has interviewed over 200 livestock owners throughout central and southern Belize, gathering detailed information about how the livestock are managed, rates of attack within villages and on farms, and the importance of livestock to people's livelihoods. These data are proving invaluable in understanding the scale and potential drivers of livestock predation, and the needs and concerns of people who suffer losses.

We know that overharvest of popular game species by humans will inevitably force predators to start hunting livestock and domestic animals. To understand this specific driver, our team met with 139 hunters to find out more about their hunting practices. The hunters' feedback is allowing us to understand the needs of the hunting community and will help us develop recommendations on sustainable hunting practices so that the country can maintain sufficient game for future generations of Belizeans and predators. Understanding the behavior of the predators is also important: how many there are, how they use the forest and agricultural landscape, how widely they range, and which individuals become livestock killers. Over consecutive years, our team has been using camera traps to document wildlife, including predators and prey species, throughout central and southern Belize. Because jaguars are uniquely identifiable from their pelt patterns, we can count individuals, monitor how widely they roam, how long they live and understand their preferences for different habitats or landscapes. We are starting to learn how human activities, such as large-scale land clearance, can displace wildlife, pushing predators like jaguars and pumas into conflict with people and encouraging the spread of coyotes, which appear to be thriving in environmentally degraded areas of Belize.

Bringing it together: testing anti-predation strategies– Our team is also working with farmers in central Belize to implement and test the effectiveness of different anti-predation strategies. We assist the farmers in improving animal husbandry on their farms. In return, the farmers keep records of livestock births and deaths, predator sign and sightings, and predation events, and allow us to maintain camera traps on their properties to monitor predator activity before and after changes in husbandry. In this way, we are assessing which strategies bring about a significant reduction in attacks. Currently we are testing predator deterrents (donkeys as guard animals, motion-sensitive light & sound devices, and cattle bells), barriers (night corrals, six-string barbed wire fencing, and electric fencing), and the use of protein banks to negate the need for free-ranging. Our goal is a landscape which is ecologically viable and economically sustainable; a productive Belize in which people and wildlife can coexist. Together we can achieve this.

Contact Information - To report attacks on livestock, or request advice for best practises, please contact: Jaguar Officer, Wildlife Program, Forest Dept., Belmopan; Ph. 822-1524 or 664-4550; Email. jaguar.officer.fd.bz@gmail.com

To download a guide about anti-predation strategies in Latin America, please visit https://www.panthera.org/cms/sites/default/files/documents/Anti-Predation-Manual_English.pdf

For more information about our research, please contact Dr Rebecca Foster via email at rfoster@panthera.org

To follow Panthera's work in Belize, please like the Panthera-Belize Facebook page

For more information about the UB-ERI, please visit www.uberibz.org

Sustainable Harvest International (SHI)

By Bibiana Paquiul

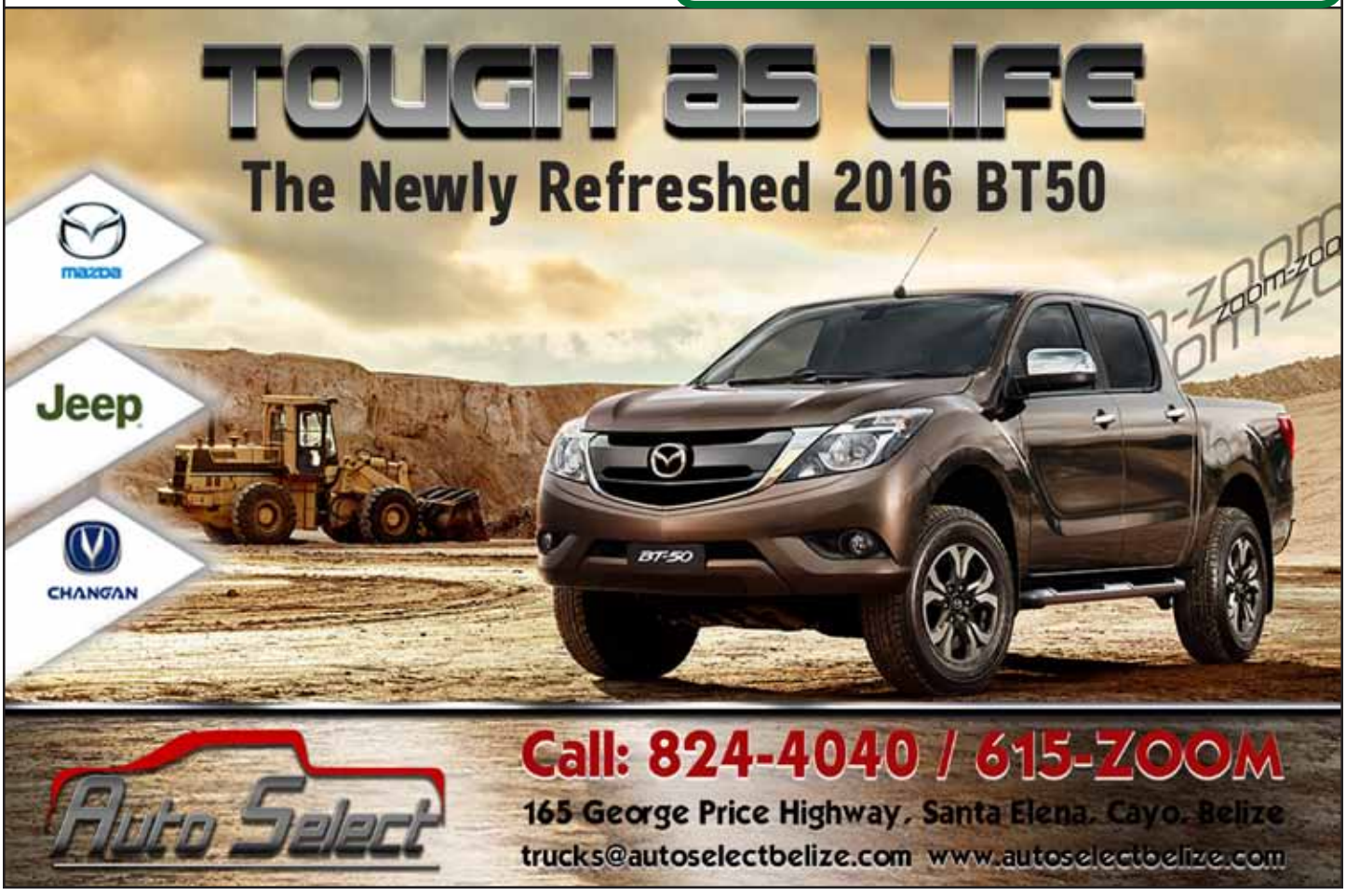
SHI-Belize began its work teaching farmers in Toledo about organic gardening and agroforestry in March 1999 with only 3 staff members who were Agroforestry extensionists with agricultural backgrounds. The project included 40 – 45 families.

Since 2005, when Nana Mensah became SHI-Belize Country Director, the organization greatly expanded in staff from 3 to 9, geographic scope to include Stann Creek and Cayo, number of farmers from 45 to 115, and project scope to include small animal husbandry and micro-business development. At the moment we are in the final stage of completing a project with 21 families in the village of Otoxha; the project was funded as a grant from the Australian government. Under this project we issued 21 sets of tools (wheel barrow, machete, level, fork, post hole digger, etc), developed various projects including backyard home gardens, animal husbandry (chicken, rabbits, pigs), tree planting (cacao, avocado, coconuts, etc.), tree nursery, farm diversification, irrigation, and training for all 21 families in composting, insecticide, fungicide, organic chicken feed, pig rearing, and small business development.

Under Mr. Mensah's leadership, which ended in 2015, SHI-B has become the leading organization in the organic farming/gardening movement in Belize establishing the Diane McCormack Seagren Research Center (DMS) and implementing various grant projects in collaboration with Rotary, Red Cross, Global Environment Facility (GEF) Small Grants Program, Inter-American Foundation (IAF), Australian Aid, as well as the Ministry of Agriculture.

The SHI-Belize Annual Organic Forum and Fair, held on the last Friday and Saturday of October, was begun in 2009 with 12 booths and 18 farmers. It, too, has expanded to 15 booths; people from all over the country attend and learn about organic farming and sustainable farming practices. SHI-B partners with organizations and schools including Ya'axche, BelizeBag, Tumul Kin Center of Learning, and Development Finance Corp. (DFC).

The senior project officer of the Belize Sugar Cane Farmers Association for over 5 years, Mr. Leonardo Pech, is taking over as SHI-B's new country director. Mr. Pech comes with over 20 years experience working in the agriculture field providing technical expertise and guidance to small-scale farmers from his research in pests and disease management in citrus and development of environmentally friendly crop management programs to increase farm yield. Mr. Pech was the first agronomist in his community with a bachelor's degree in agriculture science with emphasis on sustainable agriculture and natural resource management in the humid tropics from the university, E.A.R.T.H, in Costa Rica in 1995.



Sheep Projects in Belize

The Taiwan Technical Mission (TTM) in Belize, funded by International Cooperation and Development Fund (ICDF), signed an agreement with the Belize government in December 2015 to assist with a 3 year small ruminant project which will run until December 2018. The project is a joint project between Belize and TTM, whereby funds are granted to the host country. TTM will assist with management and Mr. Pin-Nan Lee, a small ruminant specialist is assigned to oversee the new Central Farm sheep breeding facility. The budget of the project is US$1.274M over 3 years, with US$350K provided by the Government of Belize.


Breed Assessment of Barbados Black Belly

While the project was initially planned to include both sheep and goats, a decision was made to focus solely on sheep improvement during the duration of this TTM project. One estimate of sheep population in Belize shows 7,000 head and another tally including both sheep and goats indicates about 15,000 head, with up to 90% of that, or 13,500 head, being sheep. 250 farms, mainly in the Orange Walk and Corozal Districts with some in Belize District currently raise either purebred or crosses of Barbados Black Belly and Dorper breeds.

Taiwan's plan is to import 180 head, 30 rams and 150 ewes, from southern Mexico. 10 rams and 50 ewes each of Dorper, Barbados Black Belly and Pelibuey breeds will arrive in October 2016, and be housed at Central Farm's new sheep facility under construction now. The breeding program utilizing these new animals will provide purebred offspring which will be available for sale after reaching 4 months of age, beginning June 2017.


White Pelibuey


Brown Pelibuey

Staff from TTM visited several sheep operations in the Yucatan Peninsula in June 2016 investigating sources for the breeding stock. The photos accompanying this article were taken on that trip and shared by TTM.


Barbados Black Belly & Brown Pelibuey

The new barn will be 41 m x 77 m, in 2 sections, separating male and female. The concrete construction will feature slatted wooden flooring for drainage and cleaning. 8 hectares next to the new building will be divided into smaller pastures. Aries and Transvala grasses have been recommended for these. TTM's grazing plan is seasonal; during the dry season animals will graze during the day and be inside at night, and during the rainy season they will be inside during the day and graze at night.


Dorper

TTM's project also includes farmer training of feeding and nutrition and the importation of artificial insemination (AI) equipment to collect and freeze semen. Feed sources such as corn silage, brewers grain, citrus pulp, molasses and sugar cane pulp are all being investigated and evaluated. The training courses, starting in 2017, will be for 3-5 days per course, with 4 topics a day, and will be held both at Central Farm and out-district. Taiwan sees potential for this industry to expand throughout all 6 districts and the initial project will designate 2 nuclear farmers in each district who are willing to expand and have the necessary capital. A Sheep and Goat Association, separate from Belize Livestock Producers Association (BLPA) will be organized in early 2017.

FAO Sheep Project in the North

Another sheep project in country is also running somewhat concurrently to the TTM sheep project. The European Union (EU) has donated Bz$2M for a program running from January 2015 through June 2017, which is being implemented by the Food and Agricultural Organization (FAO). This EU/FAO project is targeting 60 sheep farmers in Orange Walk and Corozal Districts. Like the TTM project, they will be importing 30 head of purebred animals (5 rams, 25 ewes) from Mexico, which will be used for breeding and their offspring sold. The breed selected for this project is the Katahdin.

Between these 2 projects, Belize can expect to have more sheep production and dramatic improvements in carcass quality, enhancing local sales and potentially enabling Belize for sheep exportation. Ministry of Agriculture (MAFFESD) has been promoting several agricultural diversification projects especially targeting Belize's north, in efforts to address the unsure future of sugar cane revenues.

Forest Fires - All is Not Well in Belize

By Angel Tzec

The rainy season has started; no longer the gloomy grey dome of smoke choking us and distressing tourists because the rains have cleared the air from the fires of the dry season. Incredibly extensive and costly fires have persistently been devastating the countryside and biodiversity year after year. Before Belize gained its independence fires were considered a very serious business. Extension officers of colonial Belize worked with farmers in the fields every day of the week and issued official fire-permits to farmers to burn their milpa clearings. It was mandatory that all cleared land have a 6-foot wide fire-pass around the entire perimeter. The extension officer of the area would ensure that the fire-pass was well done and up-to-date for the *controlled incendiary*, as it was called then. It was against the law to burn without a fire-permit. Burning without a fire-pass and burning the adjacent forest in any extensive way was a crime and penalized by the law. If a farmer burned a neighbour's premises and crops he was liable and had to make compensation for the damage which was determined by an authorized government "valuator"; it was a serious matter.

The Agricultural Fire Act is all but forgotten in Belize; a significant percentage of the natural forest environment has been destroyed by fires started by farmers who do not make fire-passes and do not monitor their fires. Not only forests are being destroyed, but farmland, plantations and houses as well. In 2012 50% of a 10-acre commercial mahogany plantation was destroyed. The fire burnt for many weeks moving up the El Pilar road to another farm that was burned down and another 7-year mahogany plantation even though the owner and his family fought the fire desperately. The fire burned more than one mile of forest before reaching a coconut farm where that farmer lost 50 bearing coconut trees, a camping site and infrastructure. This year that same farmer lost a farm house, all his bearing fruit trees and 200 young coconut plants. In 2015 beekeepers of the Honey Producers Cooperative realized that the honey-crop that year was being influenced negatively by not only the effects of climate change but also wild fires that were threatening the physical apiaries. A beekeeper in Vaca Falls lost his complete dwelling house, some timber and 10 colonies that year.

A healthy forest is not only the lungs of Belize but is a whole universe of invisible living things like fungi, actinomycetes, bacteria, insects, worms, creeping and crawling creatures and of the visible ambulant biodiversity that we call wildlife. This universe of creatures...visible and invisible, in many ways contributes to keeping the planetary environment in equilibrium. The apparently insignificant ones do work to sustain the conversion of all organic material of the forest to rich organic soil which in turn sustains the trees.

It's time to start a propagation nursery to produce millions of trees to reforest the scorched forests, to regenerate the destroyed species. We also need an organization: **People Against Forest Fires**. Let's come together and do it. My contact number is 669-6713, my email is: angeltzec@yahoo.com

Surinam Cherry
Mary Susan Loan

Surinam cherry bushes grow all over Belize; they have pumpkin-shaped fruits that are botanically berries, but resemble cherries. If you are not familiar with Surinam cherries, imagine classic bing cherries with eight ribs growing on beautiful glossy evergreen leaved bushes. The cherries/berries look like cherries, but do not taste like cherries. The taste of the Surinam cherry fruit when ripe is said to resemble fig, mango, green pepper, with undertones of balsam and apricot, and even a touch of pine-like resin and tobacco aftertaste. Before the fruits are ripe they are tart, acidic and bitter tasting. It is best to pick only the fruits which are dark red and readily fall into your hand. There is a rare variety of Surinam cherry that is dark crimsom-to-black in color; that is described to be much sweeter with no bitter aftertaste.

Surinam cherry, *Eugenia uniflora* genus, a member of the Myrtaceae family, is also known as pitanga, cayenne cherry, Brazilian cherry. It is classified as a shrub but commonly referred to a tree as it can grow to twenty-five feet in height. This fast-growing conically shaped shrub makes an attractive hedge or wind break with dense branching foliage, aromatic spicy resinous leaves ranging from rose to coppery color that turn dark green and glossy when mature. The flowers are showy and white with four petals and numerous stamens. Fruits typically produce three weeks after the flowering. Bushes can produce one or two crops per year, from March to June and from September to November in Belize. In some parts of the world, Surinam cherry bushes are considered to be an invasive weed.

Surinam cherry is named for the origin of the bush. Suriname is a country in the northern part of South America. This bush now grows in most tropical and sub-tropical areas of the world, thanks to the sea-faring explorers who introduced the bush to India, Italy and eventually to the Americas.

Most often the bushes are reproduced from seed, but can be grown with grafting or air layering. There is generally only one seed per fruit and remains viable to sprout and grow for about one month; it takes three or four weeks to germinate once planted. Some bushes produce berries in two years; others may take up to five or six years to bear fruit. Bushes can be planted in full sun or partial shade approximately six to ten feet apart in the orchard, three feet apart for hedgerows. Watering is crucial for early plant development. Once the bushes are established, they are drought-resistant with a long taproot. Surinam cherry bushes thrive in almost any soil except wet and boggy or salty conditions. Bushes are considered to be pest-resistant, but may be susceptible to fruit flies which can be controlled with soap or neem sprays. It is challenging to harvest the cherries for market as they must be picked ripe and are thin skinned, very juicy and highly perishable - difficult to transport.

Surinam cherry fruits are a good source of vitamins A and C, iron, iodine and contain antioxidants. Leaves are considered medicinal and are used for calming stomach aches, and febrifuge and astringent purposes. Other pharmacological properties include, anti-hypertensive, analgesic, antiviral and antifungal. Leaves also are used as a remedy for life-threatening infections. Pruned branches may be spread on terraces and around walkways to help repel flies and fleas when the pungent oils are released from the leaves.

There are many creative recipes for Surinam cherries. The pulp or puree can be stored for several months in the freezer and used in recipes. Here is a simple recipe for jam: 3 cups washed and deseeded cherries, 1 cup sugar, 3 tablespoons lemon, lime or sour orange juice, 1 cup water, one packet pectin (optional). Place cherries, water, sugar, citrus juice in a pan, bring to boiling, then turn down to simmer for approximately 1/2 hour or until mixture gels. If using pectin, sprinkle pectin on top of hot fruit mixture and stir in. Pour into sterilized heated jars and tighten the lid. The jam can also be stored in the refrigerator.

Surinam cherry drink recipe: 1 1/2 cups washed, pitted and pureed cherries, 4 cups water, 1/2 cup sugar, 3 tablespoons lemon or lime juice. Mix in blender, chill and serve. This recipe can also be made into ice cubes.

Delicious, healthy curry recipe: 2 cups Surinam cherry puree, 2 teaspoons ground turmeric powder, dash cayenne powder, 1 tablespoon. honey or sugar, 1-2 cloves garlic, 1 small onion, 1 cup water, a splash of balsamic vinegar, 1/4 inch of ginger diced, 1/8 teaspoon black pepper, 1/2 teaspoon salt (or to taste), 1/4 cup coconut oil. Saute onion, garlic and ginger in oil until onion is translucent, add water, cherry puree, sprinkle with turmeric powder, add dash of cayenne powder, honey or sugar, vinegar, pepper and salt to taste.

Picture Courtesy Rissy Guggenheim

Blue Moon Over Big Falls
By Jenny Wildman

Chocolate lovers congregated for the gala event of the 10th Annual Cacao Festival, now being called the Chocolate Festival, on May 20, not quite the full flower moon evening (full moon was actually Saturday) but close enough to add magic to the magnificent setting around the pool and lush tropical gardens at Big Falls Lodge, Toledo.

This year the exhibitors offering samples of their products and very informative discussion regarding their procedures and mission were:

Xoco, an event sponsor who focuses on supplying high end quality cacao beans to chocolatiers worldwide and now farming in Belize.

Cotton Tree, who makes chocolate exclusively from beans from the Toledo District. Each batch of chocolate is created from the beans of a single farm and any flavours added are fresh and locally grown.

Moho, who buys beans from Maya Mountain Cacao and produces a wide range of exciting products from their Belize Tourist Village location. They gave us some very tasty samples of quality creations.

Belize Chocolate Company, creators of Kawkaw chocolate on Ambergris Caye, who source organic beans directly from farmers. This year we sampled from their wonderful chocolate fountain. Delicious.

Che'll Mayan Chocolate, owned by Julio and Heliadora Saqui. Julio is always a mine of information and produces a fine product and offers a splendid Cacao tour.

Choco del Sol, who buys in Belize and exports to makers in Germany and Austria . We had samples of 60% and 82% chocolate - German style.

Ix Cacao of San Felipe, owned by Juan and Abelina Chowho, who produce a variety of cacao products from harvest of their own farm, which one can visit to see operations.

Ix Cacao is the Mayan goddess of chocolate, believed to be mother earth; her story is long and her talents, many. She sends her message to appreciate nature, nurture the mind and body and enjoy life.

Well, that is just what we did on Friday night. Hors d'oevres were contributed by the lodge and other dedicated business establishments in the area: conch fritters, hummus and veggies, shrimp, chicken bites, sausage, and brownies proffered by smiling faces. Wine was copious (thank you Walucos), the perfect accompaniment to fine food and chocolate treats.

When the music started the booming voices of the Garifuna Collective pulled the multitude closer and closer and soon hips started shaking, feet tapping and lips moving to the great renditions of well-known Garifuna songs. A backdrop video of our beloved Andy Palacio added to the amazing stage presentation. Thanks to Rob Hirons for being a marvelous host and congratulations to the Belize Tourist Board (BTB) and Toledo Belize Tourism Industry Association (BTIA) for making this an event to remember.

Day 2: The sun came up, time to tube down the river and hit Front Street in Punta Gorda for more vendors , performing artists and cultural displays, all with the theme of chocolate. This is where Toledo shows what it can create: a quality product and a fun venue starting at the Uno gas station passing Cotton Tree store and stretching all the way to the library, a lively street party in the making complete with good Belizean food offerings and cool spots to relax.

Day 3: The grand finale was held from noon on at the technical high school with more focus on the Mayan culture, music, dancing, art, competitions and food.

The Chocolate Festival is an excellent annual event which takes place on the weekend closest to our Commonwealth Day, May 24 (now called Sovereign's Day), a celebration of the 54 independent or sovereign states on the birthday of Queen Victoria.

So if you missed out this year mark your calendar, indulge in your chocolate fantasies and decide how you will participate in 2017.

Photos Courtesy Tanya Wildman

The Majestic Mango

By Deborah Harder

Stately, massive mango trees are the glory of a tropical farm. No other fruit is anticipated with such eagerness; no other fruit tree is so abundant to the point of overwhelming when they bear well. The varieties are as different as apple varieties and each one may have its own loyal devotee.

Grafted mango trees begin to bear from 2 to 3 years from planting and continue for many, many years. As I write, the view through one of the windows of our house is fully dominated by the foliage of a mango tree about 20 yards away; it may be 40 years old and is bearing again this year. It used to bear only a type of mango known locally as "Eleven" or "Black" mango, a small flavorful but extremely hairy mango prized by Belizeans. Some years ago my husband sawed off all the main branches but one, and when young shoots sprouted out, grafted on them a variety called Haden, which we wanted to have on our farm in order to supply graft wood for the nursery. The power of the old tree pushed the young shoots to grow much faster than a young tree grows; so within a year or two we had again a busy, full-sized mango tree now bearing Haden mangoes, with the exception of one branch. That one still bears Black mangoes as a memorial, and to satisfy hungry local visitors.

The main hindrance to mango fruiting is the blight that frequently occurs when the weather is rainy at the time of blooming in the winter. Sometimes they can blossom 2 or 3 times and still blight, or finally set. This year we have a Cambodiana tree that set some normal, early fruit, but then still bloomed near the end of the dry season when blight was not a threat, to set a good crop that in July were 1 inch small green mangoes as the early crop is already ripening.

Mangoes drop from the tree when ripe, and, if the tree is tall, can bruise or smash. Therefore, picking mature but green mangoes from the tree is recommended for most varieties which "after-ripen" well.

Mango consumption begins before the fruit is mature, when green drops are gathered, peeled, sliced and eaten with salt and pepper or vinegar. They can also be cooked as a vegetable, resembling potatoes with a sour flavor. Individuals who are hungry for applesauce can cook, mash and sweeten green mangoes for this purpose. In an ironic twist, one Belizean expatriate has her sister send her canned green mango sauce in the US, to satisfy her longing for tropical apple replacements in the land of apples.

When the fruit is mature, mango consumptions really begins. You will want to eat as many raw as possible. They can, of course, be used in muffins, pies, and cobblers, but they are so good "as is" that we hardly do. They can also be preserved in a number of ways. Either sauce or pieces may be canned with or without sugar; if packing raw, do not fill the jars quite to the neck, as they tend to foam up while cooking, which can hinder sealing. This tendency can be countered by not removing the jars immediately from the boiling water; let them cool off in the canner for half an hour or so first. They can be packed down and canned in their own juice or packed loosely and covered with water and a little sweetener: 1 teaspoon of sugar is enough per quart, as mangoes are already sweet. Mango sauce from ripe mangoes is made by putting raw or cooked mango through any type of food strainer, even as simple as a colander. Mango sauce can be eaten "as is" or diluted with water for a beverage, alone or in combination with other juices or added to smoothies.

Drying mangoes works well, but not outdoors in sunshine; they are too juicy and will ferment and attract many flies before they are dry. Various solar dryers may be used; we use a stovetop dryer based on a double boiler principle. Using this method, mango slices can be dried, but even more commonly we fill up the pan with approximately 1 inch layer of mango sauce and dry it down to the best fruit leather you'll ever taste. It will dry

faster if you stir it occasionally in the juicy stage; when half dried, smooth it well and leave it undisturbed until dry. When leathery, cut into strips, peel it off the pan, roll it up and store it in tight containers.

Mango varieties are very different from each other, more so than many other fruits. For this reason, you will want to be familiar with the more common grafted varieties available. You can grow good mangoes from seed, but like apples, mangoes are not true to type and may yield a very different fruit than the parent three did. It may be nice, but it may also be small and hairy or have other undesirable characteristics. In our neighborhood there are seedling mango trees yielding outstanding fruits that are named and prized by their owners. But if you want to be sure to have good mangoes, you should plant grafted trees. The following is a catalog of mango varieties we appreciate, most of which we carry in our nursery, although not all of them at all times. The following varieties are listed roughly by earliest to latest harvest times:

Glenn: good-sized, smooth and mild tasting mango with a pretty, colorful skin. It tends to get wormy more than some varieties, but Glenn is the earliest mango we know of.

Cambodiana: (our favorite early mango) fairly small, yellow, fibreless mango, delicious raw and prized as one of our best canners. It is also valued as a solid mango that does not bruise as easily as other varieties.

Tommy Atkins: big red mango popular in the market, not the best-tasting or most fibreless but dependable and heavy bearing. When Tommy are abundant, I use a lot for mango leather after straining out the hair.

Julie Dwarf: rather small mango with a uniquely delicious flavor from a truly dwarf tree that does not bear very dependably.

Early Gold: juicy mango with such a tough skin that it can be bitten open, squished up, and sucked out (prized by children). Early Gold is also good for juice and sauce.

Haden: (an old variety well-known by older Belizeans) big and yellow-green, similarly well-liked as Tommy Atkins.

Carrie: not very big, very soft with a special flavor you can't beat.

Palmer: an oblong, delicious red mango on a vigorous tree that grows tall and bears well.

Kent: a big, tasty and smooth mango, good for canning.

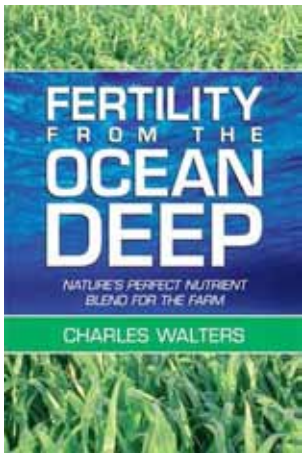
Keitt: green, delicious, huge - weighing from 2 – 6 pounds, late, and a good seller.

Gabb Julie: sweet and tasty when ripe, one of the latest, sometimes even later than Keitt, often bearing quite heavily.

Picture Courtesy Rissy Guggenheim

Book Review by Dr. Stephen F. Zitzer

Fertility From The Deep
Nature's Perfect Nutrient Blend for the Farm
Written By Charles Walters



The hypothesis that the diversity and abundance of chemical elements contained in ocean water could provide "nature's perfect nutrient blend for the farm" was tested within the context of innovative farming methods proposed and implemented by Dr. Maynard Murray in the mid-20th century. In his book, Mr. Walters describes the inspirational, scientific and practical evolution and implementation of Dr. Murray's ideas and the experiments he conducted to revolutionize modern agriculture in terms of providing healthier food for an increasingly unhealthy human population. Dr. Murray had taken his medical training at the University of Cincinnati and spent a decade testing the art and science of his profession. While working many years in Boston hospitals, Dr. Murray became increasingly appalled by the caseloads of patients suffering from various degenerative metabolic disorders including cancer, diabetes and arteriosclerosis. Subsequently, he became convinced that "the human race really was what it ate". The main problem, he reasoned, was that the quality of the food being consumed by humans "was deteriorating even while achieving cosmetic beauty". Consequently, he began his life-long quest to understand how to improve the nutritional and disease-fighting qualities of both livestock and human food crops through various unique and innovative ways that use ocean water and ocean solids in farm production systems.

Dr. Murray's initial link to the potential, almost magical, powers of ocean water's universal composition of at least 92 mineral elements to cure both unhealthy soils and living organisms, occurred as he relaxed along the fishing docks of Boston. His key observation was that the incidences and kinds of the metabolic diseases he witnessed in Boston hospitals were almost non-existent in marine animals. Charles Walter, the author, describes Dr. Murray's inspirations occurring while, "A roller comes in. It erases marks on the beach. At some uncertain point, the mind comes to life again. Unburdened thinking time always serves up new connections". Thus, Dr. Murray became the global champion of the use-application of the fabulous wealth of diversity of trace elements found in ocean water to improve plant and animal nutrient content and their subsequent impact on improving health and stress resistance. He also fully recognized the huge positive impact naturally healthy plant and animal populations would have on reducing the need for the use of fossil fuel-based pesticides. Furthermore, many of Dr. Murray's early hypotheses were later validated by the emerging sciences of plant and animal biochemistry and genetics.

Mr. Walters, founder and former executive editor of *Acres U.S.A.*, documents the many successes and significant unresolved challenges that Dr. Murray experienced during his 50 plus years applying his intellect and energy towards reshaping the health of the entire planet. Unfortunately, the majority of Dr. Murray's professional writings were lost, and Mr. Walters relies on much of his information about Dr. Murray's experiments and results from interviews with his co-workers and colleagues. Additionally, Mr. Walters integrates new discoveries in plant and animal sciences since Dr. Murray' death - discoveries that continue to create an even stronger nexus to Dr. Murray's legacy as an agricultural pioneer, even comparable to Thomas Edison's contributions to our understanding and use of electricity. At the end of his narrative, Mr. Walters states, "While we wait, the ocean abides and ocean-grown grass waits in the wings for those with the wit to use it".

Breakfast is Served!
You Name the Dish

What would you call a dish of green banana flour, seaweed, powdered milk, sugar and peanuts with water added and cooked for 15 minutes? That nutritious combination is being developed into a product at the Central Farm food processing test kitchen for the school feeding program. The Ministry of Agriculture, Forest, Fisheries, the Environment and Sustainable Development (MAFFESD) project, headed by Anna Howe, was started in July 2015 with the help and direction of a food specialist to find the combination of ingredients to (1) use local ingredients (2) make a tasty, nutritious breakfast food for the school feeding program at minimum cost, and (3) explore the marketability of such a product. Anna and her crew of 5 are testing packaging material to determine the effect of light and climatic conditions on the shelf life of the product.

The use of green bananas rejected for export because of size or appearance and donated to the trials by Fife Banana minimizes the cost of the major ingredient. The kitchen test crew peels and dries 50 pounds of green bananas at 80°C (176°F) for approximately 20 hours, then grinds them into flour before adding the seaweed (*Gracelaria* and *Euchuma ssp*, both types of red algae, obtained from the Placencia Producers Cooperative in Placencia), powdered milk, sugar and either ground peanuts chocolate or cinnamon as flavor. Peanut and cinnamon flavors were selected after testing coconuts, which was too mild a flavor, and pumpkin seeds, which went rancid too soon due to fat content. The product is currently being tested in a lab in Guatemala to determine its nutrition value. It already passed the taste test with school children.

The product will be packaged in large sizes for the school feeding program but Anna and her crew have not decided on the size or packaging material for commercial sales. They are testing 3 and 9 ounce aluminum packages with and without a clear plastic front to see the product. The 3 ounce package makes 2 servings; 9 ounces serves 6.

Now for the naming of the product! Anna wants help deciding on what to call the product which is 2/3 green banana flour. The Belize Ag Report is offering a prize of $50 if your suggested name is chosen for the product by MAFFESD's Central Farm Food Processing Lab. Send your entry to Belize Ag Report, P.O. Box 150, San Ignacio, Cayo or email it to belizeagreport@gmail.com by September 1. One entry per person.

Rainy Season War

By Wiley Forrest Tackitt

The rains have fallen, the flowers and plants are blooming and the mosquitos are buzzing. That high pitched sound there little wings make in the night time is more than annoying, mosquitos are Vectors of Malaria, Yellow Fever, Chikungunya, and now a new player....Zika!

Most of the above mentioned are transmitted by the same villain, *Aedes aegypti*, which is distributed worldwide, except in the coldest of places. Female mosquitos require blood meal for the protein required by her developing egg brood. Dusk and dawn are active feeding times for mosquitos, and we all know the wet season bed time ritual mentioned above .....hearing, but not knowing where the attack will eventually come. Vector transmission takes time, as the virus must make its way from the mosquito's gut, through the proboscis (mouth parts), and into your blood stream. Random daytime feeders usually get smacked by the second gulp, creating a short last meal, and nothing swimming in your bloodstream, but Zika research indicates heavy daytime feeding and transmission. I don't really know how they verify this assumption, but I digress.

Snakes kill 50, 000 people worldwide per year, the Gates Foundation reports more than 725 million deaths attributed by mosquito borne diseases, and that is down quite a bit from ten years ago. Zika is not really new, first identified in 1947 in Zika, Africa (hence the name), cases and spread have been slow and sporadic, until very recent months, more on that later. Please give latitude to the fact that real research and numbers are just now being made available, and by time of publication all mentioned research and numbers may be outdated. This article is intended to raise awareness of the potential damage that this virus presents, and control measures to be used in battle.

May 2015, the Pan American Health Organization (PAHO) issued an alert of the first confirmed case in Brazil. Centers for Disease Control has now raised alert to level 1 as of February of this year, and Zika has now currently spread to 46 countries. Zika symptoms usually begin to present just a few days after transmission, symptoms include mild fever, rash, muscle / joint pain, and fatigue. Duration is usually 2-7 days, and 80 % of infected patients show no symptoms at all. That doesn't sound so bad compared to Dengue, which has over 10% mortality rate, and has strickened more than 400 million. Symptoms include sever joint pain, very high fever and possible Dengue Shock Syndrome. Bad painful stuff, and we don't need to discuss the severe side effects of Malaria, but Zika has some frightening twist.

Centers for Disease Control (CDC), has issued a blunt recommendation, if you are a women who is pregnant, you really should not be heading south. Infection with Zika virus in pregnant women is the cause of a horrible birth defect, Microcephaly (children with small heads), and other severe brain abnormalities in babies. In Brazil, where it all started, there are 1,434 confirmed cases and more than 3,000 waiting to be confirmed. The virus has now been detected in amniotic fluid, placenta and fetus brain tissue. Columbian officials report 13,500 suspected cases and are bracing for more than 100, 000 possible cases by years end. Again, numbers are all over the place, due to late government response in all countries and lack of proper testing procedures. There are now blood tests to identify virus, but currently no preventive or vaccines for treatment.

Why the rapid spread, new research shows possible relationship between Dengue, and the spread of Zika. There has been a heavy increase of Dengue throughout Central and South America the past few years, and latest test confirm that the spread of Zika is highlighted in areas of previous Dengue outbreak. People who have had even mild symptoms of Dengue are most at risk as our new virus is using antibodies left over in bloodstream from original Dengue fight, to Trojan horse their way into cell undetected, and replicate very fast. This is what has allowed a previous mild virus to explode, but may also be the viruses Achilles heel and help us create a potential vaccine.

Sounds like a good place to stop and declare future victory, but here comes that twist and why we should worry. New research confirms sexual transmission (intimate contact), of the virus, and can persist in semen for many months, even after a mild infection. The U.S. CDC reports no locally acquired cases, travel associated cases at 934 and sexually transmitted cases at 13. Until just very recently, U.S. health officials presumed low risk of Zika virus, but with thousands of men returning to US every week from these infected countries and the very real possibility of the virus hitting gulf shores by end of summer, it is time to take action.

Mosquito borne disease transmission has always been a cycle between virus, vector and host, but now that that we have a virus

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AG EVENTS

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

Mark your calendars for Sustainable Harvest's Annual Organic Fair, which will be held on Friday October 28th and Saturday, October 29th, 2016. Further information contact SHI as per their advertisement on pg 23.

The Food and Agriculture Organization's (FAO) World Food Day, will be held on 14th October, 2016, at the National Agriculture and Trade Showgrounds, Belmopan.

A **Cattle Auction** for Brahman Breeding Stock will take place in Spanish Lookout on September 10th. See page 20 for details.

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	↑ $9.81 Bz/Gal	↓ $5.46 Bz/Gal	↑ $6.90 Bz/Gal
PREMIUM	↑ $10.51 Bz/Gal	↓ $5.86 Bz/Gal	↑ $7.40 Bz/Gal
DIESEL	↑ $8.73 Bz/Gal	↓ $5.59 Bz/Gal	↑ $5.20 Bz/Gal

NATS/Agric Show 2016
By Mary Susan Loan

The National Agriculture Trade Show (NATS) name has morphed into *Agric Show*. The 2016 Agric Show, held on the fairgrounds in Belmopan from April 29 – May 1, drew 39,500 visitors. The 50 acre plus fairgrounds have been updated each year with a vision to eventually use the NATS fairground for a year-round Saturday marketplace with new barns, a permanent horticulture garden and tilapia farm as a training ground for future farmers in Belize with the support of Minister of Agriculture Gaspar Vega. Mr. Vega is dedicated to helping small farms succeed with the goal of helping Belize reduce its dependence on imports and become more secure in food production and distribution.

Some highlights of the 2016 Agric Show included a showcase farming exhibit created by Central Farm of crops that grow well in Belize to inspire Belize famers and backyard gardeners. The innovative cooperatives section of the fair featured many wonderful products made by creative agro-processing villagers including plants, jams and jellies, hot sauces, juices, soy milk, moringa and hand crafts.

Ever Blandson, owner of a thirty-eight acre farm in Valley of Peace was recognized as Senior Farmer of the Year. Woman Farmer of the Year, Maria Consuelo Lara, is from Trio Village in the Toledo District.

Eric Can was recognized as Junior Farmer of the Year. Eric lives in San Jose Succotz, in the Cayo District. His specialty is beekeeping and growing vegetables. All these farmers have diversity and agro-processing with value-added products from their crops.

The Agric Show also included a rodeo, animal exhibits, an amusement park, many entrepreneurs, communication companies and an array of food vendors.

Rainy Season War...Continued from page 31

which can be possibly transmitted sexually and cause serious birth defects, we have a disease that strikes at the heart of what keeps human kind going as a species.....the ability to reproduce. I do not know what will happen in the coming months with all the research going on, but I do know what needs to happen here locally to protect us starting tomorrow, and that is the war on standing water.

Anyone remember my suggestions for control of termites one year ago? Some of you may have thought about that article Mid-June when we had those first rains and all those swarms began, I am still sweeping up tiny wings from under the furniture. Anyway, take those vigilant structure inspections I recommended and apply them to your entire property. We are fighting standing water that can accumulate in any container or depression, and eliminating it or treating. Take your morning cup of coffee for a walk as often as possible, and look for mosquito breeding sites. Habitat modification can be as simple as disposing of old tires and cans at the back of your property, or eliminating large standing bodies of water with back fill soil. *Aedes aegypti* is not called tree hole mosquito for nothing, it can develop in just a few ounces of water, so be very careful to inspect every inch of your property and if you find a hole that can hold water, fill it and plant an orchid, if it is too large to fill you can treat it with an environmentally friendly insect growth regulator to stop mosquito larvae from developing into adults. Some of those products include mosquito dunks (Bt), or altosid which contains the insect growth regulator Methoprene, both approved by Belize Pesticide board. These product last for more than a month and keep mosquitos from reaching biting and vectoring maturity. Belize Ministry of Health is available to answer any questions about treatment, and my environmental company offers site assessments, free of charge, to eliminate breeding sites with habitat modification, or environmentally friendly solutions to help with mosquitos or any pest. Feel free to call, and if you have a small piece of property, please enlist the help of your neighbors and create a village wide mosquito program which will help everyone. War on Mosquitos!

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Hemp... Continued from page 3

for food crops and they require expensive and toxic herbicides and pesticides. Hemp is easily grown on marginal land not suited for growing food. There is greater soil conservation and nearly non-existent needs for herbicides, pesticides or fertilizers in farming hemp.

Other methods for producing sustainable agri-fuel is the *trans-esterification* method that converts seed oil into biodiesel fuel and the *cellulosic* method that converts cellulose from non-food sources such as trees or grasses. Hemp is suitable for both of these processes. It is one of the most cellulose dense plants on earth, containing 77-80% cellulose, while trees are only 40-50% cellulose, and switch grass is a mere 37% cellulose. Hemp yields 4 times as much fiber per acre as the average forest and is one of the lowest costs to highest yield crops. But the best part of hemp may be that it is like a CO2 sponge, readily absorbing much more CO2 in its short growth cycle than many larger plants.

Professor Richard Parnas makes adjustments to the biodiesel reactor
Image provided by University Communications

In Canada where industrial hemp is legal to grow, farmer Paul Bobbee discovered the many benefits of producing biodiesel fuel from hemp when he had a surplus of hemp seeds. Instead of tossing them, he turned them into fuel and found that diesel made from hemp had better cloud point and cetane values than biodiesel made from other oils.

Dr. Richard Parnas, Professor of Chemical, Materials and Biomolecular Engineering at the University of Connecticut, uses virgin hemp seed oil obtained from Canada to create biodiesel using the trans-esterification process. His hemp biodiesel shows a high efficiency of conversion whereby 97 percent of the hemp oil is converted to biodiesel. It passed all laboratory tests, even showing properties that suggest it could be used at lower temperatures than any biodiesel currently on the market. Parnas points out that if farmers could grow hemp they might be able to produce enough fuel to power their whole farm with the oil from their seeds. The University of Connecticut holds a patent on a biodiesel reactor system that could be easily customized to make biodiesel from hemp trans-esterification process.

Alternatively the cellulose method could be the key to making biofuels clean to the point of becoming carbon neutral. Currently there are several major universities researching cellulosic biofuels and methods are being developed to convert cellulose into a fuel at very low cost. George Huber of the University of Massachusetts and Bruce Dale of Michigan State University believe that cellulosic fuels are key to solving the political, environmental and economic problems associated with fossil fuels.

A joint venture between Syngar of Canada, ANW of South Africa and Discovery Minerals of California is working toward developing projects that will utilize a proprietary technology to reduce costs and speed the pre-treatment of hemp cellulose to form a kind of slurry suitable for fermentation and use in the conversion of hemp to cellulosic ethanol.

Growing Hemp

Industrial hemp brings into the Canadian economy over a billion dollars a year and demands are growing. The US alone spends over $500 million each year buying hemp from other countries for

textiles, seed oil, rope, soap and body care products, paper, high protein foods and many other things and the list is growing. Everything that humanity currently makes from oil could be made from hemp bio-oil including biodegradable plastic.

Twenty-three countries successfully cultivate and process industrial hemp without affecting enforcement of marijuana laws. In fact, industrial hemp has no value as a recreational drug but because many policymakers believe that by legalizing hemp they are legalizing marijuana, it remains illegal to grow in Belize. The Belize government should lift the ban on growing industrial hemp through understanding its history and the tremendous opportunity for developing biodegradable products and encourage farmers and workers toward a cleaner world.

Summary of Advantages of Industrial Hemp

1. Carbon dioxide is released into the air when burning hemp fuel, but is absorbed by the next crop, which can be harvested 120 days after planting.
2. Hemp is a very leafy plant and thus contributes a high level of oxygen to the atmosphere during its growth making up for the loss of oxygen when it is burnt as a fuel, which in turn, reduces unwanted effects of global warming, acid rain and the depletion in the ozone layer.
3. Hemp is naturally resistant to pests and does not need pesticides or herbicides.
4. Very little fertilizers are required since its abundant leaves enrich the soil and release the required nutrients and minerals.
5. Because industrial hemp grows densely, sunlight cannot penetrate the plants, and this means the crop is normally free of weeds.
6. Hemp has deep roots providing nitrogen and other nutrients to the soil that reach ground water so erosion of topsoil is limited, thereby reducing water use and pollution.
7. The same soil can be used to grow hemp for many years, without losing its high quality. Or, it can be used as a rotation crop enriching the soil for other crops.
8. Hemp produces more biomass than any other plant. If grown in Belize for fuel, it is estimated that it could support 100% of all energy needs in the country.
9. Hemp can be used to produce both biodiesel and bioethanol fuel.
10. Hemp can yield 10 tons per acre in 4 months.
11. Hemp biomass can be converted into fuels (methane, methanol, gasoline) more efficiently than fossil fuels (coal, oil) and without the sulfur or acid rain.
12. The increased use of biodiesel fuels would reduce dependence on foreign sources while increasing national agricultural jobs and revenues.

The US alone spends over $500M USD each year buying hemp from other countries for textiles, seed oil, rope, soap and body care products, paper, high protein foods among others and the list is growing. In July 2014 the estimated value of hemp per acre was $21,000 USD from seeds and $12,500USD from stalks.

In the next issues, we will explore the many other uses of industrial hemp such as food, fiber, paper, medicine, and shelter.


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