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Micropropagation Laboratory Established in Belize

Stephen Williams, Micropropagation Laboratory Manager, University of Belize, Central Farm.

The University of Belize (UB) is establishing a commercial micropropagation laboratory in Belize at its Department of Agriculture campus in Central Farm.

The lab, which has been funded partly by European Union funds but mainly by the university, will provide a much needed and highly specialized plant production service to the agricultural sector of Belize.

The advantages of micropropagation - the production of plants on a highly nutritious substrate in closed containers - over conventional propagation - are:

- (a) Starting with small-numbers of crop plants it is possible to produce large numbers for planting material in a short time period.
- (b) Plants produced will be healthy and disease-free.
- (c) Plantations established will be uniform and so produce a more uniform crop.
- (d) The technique can be used for the safe introduction into Belize of new improved crop varieties.

Continued on page 24











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Disease-Detecting Dogs

New research proves canines can uncover citrus canker with higher accuracy than humans. The next step is training dogs to detect HLB.

By Tacy Callies



Reprinted with permission from CITRUS INDUSTRY magazine, February 2012 issue. See <u>www.</u> <u>citrusindustry.net</u> for subscription information.

"Scent detection is a very interesting but old technology," says U.S. Department of Agriculture research leader and plant pathologist Tim Gottwald of the U.S. Horticultural Research Laboratory in Fort Pierce. "People have been using dogs to track and find things since prehistoric times."

But did you know that dogs have now been trained to detect citrus canker in Florida grove, nurseries and packing houses? And as you read this, training is under way to teach them to detect HLB, too.

In 2000, Gottwald began studying canine canker detection, but after the terrorist attacks of September 2001, the dogs he was working with were pulled off the project to be used for detecting explosives and other efforts against terrorism. He resumed his work a few years later with the USDA/Animal and Plant Health Inspection Service (APHIS) detector dog program in Orlando and was making good progress, but the projet was hampered by high turnover in human personnel and dogs. Gottwald's next move (about three years ago) was finding and partnering with J & K Canine Academy, a dog training company in High Springs.

"We have a very stable relationship with the canine trainers – the best I've ever had," says Gottwald. "They use a unique methodology involving a self-discovery system in which the dogs come to recognize themselves what they are looking for. They have been very successful in training the dogs this way."

Founded by former Gainesville Police Department canine handler Pepe Peruyero, J & K Canine Academy has been in business since 1996. Its scent detection division started in 1998 with a University of Florida (UF) project on termite detection, and then bed bugs. "What separates us is we rely heavily on research and academics," says Peruyero, who has also collaborated with the University of Tennessee. "We've developed a proprietary training method system. It is a self-discovery process for the dogs; they are not forced to do it. You have to find the right dog for the job by looking at their natural instincts and drive."He says the average time is three to five months for a dog to complete training for canker detection. When a dog finds canker, the animal will "alert on it" by stopping and sitting in front of the infected tree or fruit.

Peruyero currently has four Labrador retrievers trained to detect canker-infected citrus. By May, capacity is expected to increase to 30 to 40 dogs. According to Peruyero, dogs best suited for the job are larger breeds that are genetically able to run great distances, endure the heat and have sure footing in the sand.

AMAZING ACCURACY

"Repeated runs in the (Riverfront Groves) packinghouse and field (Ben Hill Griffin grove) show the dogs can detect canker with a 98 percent accuracy rate and a 1 percent error rate. I didn't expect this rate of ability in dogs," reports Gottwald, who received a small grant from the Citrus Research and Development Foundation for the project. He says the results shouldn't really come as a surprise, since dogs have 10,000 to 1 million times greater ability to sense volatile compounds than humans.

He cites a previous study in which 14 teams of humans scouts were deployed in a grove to search for canker. Different teams found different infected trees. "Humans are considerably below the 98 percent accuracy rate of the dogs," reports Gottwald. "Most humans find less than 70 percent of infections in the field."

For example, Peruyero recalls a dog that found canker on one leaf with one tiny spot on it in a 2-acre grove that had just been cleared by USDA inspectors as being canker free. The dogs have proven they can find levels of canker undetectable by human eyes, he says.

So the dogs are "sometimes better than us at canker detection," says Gottwald.

Dan Richey, president of Riverfront Groves, had the opportunity to see the dogs in action at his packinghouse. "The level of accuracy was impressive," he says. "It is amazing what a dog can do. While it was very impressive, I am not sure how practical it would be to implement."

INCREASED EFFICIENCY

The J & K canines have proven to be excellent canker detectors, but they aren't meant to eliminate humans from the scouting process, and the dogs require a human handler at all times. "We're looking to add another level of detection for growers, not replace humans," say Peruyero. "This is an enhanced scouting program with more efficiency."

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The Belize Ag Report, P.O. Box 150, San Ignacio, Cayo District, Belize, Central America Telephones: 663-6777 & 664-7272 Editor: Beth Gould Roberson Assistant Editor: John Carr Special Editor: Dottie Feucht Printed by BRC Printing, Benque Viejo, Cayo District, Belize **Submissions as follows:** Letters to the Editor, Ads & Articles to: belizeagreport@gmail.com Deadlines for submissions: 10th of the month prior to publication. We are bi-monthly, skipping January & August. Distributed in Belize & Southern Mexico

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CASSAVA – A Versatile Vegetable

told by Mary Loan of Cristo Rey Village

Cassava, also known as yuca root, manioc, mandioca, sagu, mogo or tapioca, is a popular woody shrub of the Eurhorbiaceae (spurge family). The plant grows easily and produces starchy tubers which are used as a food source. Cassava is native to South America and is extensively cultivated as a short-lived perennial plant in tropical and subtropical regions around the world. Approximately sixhundred million people rely on cassava as a daily principal source of nutrition. The crop has been a staple food since pre-Columbian times (3000 B.P.). Some familiar foods made from cassava include: bread, puddings, beverages as well as an ingredient used interchangeably with potatoes, sweet potatoes and plantains in many dishes. Starch from cassava can be used for producing sugar, acetone and alcohol as well as a potential source of ethanol bio fuel. The leaves and tubers are used for animal feed worldwide. There are three forms of cassava - sweet, bitter, and a non-edible ornamental variety. Bitter variety cassava leaves are used to treat hypertension, headache and pain. The paste from the root is used to treat irritable bowel syndrome. As cassava is gluten free it is used as a wheat alternative for celiac disease. The tubers range in color from white to yellow or red flesh. Cassava plants yield one the highest carbohydrates per cultivated food crop, often exceeding twenty tons of edible tubers and leaves per acre! The roots are rich in carbohydrates, calcium, vitamin C and fiber but low in protein and other nutrients. The leaves are a good source of protein and have significant lysine.



The amazing thing about cassava is that it is very poisonous if eaten raw or not prepared correctly to draw off the bitter principals of cassava, two cyanogenic glucosides of hydocyanic acid (HCN). The toxins are known as "linamarin" and "lotaustralian". When eaten raw or not prepared correctly, the human digestive system will convert this to cyanide poison. Even a few pieces of cassava roots contain a fatal dose of poison. Symptoms of cyanide poisoning include: vertigo, vomiting and collapse and in some instances, death. "Chronic, low-level cyanide exposure is associated with the development of goiter and with tropical ataxic neuropathy, a nerve-damaging disorder that causes neuropathy...." (http:// www.cidpusa.org/cassava.htm). Fortunately, the poisonous substance is soluble in water. The roots must be boiled in water to release the toxins. Soaking for eighteen to twenty-four hours can remove up to one-half the cyanide. Traditionally in Africa the roots are peeled and placed in water for three days to ferment. The roots are then dried and stored to be cooked before eating. Some of the toxins may be removed by squeezing the roots, then cooking them. The liquid used from squeezing and cooking is used as an ant poison. Leaves must also be washed and cooked before consuming.

Continued on page 9

Belize Citrus Mutual



PRESS RELEASE:

20th December 2011

Belize Citrus Mutual held its first Annual General Meeting as an association on Saturday, 17th December 2011 in Maya Centre Village in the Stann Creek District. The meeting reviewed the progress of BCM over the past two years, considered its financial statements and appointed auditors for the current crop year. Additionally, the interim board of seven directors was confirmed, together with two additional directors who were included to expand the representation of small growers. The expanded Board of Directors consists of 9 members total, namely: Mr. Ernest Raymond as Chairman, Mr. William Bowman and Mr. Michael Duncker as Executive Directors, Ms. Sue Hufford, Mr. Jorge Rosado, Mr. Trevor Roe, Mr. Daniel Bolon, Mr. Mario Sho and Mr. Gerry Sharp as Directors.

The guest speaker for this historic event was Mr. Jose Alpuche, chairman of the Belize Agro Productive Sector Group. In his address, he congratulated the growers as being part of a noble profession of farmers that adds value to the economy well beyond what is recognized. He also encouraged BCM and its members to continue to challenge the status quo and to be pervasive, persuasive and persistent in ensuring that the necessary changes be made to the existing legal structure governing the citrus industry to make it more open and more dynamic.

There was also a presentation by the Development Finance Corporation on the various credit facilities that are available to citrus farmers. It was also noted that there are plans to establish a BCM Trust Fund in the upcoming year that will be operated as a credit facility for its members to access loan funds at a very concessionary rate and on a revolving basis.

Another presentation made at the AGM was that from the processor of fruit, the Citrus Products of Belize Limited. Dr. Henry Canton, the CEO of CPBL, discussed matters related to the factory and processing. His presentation transitioned into a lively and frank discussion on topics such as CPBL being legally bound to accept all fruit from all growers without the need for production licenses and on the matter of the temporary closure of the factory over the Christmas break and a bit beyond to allow oranges to mature further.

Do you have some knowledge or opinion that you would like to have printed in The Belize Ag Report? We welcome contributed articles, as well as letters to the editor and ideas for articles. Your contributions will improve the paper. Kindly send to <editor@belizeagreport.com> or call Beth at 663-6777. Thank you. Belize Citrus Mutual consists of over 70 citrus growers, 49% of which are small growers. The total combined production of BCM farmers accounts for about 52% of the total industry's production, excluding the production of CPBL's own farms. The balance of the production is accounted for by independent growers and the other citrus farmers' association. BCM was established on the 7^{th} January 2010 and has championed the cause of growers over the past two years, especially in ensuring that their constitutional rights in regards to freedom of association are respected. In this light, BCM will continue to aggressively champion the cause of citrus growers but will choose to do so in a positive and constructive way.

BCM stands willing to collaborate with other partners, including other grower associations, whether citrus or otherwise, in positively moving the industry forward and increasing production and productivity. It is in this spirit that BCM encourages the feuding partners who own CPBL to put aside their differences, to find common ground and work together to ensure the expansion and further development of a vibrant citrus industry in Belize. Similarly, BCM calls on the Government of Belize to take the bold step and make the required changes to the existing legal structure to ensure that the citrus industry can develop and progress beyond the traditional way of doing business.

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LATIN AMERICA: FAVORABLE LAND WITH OPPORTUNITIES

Latin America is the world's farm. In terms of arable land China has 0.11 hectares per capita, or less than half of the world average. On the other hand, Latin America averages twice as much at (0.25) as China. Argentina and Paraguay have seven times more arable land than China while Brazil, Uruguay, Bolivia, Nicaragua and Cuba have more by threefold. Mexico and Belize have twice as much.

Land is useless without water, but Latin America is a particularly alluring region for agribusiness because the region holds 34 percent of the world's total renewable water resources. China accounts for only 5.2 percent of the total share. This figure is more astounding considering that Latin America has less than half the amount of people. In addition, the World Bank places Latin America among the regions with the cleanest water. Every country in South America aside from Jamaica and El Salvador has water so pure that there exists only 0.5 tons of pollutant/km3 of water. On average, water in China has 3.78 tons of pollutant for each cubic kilometer. A clean freshwater supply is crucial for agriculture in a country, for it helps reduce dependency on pump sets, purifiers and irrigation systems--equipment that significantly increases costs.

Latin America is filled with rivers, streams and lakes. It holds three of the world's ten largest rivers: the Amazon, Orinoco and Parana. China, on the other hand, is home to the world's second largest river, the Yangtze, which is ten times smaller than the Amazon and seriously affected by pollution. In addition, Latin America is privileged with favorable weather for agricultural production. Latin American agribusiness is mostly centered on an export model, but almost all countries in the region are currently unable to meet global demand due to poor infrastructure. While logistics costs have fallen in the rest of the world, they have risen in Latin America. Studies show that doubling the cost of a country's transportation reduces trade by up to 80 percent. In Brazil, transportation of certain products costs up to seven times that of other nations. A 2009 survey conducted there found that 76 percent of those polled felt the biggest obstacle to growth was poor infrastructure. With their expertise in managing large infrastructure projects and a voracious appetite for food, the Chinese are securing infrastructure contracts and future food supplies in Latin America.

CONCLUSION

China is urbanizing in a dramatic fashion. Estimates expect another 300 million people to move to cities by 2025. As a consequence, China is increasing resources devoted to its "Go Out" policy for food resources. Even though Latin America is on the opposite side of the world and has infrastructure problems, Chinese companies are very active in the region, and are only just beginning to realize the opportunities that await in Latin America.

This article is based on an excerpt of a white paper by **SinoLatin Capital.**



1st National Organic Forum

By Peter Ivory

Having attended the first national organic forum sponsored by the Ministry of Agriculture, Fisheries & Cooperatives (MAFC) and the Inter-American Institute for Cooperation on Agriculture (IICA), I came away impressed with the group of 80 committed people who gathered to organize the Belize National Organic Council (BNOC). Every district was represented. Both the Minister of Agriculture, the Honorable Rene Montero, and the CEO of MAF endorsed the idea of a BNOC in their remarks. Lively discussions followed the speakers who included:

- Mr. Maximiliano Ortega (IICA), who spoke on global trends in organic agriculture
- Ms. Celi Cho (Dept. of Environment), who spoke on organic agriculture and the environment
- Mr. John Bodden (Ministry of Health), who spoke on the health benefits of organic food
- Ms. Fay Garnett (MAFC), who coordinated the event, gave an overview of the research being done in the region
- Mr. Nana Mensah (Sustainable Harvest International), who described organic agriculture being done in southern Belize
- Mr. Greg Clark (Sol Farms), who discussed organic marketing and the demand by Belizean resorts for quality food

Those who were elected to the BNOC are:

- Mr. Greg Clark Manager Sol Farms
- Mr. Juan Tun Belize Organic Alliance
- Mr. Nana Mensah Sustainable Harvest International
- Mr. William Usher BAEL
- Mr. Pantaleon Escobar Humana People to People
- Mr. Candido Chun Sustainable Harvest international
- Ms. Emily Stone Moho River Cacao

Gratitude for attending the workshop was expressed in certificates given by MAFC and IICA to each participant for charting "The Way Forward for Organics in Belize".





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BEYOND THE BACKYARD A Mother's Love By Jenny Wildman

One day whilst begging some plant cuttings a friend (born Belizean) suddenly exclaimed "Hey, you have that pretty plant which I have not seen for years. This is the plant that for sure tells you that your mother loves you. If we would have a cut, scrape, bruise or upset tummy, mum or granny would go hunting all over the bush with great determination searching until they returned with the medicine." I tried it out on a couple of boo boos warming the leaf and applying directly to the wound. Well not knowing if it was something in the leaf like iron or just the added attention, I was still very pleased with the result and loved the story behind it.

The gardener arrived on Saturday morning and in minutes went through the area with the weed whacker. Exit my miracle plant. Earlier on my morning walk I had spotted the same Vervain at the side of the road and assumed it was everywhere but as the story goes it is somewhat elusive and when I retraced the strides of my four mile route I could not find a it again. I resolved to locate it, save it, cultivate it, pot it and exclaim its virtues to all. Stachytarpheta Jamaicensis is also known by the local names, Verbena Hastata, Verveine, Queue de Rat, Vervain, Veng Veng, Simpler's Joy, Holy Herb, Blue Vervain, Porterweed, Medical Ironherb Wild Hyssop, Devil's Coachwhip, Blue Snakeweed et al. It must have been well studied to acquire so many names and be esteemed in botanical thought as having divine and supernatural healing power and offer protection from demonic forces. It was also rumoured to have been used to stanch the wounds of Jesus when taken from the cross; hence the name Holy Herb.

The whole plant can be used, flowers and buds made into a cooling herbal tonic mentioned as early as 1652 by Nicholas Culpeper or roots and stems as a vermifuge and leaves as a poultice for wounds. Offered as a love token or bridal bouquet it is a symbol of love and chastity and hung over the door with a horseshoe to bring good fortune and ward off evil. Hard to imagine anyone suggesting this could be a troublesome invasive weed spreading rampant across wastelands. Perhaps only to the pharmaceutical companies as it appears to be an effective cure all. Different species of verbena can be susceptible to each other's pollen and I have found similar looking weeds here but with stiffer leaves.

Looking at the garden centre catalogues, I see that one plant will cost at least US\$7.99. Not a bad return for a weed. They say that it is a short lived perennial that makes a grand ground cover and suited to hanging baskets. It prefers sandy soil and full sun and propagates by root cuttings or seed and is perfect if xeriscaping. Its small blue flowers open once a day attracting hummingbirds, butterflies and bees.

Vervain is one of the original 38 Bach flower remedies specifically prescribed for perfectionists with over abundant enthusiasm. It is said "to encourage the wisdom to enjoy life". Luckily I have the remedy right on my doorstep. Having searched all over unsuccessfully in the hopes of rekindling my relationship with this mother's love, imagine my surprise when it popped up at the foot of my stairs in my little courtyard, along side my treasured herbs, without any assistance. Now if you a wondering what a simpler is, it is a person who collects medicinal plants (simples) and yes I have much joy today at having this pretty blue simple grace my garden with its presence.

Please share your comments and any ideas on this and other related topics to

Jenny Wildman <u>spectarte@gmail.com</u>

In response to a question about the use of Hoja Santa: Blanch a whole leaf for 10 seconds then dunk in cold water and wrap around game or chicken and steam. Try braising vegetables with it or muddle it into a cocktail as a fresh herb like mint in a mojito. It gives a unique licorice peppery taste. Enjoy.



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Mr. Graham Herbert, manager of B-Oil Belize Ltd. has been supplying jatropha seedlings and promoting its development in Belize for several years. In 2011 B-Oil Belize became the Belize and Caribbean distributor for India's famous **Oorja stove**. Also, B-Oil Belize has expanded to produce their own biomass pellets from jatropha byproducts to fuel them.

The Oorja was developed in India by BP and the Indian Institute of Science in Bangalore, as a more healthy and ecofriendly alternative to their more traditional biomass fuels, wood and dried cow dung. Studies there show that the stove is very efficient, and B-Oil estimates that in Belize, cooking with the Oorja can save over 60% compared with LPG. It produces the same flame type pattern as LPG, and is smokeless and odorless. BP's claims that the Oorja "significantly reduces carbon monoxide and particulate emissions as compared to traditional open stoves", thus "has the potential to make an important impact on a key public health concern". In addition to the lessened indoor pollution, the stove offers a way to decrease cutting down our forests for firewood. In India, the first agricultural waste products compressed into fuel pellets for the Oorja were sugarcane bagasse, groundnut husk and maize cobs. B-Oil notes on their website that they are "committed to utilize every option in our current operations to waste no particle of the sustainable harvest, from our own jatropha plantations and other agri-waste here in Belize ... ".

B-Oil plans to establish outlets for the stoves and fuel in 200 villages throughout Belize. 3 Oorja models are advertised on their website, the smallest household unit costs \$60.USD and the largest, a commercial size unit, for \$165.USD. The jatropha pellets are priced at \$10.Bz/30 lb bag.





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David Wu, Ambassador of the Republic of China (Taiwan) addressed

the guests during the morning session. Mr. Miguel Cheng, Ms.

Silvia Lee and Mr. Cristobal Teck took charge of the hands-on field

visits to the guava orchards at the Horticulture Crop Training and

Demonstration Center in the afternoon. Visitors were shown and

encouraged to attempt grafting, air-layering, transplanting, pruning,

Although native to Central America, Taiwan is the world's premier

producer and leader in research on guava. The varieties that the

TTM has selected as best suited for Belize are the Taiwanese Guava,

the Century Guava and the Pearl Guava. The Taiwanese and the

Century bear fruits year-round. Mature trees can produce up to

40kg/year and they will begin fruiting in only their 2^{nd} year. At a

spacing of between 12 to 15 ft between both trees and rows, an acre

pinching and thinning.

Both the beautifully illustrated manual and the video present sections on cultivars, growing requirements and cultivation techniques, pests and diseases and a section on production costs including a chart showing estimated costs over 3 years for establishing 1 acre of guava. The manual and video are predicted to be effective tools to encourage the expansion of guava for the local Belizean market as well as for export. El Salvador is reportedly seeking a large quantity for importation, and the potential for export of Belizean guava to North America and Europe is enormous. Guava properly packed and refrigerated can be stored for 20-25 days.

The video was produced in collaboration with Mr. Luis Wade of Plus TV Shamax Productions. Both the video and the manual are available at the TTM at Central Farm. Favorable reception and feedback of these to MAF and TTM could lead to further videos and manuals on other agricultural topics.



Preparing Liquid Fertilizer





Reprinted from *Taiwan Guava Production Manual*, First Edition, Nov 2011

Ministry of Agriculture and Fisheries and the Technical Mission of the Republic of China (Taiwan)

Organic liquid fertilizer is easy to prepare and efficient to use. Below is a step by step guide on how to prepare liquid fertilizer which can be used to fertilize fruit trees and vegetables.

Ingredients:

- 1. 200 liters of water
- 2. 1 gallon of molasses
- 3. 15 eggs
- 4. 2 buckets mill feed (wheat middling)
- 5. 1 gallon of milk
- 6. 1 liter of EM solution

Preparation:

- 1. Break egg into the one gallon of molasses (egg shell adds calcium, optional)
- 2. Add the gallon of milk
- 3. Add the EM and other liquid ingredients;
- 4. Stir thoroughly until molasses is completely dissolved

Add this mixture slowly into a drum half filled with water (100 liters), and then add in the 2 buckets of mill feed or rice bran. Stir until the dry feed is completely dissolved and then fill to 200 liters drum capacity.

14 Days Process: Mixture must be stirred daily for about 5 minutes in the morning and 5 minutes in the evening for 14 days; thereafter it can be used as liquid fertilizer. Daily stirring is necessary since bacteria added to the mixture needs oxygen to accelerate decomposition. The mixture will develop a fermented smell similar to sweet wine or vinegar as indication that the process has been done correctly and properly.

Application: For soil drench, the recommended dilution rate is 1:25 to 1:50 (i.e. 1 part liquid fertilizer to 25 parts water) and 1:80 to 1:100 for foliar application. To use as a plant drench, add 4 to 8 liters of liquid fertilizer to 200 liters of water.

Recommendation facts: It is safe to use and is effective; it contains macro and micronutrients.





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TOBACCO Dr Mandy Tsang, BMChB, DRCOG



Flowers, leaves and buds used as an agricultural product.

This is article is written as a tribute to tobacco as a plant. It is important to remember the history of this plant and to remind us of its place in history and agriculture.

I like tobacco plants and I grow them on my farm because I think they are beautiful and the flowers exude a wonderful aromatic spice especially on balmy hot nights. Having an excess of these plants I took the opportunity to take them to a fair to sell thinking that they would go like hot cakes; well, I was received by many phlegmatic responses including, "I don't smoke. I have no need for that plant." I was so shocked by the negative responses to this plant that I simply had to write about the tobacco plant and give a more balanced, factual account of this plant.

History.

Native Americans were the first known people to use tobacco; tobacco was smoked, uncured tobacco was eaten, a drink was made out of tobacco juice and it was even used in enemas. Tobacco was only used for spiritual purposes in the Native American culture and traditionally used in sacred occasions (for instance in the sealing of a pact). It was thought that exhaled tobacco was capable of carrying one's thoughts to heaven. Interesting enough, because of its mode of use, there was no record of addiction or abuse of tobacco by these people. When Europeans settled in North and South America, it was these people who decided to farm tobacco as an agricultural product and through the commercialisation of this plant it created the use of tobacco as a recreational drug. The addiction of cigarettes and subsequent health effects was borne out of the Europeans' use of this plant as a cash crop. John Rolfe in 1609 arrived in Jamestown Settlement in Virginia and has been credited for starting the first cash crop of tobacco. By 1620, Jamestown became the largest producer of tobacco with a documented quantity of 119,000 pounds farmed in that year. It was the lucrative tobacco farming which led to the importation of black slaves to the colony as more labour was needed to work the plantations.

Cultivation, Harvest and Curing of Tobacco

Tobacco seeds are scattered onto the surface of soil and germination is activated by light. In colonial Virginia, these were fertilised with wood ash and animal manure. In modern Northern America, the plants are fertilised with a mineral Apatite which partially starves the plant of nitrogen which changes the taste of tobacco. Modern cigarettes have liquorice and other additives to add flavour to the final product. After the plants have reached a certain height then they are transplanted into fields. Tobacco can be harvested as single plants in their entirety or by a method known as "pulling" whereby individual leaves are pulled off as they ripen from bottom to top. The leaves are then transported to curing barns and there are a variety of curing methods used depending upon the flavour of the final product. Traditional curing barns are no longer in use in Northern America; however there were three ways of curing tobacco leaves, the first one being air-drying which involved hanging the leaves in well-ventilated barns for 4-8 weeks. Another method was fire-curing which made use of intermittent or continuous fires inside the barn and curing could take between 3days to 10 weeks for this process. The third method was flue-curing which exposed the leaves to smoke whilst external fire boxes allowed smoke to be fed into flues leading into the curing barn; this process lasted one week. tobacco is then sold in bales to pre-sold contracts.

Uses of Tobacco

- 1) Tobacco can be smoked, made into snuff or chewed. Native Americans chewed tobacco with lime.
- 2) 'Creamy Snuff' is a product made and sold in India, and marked for women in India, which is a tobacco paste mixed with essential oils sold as a 'toothpaste' and has the following directions, " let paste linger in mouth before rinsing."
- 3) Tobacco water is an organic insecticide comprising of tobacco boiled and steeped in hot water and then applied to plants as an insecticidal spray.
- 4) Tobacco paste treatment is an old traditional healing use for insect stings including wasps, hornets, fire-ant, scorpions and bee-stings and involves the mashing of tobacco in water to make a paste which is then applied onto the area like a poultice and remission is said to occur in 20-30 minutes. Note that I have not tried this method so I can not comment on its effectiveness.
- 5) Flowers of plants are used in the perfume industry.

Health Effects.

Curing and subsequent aging of tobacco allows for slow oxidation of caretenoids in the leaves which produces the aromatic flavour in cigarettes and cigars. Starch is broken down into sugar which binds onto proteins and further oxidises to Advanced Glycation Products (AGES) which contributes to the increased risk of cancer and cardiovascular disease. Fire-curing, flue-curing and subsequent smoking of tobacco exposes the user to nitrosamines and other carcinogenic compounds. Long term and excessive amounts (generally speaking, 20 or more a day for more than 20 years continuously...of course there are always exceptions to the rule) increases the risk of cancer, cardiovascular disease, respiratory disease and pancreatic disease. In tobacco consumption, the lethal dose can be very small because all nicotine is absorbed into the bloodstream (in smoking, only a fraction of nicotine is released into smoke thereby making it a 'safer' way for nicotine delivery).

The main points I would like to conclude is that the use of Tobacco has a long traditional history with the Native Americans and an important agricultural history with Europeans and Northern America. The excessive use of tobacco as a recreational drug has led to the negative feelings towards this plant largely due to its health consequences. Nevertheless I would like to acknowledge this plant for its existence in our cultural, social and agricultural history.

The Turkey Tail Mushroom. Dr Alessandro Mascia, BMBS, CHEd



In this issue I would like to discuss a mushroom species which has caused great excitement because of its medicinal properties; it is known as one of the most potent and best studied of all medicinal mushrooms, with many commercial preparations being sold on the market.

Turkey Tail, or Trametes versicolor, is another of those mushrooms that has a virtual worldwide distribution from temperate to tropical zones; I have seen it in every country I have lived. It is one of the most easily identifiable mushrooms, belonging to the family of mushrooms called polypores or bracket fungi. They are generally thin and leathery when wet but become rigid or slightly flexible when dried. As the species name suggests, the cap colour is extremely variable and can range from a mixture of white, gray, brown, yellowish-buff, bluish, reddish or black in distinct zones (or uniformly) with, sometimes, a white margin when actively growing. This mushroom does not have gills but rather, pores, which appear white to dingy yellowish with minute but visible shallow tubes. This mushroom typically grows in groups, rows, tiers and shelving masses on logs, stumps and fallen branches of dead hardwoods. If you make use of polewood on your farm, it will commonly appear next to Schizophyllum commune on the same pole after the wood has been out for a season or two. It causes a general delignifying decay of wood and is a common cause for your polewood thatches to collapse after a few years.

Apart from its medicinal properties, which I will describe next, this multicoloured mushroom is very resistant to decay itself and can be used to make beautiful ornaments (if you are into natural forms) such as brooch clips, earrings, necklaces and other ornaments. With regards to edibility, the mycologist, David Arora puts it very succinctly: "boil for 62 hours, squeeze thoroughly and serve forth!" A very accurate statement once you have seen this mushroom but nevertheless, perhaps we can reconsider its consumption when we take into account the powerful medicinal properties it has:

According to Paul Stamets quoting a number of studies,

Trametes versicolor is the source of PSK (protein-bound polysaccharide), which is commercially known as "Krestin," an approved cancer drug in Asia. According to a number of clinical studies in patients with gastric cancer treated with chemotherapy combined with a regimen of using PSK, there was a decrease in recurrence and an increase in the disease-free survival rate. Another study showed that PSK reduces cancer metastasis and stimulated interleukin-1 production in human cells. There are also a number of other substances produced by this mushroom which include PSP (low-cytotoxic polysaccharopeptide), a possible antiviral agent inhibiting HIV replication which also induces gamma interferon, interleukin-2, and T-cell proliferation. Other molecules isolated have shown antitumor properties, immunomodulating responses and strong antibiotic properties effective against a number of organisms such as E. coli, Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans and others pathogenic to humans.

There are a number of commercial products on the market made from this mushroom, usually in the form of powdered fruitbodies in capsules or tea form. Once you find out how common this mushroom truly is, by taking a walk in your closest jungle or forest, I would suggest picking some, drying it and then extracting it by boiling in water for use in soups or teas. The abundance of research available on this mushroom would suggest that it would benefit all of our lives from incorporating it into our diet.

Go forth and spread the spores!



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		Agri	culture Prices	s at a Glance- \$\$\$\$\$		March	- Аргіl 2012
A-B denotes the diffe and bulk	erence < or sm	between 1st prefe all amounts . Tren	rence & second pref d (H) means Higher	erence and sometimes between wholesale & over last 30 to 60 day (L) Lower (S) Steady	k retail		
Belize Cattle			B B	Grains. Beans & Rice	F	٩	8
Young strs. & bulls- 750- 1100 lbs	I	1.20 -1.25	1.10 - 1.25	Belize vellow corn	Т	.3032	.2930
Cows & heifers for butcher	т	.90 - 1.00	(thin).7590	White Corn	-	.3234	.3132
Heifers for breeding 500-800 lbs	-	1.00 - 1.05	.90 - 1.00	Corn/ Local retail (low volume)	т	.3540	.3335
Young grass cattle- 350- 650 lbs	S	1.10 - 1.25	1.00 - 1.10	U.S corn @ 6.40-per 56 lb bushel		\$22. 85/ BZ 100	♯-12¢ frt. to BZ
U.S price -corn fed- 1000- 1200 lbs	I	1.28 US=2.	56 Bz	Guatemala corn price/Peten	-	.3438	.3234
U.S price - feeders 600- 800 lbs	т	1.58 US=3.	16 Bz	Belize milo	S	.2627	.2526
U.S price- calves 450- 600 lbs	Т	1.80 US=3.	60 Bz	R-K's, little reds & blacks (beans)	_	1.00-1.10	farm pric€
U.S price- aged butcher cows	s	.90US=1.80 Bz		Black eyed peas	S	.8590	farm price
Belize Hogs				Milled retail rice per pound	S	.8888	farm pric€
Weiner pigs- 25 -30 lbs- by the head	S	\$95.00 -	\$100.00	Citrus			
Butcher pigs 160 - 230 lbs	S	1.75 - 1.85	1.70 - 1.75	Oranges per 90 lb box-lb.solid basis	н	\$14.00 Est. 201	12 price
Belize Sheep				Grapefruit- per 90 lb box	н	\$ 6.25 Est. 201	2 price
Butcher lambs	S	2.00 - 2.25	1.75- 2.00	Sugar			
Mature ewes	S	1.70 - 1.75	1.60 - 1.70	Cane per ton- est. 2012 price		\$47.50 Hopefull	y \$ will increase
Belize Chickens				White sugar- 112 lbs- controlled	S	\$45 per bag + 3.	-5 cent mark up
Broilers- live per Ib	т	1.22 - 1.24	1.21 - 1.22	Brown sugar- 112 lbs- controlled	S	\$39 per bag + 3.	-5 cent mark up
Spent hens	S	.7072	.6870	Special farm items			
Fruits & Vegetables				Eggs- tray of 30 eggs	S	6.67 farm- retai	l .27 per egg
Tomatoes, cabbages, cucumbers	S	whosal.75-1.75	ret\$1.00-\$2.50	WD Milk per lb to farmer	S	contract .50 & n	on contract .35

March- April 2012

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

Dear Ag Readers: Farmers the world over, usually talk about the same things- prices, weather and production problems. It's definitely the same in Belize Prices are pretty good- weather is crazy with unusual rain patterns and worms, insects, fungus and weeds are always front and center. We sprayed some game). I also do not understand marketing board as a buy-sell business entity that sometimes competes with private sector. Agriculture can lead the way understand is price controls (such as sugar, where the price controls are below the current area prices and smuggling & corruption is the name of the corn 4 times before it was 6" high. The worm only surfaces 2 or 3 hours a day and then goes underground and avoids the poison. Something I do not for Belize, but it really needs some Brazilian thinking. All the best- John Carr



ENDURANCE RACE

The 2nd Annual TCER was great! Perfect weather, trails were in good shape and, an additional rider joined the 30 mile race. Competition was close and spectators had a fun event to watch. The barrel racing competition that followed also saw additional riders and had fast runs thanks to the excellent ground they have at the Belize Equestrian Academy arena.

The sponsors of the TCER are to be recognized as visionaries for the equine world of Belize. Without their support, new events such as the Triple Crown could not move forward. Please give a thank you when you are in any of these businesses or see the folks responsible: *Belize Natural Energy, Reimers Feed Mill, Uckele Health and Nutrition, Yalbac Ranch Sawmill, San Ignacio Hotel, Cheers, Bio Meds, Running W, Banana Bank, Mega Foods, Caribbean Treasures, Olde Mill and the Belize Ag Report.* Trey's Barn and Grill and the BEA host this amazing event and Light Rein Farm and BEA produce the TCER and Barrel show.

Winners of the 30 Mile TCER were Hannah Pershing riding for Ian Anderson, 2nd was Cesar Xi riding for Banana Bank, 3rd Joel Neal also riding for Banana Bank and in 4th doing an excellent first time ride was Kaitlyn Britt riding for MET.

Sweeping the 3 Divisions of the CHAMPIONSHIPS was Hannah Pershing winning the Champ Rider, Champ Horse and Champ Team, riding Lil Bit and taking home the plaques and the additional \$1500.00! Total monies paid for the 2011 event was \$3975.00 for the Endurance Race; add in all the payouts for the Barrel Events and dollars totaled well over \$4000.00.

Besides the dollars there were champion leather monogrammed breast collars to be won after the three events. They were for the high point barrel rider and the high point pole rider. Close points ran throughout the events; determining the champion came down to the last runs of the year, but after totals were done we had a DOUBLE CHAMPION! Asad Bedran won both of the events and took home the two beautiful breast collars. Running our barrel classes in the National Barrel Horse Association Divisional Format allowed us to present belt buckles to the 2D champion - Marjie Olson and 3D barrel champion - Sherman Erera as well. And the 2D pole buckle was awarded to Amir Rodriquez.

The NBHA "DIVISIONAL" barrel races make running barrels a true family event and place three winners versus one. Watch



metbelize@pobox.com ~ www.metbelize.com

Mile 8 Mountain Pine Ridge Road, Cayo, Belize

for the NBHA here in Belize starting in March. The *world's largest* barrel organization is being produced here in BZ by Light Rein Farm and many events will be held at the BEA as well as around the country. If you are interested in hosting an NBHA event let me know.

A HUGE thank you goes to Maruja Vargas for her energy and willingness to do whatever needed to be done. Thanks to Dr. Trejo who has been the TCER vet now two years and has done a superb job. Phil Koenig donated his time for us again and took some great photos that you can see at <u>http://Poozieswicked.</u> **blogspot.com** And of course big thanks to all of the BEA/Olde Mill/LRF workers who pitch in and always do an excellent job.

Watch for the 2012 dates for the NBHA barrel events and TCER. Please remember we need your support to be able to continue to run these world class horse events.





Photo-Periodic Mayan Bean Plants By Felix Tzul and Dottie Feucht



The Mayan tradition of saving beans from each year's harvest for planting the following season includes some that are photo-periodic plants, i.e., light sensitive to either short days or long days. The beans Felix Tzul plants in late September blossom during the time of year when we have short days end of the year. As a matter of fact, he says they blossom in late November or December almost regardless of when they are planted. So if planted in November, they still flower before the end of the year, but the harvest is scanty because of a very short vegetative development period before blossom initiates. Cultivars planted in August have a prolonged vegetative development period; the vines are well-developed with plenty of biomass which is conducive to fungal attack, especially if planted in areas where there is a lot of rainfall or excessive moisture during the nights. The characteristic of producing abundant biomass during increasing day length makes these varieties suitable for "green manure". On Mountain Pine Ridge Road, where Felix plants, the ideal time to plant for a good harvest is late September or early October. Planting at this time reduces the vegetative development period allowing better air circulation between rows and plants, hence reducing the incidence of fungal diseases.

Felix said the traditional method of planting when he was growing up was to plant the beans near the stem of growing clumps of corn in the month of August to take advantage of the corn stalk for these pole beans to use for climbing. When corn was harvested in September/October and the stalks were bent, the bean crop was left free to develop fully on the standing stalk where it flowered in November for green bean harvest in December. Now Felix uses 4 inch diameter posts spaced 10 feet apart and connects the posts with recycled telephone or TV cable for the beans to climb on. The insulation on the wire prevents it from rusting; so it can be used again. Even planting different varieties of beans close together does not alter their type; they retain their true characteristics.

The method of harvesting when Felix was growing up was to harvest the ripe bean pods and sun dry them in their pods. Another traditional option was to hang the harvested ripe clusters of bean pods on wire in the kitchen where the smoke and heat from the fire hearth slowly dried the bean pods and preserved them. Beans dried in this manner have less weevil attack and cook fast and soft. Beans sundried without their pods become hardened and take longer to cook; they have a hard consistency – "long water beans" they're called. The flavor of the beans is lost.

Felix is trying to preserve six Mayan varieties that are being overlooked by farmers who opt for other foreign varieties that are not photo-periodic and are highly productive for commercialization. Five of those being preserved by Felix are photo-periodic:

- 1. Bolok Ché a rounded, full black bean with a unique and delicious flavor; it makes a thick soup. When ripe its pod changes from green to mauve. Bolok in Maya means to cover over.
- 2. Pascua or Christmas a small red bean that ripens in December (hence the name) to a beautiful red color. The dry beans cook to a soft texture but the soup does not thicken. When dried, the bean pods lose their beautiful red color and become brown and shriveled exposing each bean clinging to the interior –as though vacuum-packed.
- 3. Chac Tzamá a small bean with varying hues. Chac means red in Maya but the language has words for only basic colors; so this bean is called red although it is closer to purple in color. Its pod is about 6 inches long, producing more beans per pod than the shorter pods.
- 4. Boox Tzamá a black, almost kidney-shaped bean, flatter than the Bolok Ché. Boox means black in Maya. Its pod turns from green to white/cream color with purple streaks (tzitzib sol).
- 5. Xtchá lat bú ul a long, flat black bean, almost kidneyshaped. *X* in front of a Mayan word means it is feminine gender; tchá lat means rib. This bean gets its name from the shape of its 8 to 9 inch long pod that looks like a rib. The pod ripens to a deep purple, almost black color.
- 6. Xme-hén bú ul a small black bean with a narrower and smaller pod than the Bolok Ché. Me-hén means small in Maya. The pod has 5 to 6 bean seeds inside. The Xmehén is the only one of these beans that is not photo-periodic; it can be planted any time of the year as long as there is rain or adequate moisture in the soil from irrigation. Felix plants them in January to reduce fungal incidence.



Ask Rubber Boots

FLEAS BE GONE! Too Simple to Believe, But It Worked for Us!

Dear Rubber Boots,

Do you have any tips for flea control for dogs?

Signed, Desperate Dog-lover

Dear Desperate,

Last summer, an Ag Report reader shared with us her home remedy /preventative for canine fleas. It was so simple that we had to try it before we shared it with you. Our reader asserted that she had not used any chemicals for tick or flea prevention on her house pets (dog/cats, all in glowing health) or around her home for over 20 years (in Belize and Mexico). Now that was just too good to be true. It's also available in Belize and inexpensive. Her secret? Brewer's yeast! Here are her simple instructions and our results.

It was September, and our 3 large shepherd-type dogs (each weighing approximately 120 pounds) were badly infested with fleas and had been for months. We had been spraving under and around our home with various chemicals and giving the dogs weekly flea shampoos, but neither yielded much success. In consideration of our dogs' high flea infestation, we were advised to begin with a higher-than-maintenance dose for them. We added 2 tablespoons of the flaky brewer's yeast to each dog's evening meal. At first we added canned food to their regular dry food, thinking they would dislike the strong aroma of the yeast, but we were wrong. They love it! The dosage of 2 Tbs. per dog did give them slightly loose stools as we had been forewarned and after 30 days we dropped back to 1 Tbs. per large dog. Their digestive systems immediately returned to normal. During this first month, we continued with spraving the vard and using flea shampoos. These were both discontinued after completing the first month with the double dose. In the 4 months since going on their reduced (1 Tbs. per day) doses, our dogs have remained flea-free. *

Searching online, we find reference to a dosage of 1 teaspoon per day of brewer's yeast per 45 pounds of dog's body weight, which is close to the dosage we are using. We suggest you work out what may be a dose high enough to deter the pests, and low enough not to disturb your pet's digestion. We purchase our "Nutritional Yeast Flakes" at Reimer's Health Food Store in Spanish Lookout. Our last purchase of a pound in a plastic bag there cost \$29.25 Bz. We have kept it for 3 to 4 months in a plastic container unrefrigerated, with no apparent loss of effectiveness for our purposes. One pound yields approximately 6 cups, which is 96 tablespoons or 288 teaspoons. The cost then for our large dogs on their maintenance doses is just over 30 cents /day per dog, or \$9.14/ month /per dog. The cost for a 45 pound dog at 1 teaspoon per day would be 10 cents per day, or \$3.05 per month.

Why does this work? We offer the explanation that brewer's yeast is an excellent source of B vitamins, and other nutrients perhaps not found sufficiently in most modern dog diets. Since

this addition to our dogs' regimens, they are shinier, slicker and overall in excellent condition. (We have experienced similar improvements of conditioning in horses when fed alfalfa hay, famous for nutrients sourced by its 10+ ft deep roots.) Perhaps simply keeping your dog in a state of 'supernutrition' is the best inhibitor of all to control canine fleas.

*did find one tick (on the nose) of one dog last month. Please note that the writers of this column are not vets and make no claims or warranties for any treatments. This column is simply a sharing of successful experiences. Also, although this appears to inhibit ticks in dogs, we caution readers NOT to try this with horses, due to their very sensitive digestive systems.

RUBBER BOOTS wants to hear from you! Please do write us and share with us your experiences and ideas. We will print or withhold your name as contributor, as decided by you.





Humates Increase Crop Yield By Maruja Vargas

Humates are highly compressed, natural humus, the decayed remains of tropical rain forests which existed millions of years ago in what is now the southwestern United States. The minerals and trace elements contained in humates and in the soil are readily available to plants through organic complexing. Since humates are completely decomposed, they enter into no nutritional competition with plants for nutrients such as nitrogen. Because they are already a part of a certain organic structure, the chelate complexes with microelements of humates can penetrate into the cell more easily than ordinary ions. The humates increase the penetrability of a cell membrane and, as a result, are conducive to potassium retention in intra-cell fluid, which leads to the increase of cell division. Due to the additional energy supply, a photosynthesis process in the cells proceeds more intensively, leading to an increased amount of chlorophyll. A determining factor in plants' growth, nitrogen assimilation proceeds more rapidly, and nitrate formation is averted. All together, it leads to an increase in crop capacity.

Humates can improve root development, total leaf area and total crop yields per acre. A consistent result from all crops tested was increased root growth. Length, density, and radius of plant roots dramatically increased. Tests have shown that root system vigor is very important to the nutrient uptake capability of plants, as well as to the plant's ability to combat disease.

The biochemically active nature of humic acid works to enhance a plant's natural defenses against toxins and disease. Many toxins are inhibited or neutralized directly by bonding interactions with humic acids. Finally, plants which are healthy and receive all of their required nutrients are better able to combat disease and pests.

Application Methods

Pre-planting treatment of seeds and potato tubers is a highly effective and cost efficient method of application. Even before germination begins, vital forces are awakened, and the immune system is stimulated. A young sprout develops a strong root system, and its endurance increases.

Intensification of the root system growth was studied on barley. (L. Ekaterinina, T. Kukharenko, Ukraine, 1971.) As a result of humate treatment, the root length of the plants increased by 2.5 times, and average stem length increased twice, in comparison with the control group. Similar results were obtained in the course of other research and were confirmed by the experience of California citrus growers. (T. Senn & A. Kingman, 1973.)

The treatment of seeds is particularly important for potatoes. Soaking the potato tubers in the humate solution prior to planting is practically the only necessary operation in treatment of potatoes, especially since spraying the vegetating potato plants can lead to growth of the over-ground parts of the plant at the expense of the tubers' development.

For soil applications at the rate of 75 kg/ha as suggested by Chen and Aviad (1990), using an oxidized lignite with 70% combined humic (HA) and fulvic acid (FA) content, the amount required would be about 110 kg/ha (97 lbs./ac.). Agronomic benefits probably decline below application rates of 100 kg/ha (88 lbs./ac.).



For foliar applications at the rate of 500g HA and FA per hectare, as suggested by Chen and Aviad (1990), using a 6% HA and FA extract of oxidized lignite, the amount required would be about 8.5 liters per hectare (about 1 gallon per acre). For 12% HA and FA liquid extracts, the rate would be half that. Vendors have suggested rates ranging from 1/2 gallon to 3 gallons (4 to 26 liters per hectare).

Oxidized lignites vary not only in the total amount of humic substances, they also vary in the relative proportion split between humic acids and fulvic acids depending on the source of the mined humate deposits.

Test plots are underway in Belize at this time. For more information call M. Vargas 600-2853 or email to <u>amar.</u> international.maruja@gmail.com

Detecting Dogs.... Continued from page 3

Efficiency can come from speed and cost savings. "Canines move fairly fast and don't have to look for visual cues," says Gottwald. "Using dogs to detect canker and other diseases is cheaper than using polymerase chain reaction (PCR)-based methods. I think using dogs would be comparable or cheaper than using human scouts. Dogs are definitely much faster than lab-based assays."

While Peruyero is still finalizing the price structure for his scentdetecting dog services, he says, "It will be less expensive overall in price because dogs can cover larger areas faster and the accuracy level is higher, resulting in greater savings."

EARLIER DETECTION

Peruyero believes the biggest benefit to using his cankerdetecting dogs is that they can detect much earlier levels of disease than humans. "Dogs are identifying canker so early that we can reduce the number of trees in a grove that are infected by treating them early, so the disease doesn't spread as much. When humans detect canker, there may be other areas that are infected, but not showing visible signs yet." Since dogs detect by scent, visual symptoms on the trees or fruit are not a factor.

"I think the earliness of detection will change the industry completely," predicts Peruyero. "Our ultimate goal is to provide a service that will provide a greater level of accuracy, efficiency and savings for the farmer."

UP NEXT

"This projet was taken on with the understanding that it would be a stepping stone to dogs detecting greening," says Peruyero. "We are moving forward with that, and I think we will achieve the same level of proficiency with very early detection."

Peruyero predicts that by March, the first dogs will be trained to detect greening and ready to go. Will dogs be able to detect canker and greening simultaneously? "How dogs are trained will depend on what the industry wants and needs," he says.

Peruyero is seeking industry input on how his dogs can best serve and become established in the citrus industry. For example, he'll need to know at what stage in the growing or packing process the dogs whould be utilized, and how frequently.

"There is some development that still needs to go on, but this has a lot of possibilities, not just for canker, but for HLB," says Gottwald. "A group of dogs in California has been used very successfully for detection of wine grape mealybug."

Gottwald cautions that there are limitations to using the dogs. He says dogs can't be deployed in the grove when there is wind or on a very hot day when the dogs are panting, but they are easily used in the packing house to detect canker-infected fruit in boxes. "We need to look more at how to keep dogs cool in the field and what their stamina is... and to determine how best to deploy the dogs in the most useful and efficacious way we can."

More research is planned. "In the future, we will study lesions of different ages, but for now, it appears that dogs don't seem to discriminate between old land new lesions," says Gottwald. "We'll also see if there are any cultivar or species differences in detecting. I think it is a burgeoning technology for detecting canker. The detector dog is another potential tool in the toolbox for the grower's arsenal."

Note: Citrus canker has not been detected in Belize, but HLB is present.



The Sustainable Integrated Eco-Farm Increasing Yields per Acre by Growing Skyward By Maruja Vargas



The foremost example of a prolific ecology in terms of the products it contains is the densely populated tropical forest. The intensity of production is created in the use of the vertical growth area unlike the savanna, grasslands, or the commercial mono cropping of grains which can be classed as horizontal growth crops. And...the variety of plant species that co-exist enhance the health of their neighbors.

We can learn much by studying the use of the vertical growing area in terms of increasing yield of vital nutrients per horizontal acre of land.

The phrase "vertical farming" was coined by Gilbert Ellis Bailey in 1915:

"Vertical Farming"... The farmer farms deeper and goes down (or up) to increase area, and to secure larger crops. Instead of spreading out over more land, he concentrates on less land and becomes an *intensive* rather than an *extensive* agriculturist. *The farmer soon learns that it is more profitable to double the depth of his fertile land than to double the area of his holdings.*"

Vertical farming is based on the cultivation and harvesting of tree crops. The advantages of tree cropping are many. Trees are, in the main, perennials and therefore self-renewing. Once established, the crop tree requires maintenance as opposed to replanting each season as one does with horizontal crops such as grains. While pasture grass is certainly a perennial as well, the protein content is on the low side in comparison to most crop trees.

Many crop trees are legumes and therefore nitrogen fixing, recharging the soils as they produce their crops. When intercropped with pasture grass for example, the leguminous tree enhances the companion production of the grass by the addition of valued naturally-produced nitrogen by the legume to the grass, in turn naturally increasing the quality of the grass, without the addition of costly fertilizers.

Another significant contributor to our goal of higher yield is

the fact that leguminous trees typically are sources of highly concentrated proteins, packed with minerals and vitamins, desirable for animal concentrated feeds. The production of protein per acre is significantly increased with tree cropping in comparison to horizontal grain crops.

For example, the leucaena tree intercropped with pasture grass with rows 20 feet apart, increases the protein yield of that acre by 58 % - 22% directly from the leucaena tree and 7% to 8% from the grass. The intercropped tree greatly enhances the protein uptake and weight gain of cattle, while the feed cost is reduced over cattle fed grain.

Another major advantage to tree cropping to those farming in the tropics is the drought tolerance of most tree crops. This is due to the large established root system as well as the genetic variety, most of which are indigenous to the tropics.

Some tree crops can be farmed by mechanization. For example, Nicaragua has been row cropping moringa olefeira for some 15 years. They harvest with a sickle mower periodically and feed the fodder to dairy cows. The milk production was documented as having risen 43% to 65% since the introduction of the moringa to the feeding regime.

Here in Belize there is a splendid example of intercropping and vertical farming, the result of many years of work at San Lorenzo Farms, Cayo District. First cleared in 1922 by Santiago Hanna, who later changed his surname to Juan when he immigrated so as to "fit in with the locals", this 400acre farm is a sustainable, integrated farming model that is also superbly ecological. The acreage was assembled by the Hannas and designed originally as an integrated, vertically cropped landscape by the senior Mr. Juan and his sister, Salima.

The tradition of this 80-year old eco-farm is carried on by his three grandsons, Santiago, Dominic and Daniel. Santiago maintains the grasses and tree crops. Dominic works the dairy and cheese fabrication while Daniel is developing a dairy goat herd to be sustained on vertical crops.

One of the amazing aspects of San Lorenzo is the preserved wildlife corridors interconnected with three reserves that exist along side lush multi-cropped pastures, coffee, organic truck gardens, and a magnificent reestablished selected forest of mature guanacaste originally reforested by the senior Mr. Juan some 70 years ago. The guanacaste grove hovers over the coffee plantation on the edge of the Mopan River and is one of the most elegant and beautiful stands of guanacaste seen in Belize. The pods of the guanacaste are edible to cattle and horses, and complement the dietary regimen during the dry season when grass growth is lowest. Many species of birds are supported in the wilderness areas. The reserves leading to the river's edge provide cover for wildlife as well as respite for cattle.

San Lorenzo's 'protein banks' of bay cedar, moringa, and nacedero (origin: Columbia) are densely planted three feet on centers several rows deep on either side of meandering horse or foot paths, providing relaxing cool shade for trail rides from Hanna's Stables to Xunantunich as well as easy access for harvesting leaves. The numerous protein banks on the farm are an intense production of high protein materials for

Continued on Page 23

Eco- farm.... Continued from page 22

supplementing the feeding of dairy cows and horses. These supplements replace the need to horizontally farm grains such as corn and milo. Hence the protein productivity of the acre is greatly enhanced by vertical cropping.

Taiwan long-grass pastures are co-cropped with leguminous materials such as kutzu that both enhance the dietary structure of the pasture while nitrogen-enriching the soil. This co-cropping also significantly enhances the protein uptake of the forage. Crop rotation is regularly practiced among all of the paddocks, rotating potatoes, carrots, grasses, beans and other vegetables, balancing and replenishing soil nutrients for highest quality of production from the paddock in each ensuing season.

Fence boundaries are all lined with productive trees such moringa, leucaena and chaya as well as Norfolk pine for future timber. A chayamansa forest feeds the pigs. Chickens subsist on finely chopped mulberry, moringa and nacedero without the use of any grain supplements and free range part of the day for high nutrient egg production.

Moringa, high in calcium and protein, is now being row cropped for cutting to allow the expansion of the bovine and caprine dairy operations in the production of prime quality organic milk products.

San Lorenzo uses no chemical pesticides, herbicides or fertilizers. The ecological balance is totally maintained by the intelligent and studied management of the farm and constant attention to the rebuilding of the soils.

Three generations of farmers have succeeded in creating and maintaining a breathtaking masterwork of agricultural sustainability that is as beautiful as it is functional. Hanna's San Lorenzo integrated eco-farm indeed serves us all as a working model for a sustainable, integrated farm that is also supremely ecological.



Cassava... Continued from page 4

From stem cuttings, the plant produces five to ten fleshy roots up to fifteen centimeters in diameter. There are at least two different methods of planting cassava. Cassava stems are cut with a machete in pieces approximately eighteen inches long. Some people insist that stems must be planted in a cross pattern using two stems with the stems crossed at the halfway point planting the lower stem underground. Others insist that the best way to plant is to lay the stems horizontally approximately six inches apart under 3-4" of soil. Many local farmers I have interviewed claim that a greater yield is had by the horizontal planting method. It takes approximately six to eight months with no tending needed for the plant to be ready to harvest. Tubers may be kept for storage underground as once harvested cassava tubers tend to rapidly deteriorate. Cassava is used as a food security crop in times of famine. A loaf of cassava bread can last up to one year without refrigeration. Vast quantities of cassava roots are made into chips and dried then stored until ready to be cooked.

Cassava is grown in Belize and is a staple food for the Garifuna culture. In the Garifuna language there are at least ten different words for cassava in all its forms. In Dangriga the Sabal family has operated a small-scale cassava farm and factory for over fifty years. From their twenty-five acres they hand harvest up to one thousand tubers at a time to make cassava into bread. The cassava tubers are peeled, grated, rinsed and squeezed by compression, then dried and cooked on an outdoor stove on Tuesdays and Wednesdays of each week. The Sabal family sells this delicious flat bread in Dangria and Belize City. Cassava bread can last for months without refrigeration. One of the Sabal family members, Eddie Sabal, said the family has private tours upon request and said in addition to cassava bread, the family and workers make farina for sale.

Fresh cassava is available year-round. Look for firm blemish free roots. Store as you would potatoes in a cool dark place for up to one week. Peeled root covered with water and refrigerated or wrapped tightly and frozen will keep for several months.

Cassava is simple to grow and once planted requires little tending. It is quite a showy plant. It does well in all kinds of soil as long as the climate is warm. So, enjoy cassava in all its forms and recipes – but don't forget the importance of properly preparing and cooking cassava before eating or drinking cassava products or beverages.

Cassava is generally available in the San Ignacio famers' market and sells for approximately seventy-five cents per pound. The thinner tubers are used for soup and other food items, while the larger thicker roots are generally used to make bread.

UB Lab Continued from page 1

Use of Micropropagated Plants in Belize

In Belize, the first micropropagated plants from the UB laboratory will be used to establish plantations in the sugar and the banana industries. The Ministry of Agriculture has expressed interest in working with UB to use this technology to supply small-scale farmers with high quality plantain, pineapple and cocoyam plantlets; the production of ornamentals, such as orchids, is also being considered.

In the first instance, staff at UB is collaborating with the Sugar Industry Research & Development Institute (SIRDI) and the Banana Growers Association (BGA) to ensure that the laboratory can meet their needs to the production of micropropagated plants.

From December 2011, sugar cane planting sets and shoots were collected from the SIRDI plots near Orange Walk and used to establish similar plots at the Central Farm UB campus and to introduce shooting material into culture in the lab. In November, discussions were also held with members of the Banana Growers Association to discuss their needs for plantlets from the lab; work to introduce plantain into culture began in January 2012. Lab staff is currently focused on optimizing the plant production protocols before they move into the large-scale plant production phase.

What is Micropropagation?

Micropropagation is a method that produces large quantities of disease-free, uniform, quality planting material in a short space of time for quick plantation establishment. Many commercial crop production industries around



the world are now using micropropagated plants; if maintained properly, these plantations often produce higher yields than plantations established with conventional planting material.

In micropropagation systems plants are grown in sterile conditions on a culture media, in glass or plastic vessels, under artificial light. The culture media contains the nutrients required for rapid plant growth and to produce the required type of growth, different plant hormones are added at different stages: cytokinins are added to stimulate shoot development and auxins are added to stimulate root growth.

Depending on the plant species, plant cultures can be subcultured, into new vessels, every 20-25 days with an expected multiplication rate of 3 to 5 times.

Stages of Micropropagation

Micropropagation is divided into 4 stages: Establishment, Multiplication, Rooting and Hardening (or acclimatization). To establish the cultures plant material is collected from the field and surface disinfected with chlorox and alcohol. The growing tip of the plant, known as the meristem, is removed and placed in a test tube on culture establishment media for around 30 days before being transferred onto multiplication media. The multiplication media contains cytokinin which encourages the plants to produce shoots and these cultures can be sub-divided or multiplied roughly 4 or 5 times every 25 days. Cultures can remain in the multiplication phase for up to six cycles before entering the root production phase where the plantlets are placed on medium containing the plant hormone auxin.

Plant culture vessels have high humidity so plants growing in them have very thin cuticles. If these plants were transferred directly into the field outside they would rapidly lose water, wilt and die. The hardening or acclimatization process ensures the plant is adapted to the outside environment by passing them gradually through several stages, from high levels of humidity, to natural-field humidity levels, over a period of two months.

Technology from Cuba

UB is collaborating with the Society of Engineering and Technical Sugar Services (Tecnoazucar) from Havana, Cuba. Tecnoazucar are providing specialists from their National Institute for Sugar Cane Research (INICA) to work with UB to transfer the technology to produce sugarcane and banana micropropagated plantlets.

The specialists will introduce to Belize a micropropagation method called "temporary immersion bioreactor system" or TIBS. TIBS bathes the plants in a liquid nutrient media for short periods of time to give a multiplication rate that is higher (potentially 9x every 15 days) than on solid media.

Crops for MicroPropagation in Belize

Many crop production systems can benefit from using micropropagation technology but the initial work of the micropropagation lab at the University of Belize will be with sugarcane and bananas.

Sugar Cane

Micropropagation of sugar cane will be used to introduce new superior varieties into Belize and to "clean-up" (make diseasefree) varieties that are currently widely used by sugar cane farmers in the



country. Sugar cane nurseries will be established by SIRDI, in Orange Walk, using sugar cane micropropagated plants and the nurseries will provide farmers with high quality stem cuttings for planting.

Bananas

Conventional banana planting methods, using suckers, have several disadvantages. These methods can significantly reduce yields in fields from which the suckers are obtained, can spread diseases and root nematodes, and can often result in a plantation with varying sized trees, making management and harvesting difficult.

The use of micropropagated banana plantlets will provide disease-free, uniform plantings that will produce consistently higher yields. UB is collaborating with the Banana Growers Association in this work.

For more information – on this initiative from the University of Belize contact the campus in Central Farm.

Theobroma bicolor: False White Cacao by Beth Roberson



With high expectations I drove from San Ignacio to Punta Gorda town, to collect 13 white cacao pods which someone had harvested for me from the wilds of Toledo. 13 pods times 34 seeds each(which Cayo District whites had yielded) = 442, which, with the almost 98% germination rate common with fresh cacao seeds and at roughly 300+ trees per acre, could mean almost an acre and half of whites, without grafting. Even with unknown potential yields, the possibility of recovering a bit of the rare native white cacao genetics and planting the ancient lines was exciting.

All cacaos are Theobroma ('oats of the gods', commonly translated as 'food of the gods') cacao. The main cultivar in Belize is the well known Trinitario (Theobroma cacao Trinitario). Toledo Cacao Growers Association (TCGA) has foreign buyers keen to purchase up to 10 times the current amount produced here. Only about 15% of the world's cacao is the highly desirable Trinitario. The beans, when cut in half, are a lovely purplish color. In colonial times, the native Mesoamerican variety, the true white cacao, Theobroma cacao Criollo, was grown here and also exported to Caribbean island plantations. As with many crops grown in monoculture, disease devastated them. In Trinidad, a cross was made between the more fragile Mesoamerican white Criollo type, and the hardier Brazilian Amazonian type, the Forestero. The new and hardier type created and known as Trinitario was exported back to Mesoamerica, including Belize. About 80% of the world>s commercial production is Forestero, 15% is Trinitario, and only 5% is Criollo, the real white cacao.

the home to 80% of Mexico's cacao industry, and it is there that you will find the world famous Finca La Joya where they raise exclusively white cacao. Reputedly, all of Mexico's white beans are exported, mainly to Europe. There are no white cacao farms in Belize. There are a few wild trees in several of our national parks, guarded by those in the know.

The Criollo cacao bean is white because there are no tannins in it. Tannins are plant compounds that cause a biting sensation when eaten. A fresh Criollo bean, when cut, is a clean ivory color that quickly turns rusty brown from oxidation. The Criollo fruit that surrounds the beans that I have tasted is slightly bitter. This can be made into a traditional Maya drink at harvest time. The beans when planted, turn a lovely deep mint green; as the cotyleydons pop up through the soil it>s an unreal almost neon colorblast. Trinitario seedlings, by contrast, are a tasty brown color. I have never tasted fermented Criollo beans, or the fine chocolate produced by them. *

In Belize, many folks call another plant, which is also a Theobroma, 'white cacao'. This is Theobroma bicolor, a relative of cacao but not chocolate. I call this False White Cacao, as it is commonly mistaken for the true white cacao. It's known in southern Belize as balam, in Guatemala and Mexico as *pataxte* and as *mocambo* in Brazil. Balam, which is white, has a slightly different shape from cacao and does not require fermenting. The pods are quite exotic looking and readily identified by their uniqueness: deep veined grooves cover a light yellow pod which later turns tan color. There is no chocolate flavor. The fruit around the beans is tasty and can be made into a drink and the beans can be roasted as nuts. Raw the taste is unexciting. Some chocolatiers roast them for an added 'texture and depth' to their concoctions. I did not roast mine; I planted them. The balam seedlings are quite bizarre looking, crinkled up like little bib lettuces, and strikingly mirroring their parents' ribbing on the pod exterior. Theobroma bicolor is grown in other Central American countries as a shade tree for coffee and cacao. But do not be confused; Theobroma bicolor although fascinating, is not cacao. The 13 pods I retrieved in Punta Gorda? Theobroma bicolor all!

*note: the white chocolate squares found in North American super markets may be a slight misnomer too. Beans are separated at processing into cocao fats and cocao solids. The antioxidants are in the solids. The common white squares are cocao butter mixed with sugar and milk. Read the label.



There are few producers of Criollo worldwide. Tobasco is

AG BRIEFS

Many citrus exporting nations, including Belize, have had their juices subjected to testing for **CARBENDAZIM** since residues for the fungicide were found on orange juice from South America. All of Belize's tests have come back negative, which is not surprising since the product is not licensed for citrus here. There is one product containing carbendazim (in combination with epoziconazole): Duett 25 SC,(label can be googled) which is registered with Belize's PCB (Pesticides Control Board) for use as a fungicide for rice, peanuts and coffee.

U.S. exports of farm equipment to Central America as reported by the Association of Equipment Manufacturers, increased by 14% to \$1B in 2011. South America increased by 31% with Brazil leading that group with country purchases of \$517M. Mexico, who spent \$806M, was 3rd largest purchaser worldwide. #1 buyer was Canada with \$3.4B and #2 slot Australia with \$1.1B. (all USD)

November 2011: **Peru's Congress** announced Friday it overwhelmingly approved a **10-year moratorium on imports of genetically modified organisms** in order to safeguard the country's biodiversity. The measure bars GMOs -- including seeds, livestock, and fish -- from being imported for cultivation or to be raised locally.



Local and Regional						
5	Fuel	Prices				
	Belmopan, Belize	Quintana Roo, Mexico	Peten, Guatemala			
REGULAR	\$11.37 Bz/Gal	↓ \$6.00 Bz/Gal	\$10.28 Bz/Gal			
PREMIUM	\$11.64 Bz/Gal	\$6.50 Bz/Gal	\$10.56 Bz/Gal			
DIESEL	\$10.76 Bz/Gal	\$6.22 Bz/Gal	\$9.45 Bz/Gal			
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El Salvador's Minister of Health asks for international help to combat a **mysterious epidemic of chronic kidney disease (CKD)** which, as Salvador's 2nd largest cause of death among men, is "wasting away our populations". In Nicaragua CKD is killing more men than HIV and diabetes combined. The epidemic is affecting farm and rural workers, mainly on cane plantations, across 6 countries along the Pacific coast

of Central America. Curiously, these CKD sufferers do not show signs of high blood pressure or diabetes which are the most common causes of CKD worldwide. According to Dr. Carols Orantes of Bajo Lempa, El Salvador, what these CKD sufferers have in common is that they all work in farming, and he questions if a major cause of their kidney damage might be the toxic chemicals, pesticides and herbicides that are routinely used there. He claims that "chemicals which are banned in the USA, Europe and Canada are used here, without any protection...". Regional sugar giants are studying the issue and one researcher hypothesizes that the causes may be "heat stress and insufficient replacement of fluids".

BLPA held its annual AGM on November 29, 2011. Abdala Bedran, Peter Dueck, Ramon Galvez, Fred Hunter Sr., John Plett and Alvin Stephenson were elected as directors and the newly formed executive is now John Carr as Chairman, John Dyck as Vice-Chairman, Fred Hunter Sr. as Treasurer and John Plett as Secretary. BLPA is very proud to announce that The **Belize National Sanitary Cattle Plan Project** opened its new offices at NATS grounds in Belmopan in January. This is a move forward towards implementation of the cattle sweep and legal exportation of cattle. The new Project Director for this is Ms. Marina Rosado.

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DALE DAUTEN, ACRES USA MAGAZINE, JAN 2011



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