

The Belize Ag Report

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Agriculture

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Issues, Challenges and Options for Belize's Agricultural Sector

By Dowlat Budram, Director, Secretariat of Planning and Evaluation, IICA

Introduction

Agriculture plays an important role in Belize's economy, contributing almost 14% to GDP, about 50% to export earnings and provides a significant base for employment and income generation in the rural areas. In the last decade (2003 – 2012), the growth of the agricultural sector averaged over 4% per year but there was negative growth in five years during the decade. In 2012, both the economy and the agricultural sector recovered significantly, expanding by more than 5% and 15% respectively.

A review of policies and strategies and the many studies done on Belize's agriculture during the last 25 years indicate that there is no shortage of recommendations on what needs to be done to facilitate the long term growth of the sector. The first comprehensive policy document for agriculture was prepared by the Ministry of Agriculture in 1986. This was followed by three other initiatives in the last 15 years to provide a policy and strategic direction for the sector.

Previous Challenges and Recommendations

Since the early 1990s, recommendations on policy options and a strategic direction for the sector emphasized five major areas: (1) a market-led approach; (2) the need to make the sector more competitive in both the domestic and export markets; (3) diversification; (4) incorporation of the issues of sustainability in agricultural production, management and use of the environment and natural resource base; and (5) strengthening of inter-sectoral linkages. The emphasis on these five broad areas has been largely based on: the country's dependence on a few traditional agricultural products that were exported to preferential markets; the preferential markets that were gradually becoming less important and uncertainty of the preferential trading arrangements; Belize's major agricultural exports not being competitive in free markets; greater globalization and trade liberalization and pressures on protected markets to reform; the emergence of North American Free Trade Agreement (NAFTA) and its threats to Belize's agriculture; the small size of the domestic market which limits diversification and achievement of scale economies; and the need to focus on export market opportunities.

With regards to improving efficiency and growth in the sector, four broad areas were recommended to be targeted:

- (1) **traditional exports** (sugar, citrus products, bananas and seafood) due to the continued dependence on these for foreign exchange earnings and employment. Some specific recommendations on this area included longer term planning for a traditional sector; greater focus on increased productivity and reduction of production costs, commercialization of new products and more utilization of by-products, and a continuation to lobby for preferential market access where this is possible.
- (2) **traditional domestic food crops** mainly rice, corn, and beans for the local market and export markets. These products are integral to the average Belizean food basket and critical to food security. The policy objectives recommended were to achieve and maintain self-sufficiency on a competitive basis, achieve output increases in the medium and longer term to meet projected higher demand in the domestic market, and

improve productivity and incomes of small and medium-sized farmers. With respect to rice, the strategy is to achieve a higher self-sufficiency level, reduce government subsidies, make local production more competitive with imports, reduce production costs and improve quality through improved seeds, better technology, improved infrastructure, irrigation and support facilities and access to credit.

(3) **non-traditional production** expansion to contribute to food security, diversification and small farm development. Belize's food import bill is continually increasing and the strategy is to focus on commodities that are high on the import bill that have the potential to be produced locally on a competitive basis and enhance diversification. These include various vegetables and livestock products and animal feed, oils and fats. Belize could produce soybean competitively; the technological package for this commodity has already been developed. With regards to other commodities, the expanding tourist sector offers a growing market to enhance agriculture-tourism linkages (for products such as onions, tomatoes, cabbage, carrots, lettuce, milk, and various meat products). Belize is self-sufficient in poultry meat which is also a critical food security commodity but there is a need to improve production efficiency through the use of lower cost feeds from local sources. The country has much potential to expand livestock production but is constrained by the small local market size. More efficient production systems are needed for Belize to compete in external markets. Similarly, both the dairy and pig sub-sectors need to be more competitive with imports and to meet the growing local demand.

(4) **non-traditional exports.** Given the limited market size, growth of the agricultural sector requires expanding non-traditional exports. Belize needs to compete in open markets which requires lower production costs and higher productivity, a strong export marketing strategy, product identification and product development (including quality control) and commercialization of new activities (both in primary and processed production). A three-pronged approach is recommended that includes promotion of large scale, capital-intensive operations involving joint ventures with foreign investors in selected areas, development of intensive small-scale operations and focused research in one or two commodities from pilot production to full-scale commercialization.

On the positive side, Belize has a set of drivers that can facilitate the sector's development and enhance its competitiveness. These include: a long history of political, economic and social stability that is an important incentive for both domestic and foreign private investment; the strategic location of country to large

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TO THE EDITOR

Response to Development of Corn, Issue 23 page 17

Dear Editor,

In his article titled, "The Development of Corn", Mr. O'Brien states, "In the field of agriculture, hybrid corn is one of the greatest marketing success stories of all time." I agree with this statement and I think that if he were still alive, the late soil scientist, William Albrecht, Ph.D, would also agree with this statement. In studying Albrecht's papers, however, the reader would find that Albrecht explained how simply measuring yield does not take into account the nutritional value of the crop.

In Volume II of his papers, Chapter 4, "THE LOW QUALITY AS NUTRITION AND HIGH YIELD OF BULK DEMONSTRATE THEIR MATHEMATICALLY CLOSE RELATION", Albrecht reports that this mathematical relationship was worked out by O. W. Wilcox and published in June, 1956 as an article titled, *Inverse Yield—Nitrogen Law of Nature*. This relationship ties increasing yield per acre of dry matter to the production of more carbohydrates but less protein. Albrecht explains that the introduction of hybrid corn is an example. The increased yield of hybrid corn reduced the protein content while the starch and fodder yields have increased. Albrecht concludes, "By this manipulation, we have pushed this crop's production of protein nearly down and out for growing young animals."

Later in Volume II of his papers, in Chapter 11, Albrecht explains "THE PROBLEM OF GROWING THE ESSENTIAL AMINO ACIDS IN WHAT CROPS". He states that measuring protein by the ash analysis for the nitrogen content does not even measure the true protein content correctly. Any non-protein content of the ash containing nitrogen also counts as protein. (Remember the Chinese milk powder scandal in 2008?)

Continued on page 5

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To the editor... *Continued from page 4*

If you want more "crude protein" in your milk powder, just add melamine which is a good source of nitrogen.) In measuring the nitrogen content and multiplying it by 6.25 does not only fail to accurately measure the protein content, it clearly does not measure the various amino acids concentrations which would indicate the quality of the protein. Large crude protein content, even if it has been measured accurately, does not indicate the quality of the protein. Shortages of essential amino acids like tryptophane, methionine and lysine indicate low quality of the crude protein.

In Volume IV, Chapter 5 of his papers, Albrecht describes an experiment in which rabbits were fed cracked corn. Uneaten corn was removed for three different groups of rabbits after it was 25, 50 or 75 percent consumed by the rabbits and replaced with a new supply of corn. In all three lots of rabbits, the rabbits were eating the germ out of the cracked corn while rejecting the endosperm. This resulted in all three lots of rabbits having a greater percentage of protein in the consumed portion of the corn than the percentage of protein in the corn. The less corn that each lot of rabbits was required to consume before receiving a fresh supply of corn, the greater the increase in the percentage of protein in the corn actually consumed as compared to the percentage of protein in the corn itself.

Thus, while the hybridization of corn may be one of the greatest marketing success stories of all time, it does not mean that this marketing success has been of any benefit to the consumer of hybrid corn, whether man or beast. The rabbits by their above demonstration in how they selectively eat the germ from the corn while attempting to reject the endosperm suggest that they, along with Albrecht, would reject the idea of increasing the yield of corn without taking into account the resulting nutritional value of the corn. I think that the rabbits and Albrecht, however, would support hybridization of corn if the resulting grain had a higher protein content and, at the same time, a lower endosperm content. Wilcox's work would indicate that the yield per acre would, of course, decrease.

Who did the marketing success of hybrid corn benefit? First, of course, it benefits the producer of the hybrid corn as the farmer needs to buy new seeds annually. Second, it benefits researchers funded to create new varieties to continue the "marketing success". Third, it benefits the farmers growing the hybrid corn as it can be grown in lower soil fertility than open pollinated corn because it places less demand on the soil for the creation of protein.

For me, I don't want to eat hybrid corn. If it is conventionally grown, I call it malnutrition with poison and if it is organically grown, I call it malnutrition without poison (if the farmer wasn't cheating). If you want to eat hybrid corn, go ahead.

Gary Wilson
Toronto, Canada

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Fertilizers: What & How They Work

By Bill Lindo

Belize City, Jan. 13th, 2014: Most everyone thinks of fertilizers as some chemicals made in a factory and used by farmers and gardeners to feed plants and crops. This is what we call a half-truth. There are many kinds of fertilizers and their use is varied. Some are natural, meaning we mined them from nature and use them as such, or mankind, using different manufacturing processes, refines and concentrates the natural, mined fertilizer into a product with more value added. The by-products of humans and animals as well as plants are also used as fertilizers by farmers, and have been used for over 10,000 years since the dawn of agriculture.

In addition, there are slow-release fertilizers and instant – soluble – fertilizers. But, really, what is a fertilizer? It is a concentrated source of energy for plants. Plants grow by energy. They need water, carbon, air (nitrogen & oxygen), sunlight, good tilth soil, and energy to grow and feed humans and animals. Science (Dr. Maynard Murray) has shown that at least eighty or more of the elements in Mendeleev's Periodic Table of elements are necessary for optimum human health.

The farmer is a person who has knowledge of chemistry, biology, physics, mechanics, weather, computers, economics, and some business principles. The farmer knows that agriculture is the only thing on God's earth that gives one something from almost nothing. He/she puts a bag of 60,000 corn seeds in the soil and 3 months later gets back some 16.5 million seeds – for every pound of corn seeds he/she gets

some 275 pounds of seeds – the potential of corn (op) is some 500:1. But the farmer also knows or should know that if he/she violates the laws of nature, the plants will be sick/die, and all the coins used to buy inputs will be gone – up in smoke.

Some humans, in order to obtain coins from others, sell them fertilizers that are not of good quality. They kill the soil, because of too much “salt” or are too soluble and thus “leach” too fast, ending-up in the sea. Sometimes the chemistry of the compounds are not right, like mixing phosphates with calcium or sulfates which produces a cement-like compound. The farmer should know basic chemistry to foil the efforts of those who seek only their coins.

Here are some tips for farmers:

- The farmer/gardener should be less concerned about the numbers on the tag (12-34-14), and more concerned about the quality of the ingredients that make up the fertilizer. Fertilizer ingredients should promote soil life, plus provide soluble and slow-release nutrients to crops. One reason that natural, mined fertilizers like soft rock phosphate are used is that it not only provides phosphate, but more importantly, it supplies over 60 trace elements of the 80 or more that the plant, animals and especially humans need for optimum health; and these natural, mined fertilizers stick around in the soil longer and don't leach.
- Soft rock phosphate is a slow release phosphate fertilizer. A crop also needs soluble quick-release energy from phosphates for sugar production. The solution is to blend soft rock phosphate with a “good” commercial grade phosphate such as MAP (monoammonium phosphate).
- A soil that is acidic is bad for farming; potassium chloride has a salt index of 116, while table salt is 154. Sulfate of potash salt index is 46. But a fertilizer should be a little on the acidic side. The tips of roots are acidic so they can break-down limestone and other rock sources. In addition, acid (salt) soils kill the biology of the soil, and make the growth of diseases prevalent. Low pH also means the soil is missing minerals - meaning weeds, diseases and insects will come to do their jobs.
- Carbon is a must in farming. Fertilizers need a source of carbon to act as a buffer. Good sources of carbon are humates and compost.
- One farming consultant that I know is always complaining about the use of the words, “major”, “secondary” and “trace minerals” fertilizers. I believe he is correct. Farmers always make the mistake of thinking that if enough nitrogen, phosphate, and potash (NPK) is applied to the soil, the crop or plant will be okay. This is one of the reasons that the potentials of crops are never reached. Corn, beans, rice, cabbage, pepper, and grass need a balance of over 80 minerals. The largest amount is calcium –at least 3,000 lbs/acre. Soil needs potash, phosphates, and magnesium on a weight basis, at least 200 to 450 lbs per acre. Sulfates, about 200 lbs/acre. Boron should never exceed 4 lbs/acre, but without boron, calcium is useless. Some say, “Calcium is the truck, but boron is the driver.” Then there is selenium. It is toxic to plants above 0.75 ppm; but available in sea minerals at a ratio of 0.0009 ppm. God's nature is perfect.

Continued on page 7

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Fertilizers...Continued from page 6

There are several sources of soluble and slow-release fertilizers available to farmers. Calcium, as crushed limestone, and mined "white marl" are both good sources of slow-release calcium fertilizers. Dolomite lime is also a slow-release source with some 12% magnesium. Soluble sources are calcium nitrate, and calcium chloride. Calcium sulfate is a medium-release source. Urea, ammonium nitrate, and anhydrous are soluble nitrogen fertilizers. Feather meal, fish meal and legumes are slow-release forms of nitrogen fertilizers. Ammonium sulfate is a medium-released form of nitrogen fertilizer. Phosphoric acid, monoammonium phosphate (MAP), diammonium phosphate (DAP), and triple-super phosphate are soluble forms of phosphates. Rock phosphate and soft rock phosphate are slow-release phosphate fertilizers. Potassium chloride is the soluble form of potash fertilizer. K-mag, granite dust, and sawdust are slow-release forms of potash fertilizer. Potassium sulfate with both sulfate and potassium is a medium-release source of potash fertilizer. The sulfates such as zinc, magnesium, copper, and manganese are soluble forms of such fertilizers. The traces such as iodine, cerium, titanium, arsenic, and cobalt are derived from rock dusts, sea minerals, and humates. Note: manure and young green plants are soluble while compost and mature crop residues are slow-release forms of fertilizers.

Farmers need be reminded that soils need a balance of minerals for good energy production. The first step is to get a soil test done. It will help you keep coins in your pocket.

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Milestone Project Handover

TTM to MNRA

Thank You, ROC Taiwan

TAIWAN



By Dottie Feucht

After an impressive list of assistance to Belize, the Taiwan Technical Mission (TTM) signed over three important projects including the assets associated with them to the Ministry of Natural Resources and Agriculture (MNRA). In his speech at the signing ceremony on November 27, 2013, the ambassador of the Republic of China (Taiwan), H.E. David Wu, reported 472 families directly benefitted from TTM's projects; 175 families assisted with training and loans; 24 farmers graduated in November, 2013 from their formal training in food safety and good pesticide use; 700 farmers trained in horticulture practices to improve quality and reduce costs produced over \$1.3 million of vegetables and fruit; 517 women's groups helped; and other noteworthy results of the efforts of TTM. According to MNRA statistician, Philip Tate, Belize used to import rice in 1987 but now, after 450 farmers received training in rice production Belize can supply the local market.

The three projects that were signed over by written agreement are the Rice Seed Project (begun in 1991), the Horticulture Training and Demonstration Project (begun in 1992), and the Agro-Processing Project (begun in 1999). To assist MNRA personnel now in charge of continuing these projects, TTM also signed over all the assets, approximately BZ\$790,000 worth of vehicles, farm equipment, food-processing equipment, buildings, and documentation such as training and operating manuals.

TTM is now reorganizing to be project-oriented and its staff will reflect the reorganization by assigning personnel with expertise directly associated with the projects selected for technical assistance to Belize, such as the citrus greening problem and small-to-medium enterprises (SME).

The meeting also included a farewell to Mr. Frank Lin, who headed the Rice Seed Project; after 8 years in Belize he is returning to Taiwan for reassignment. Mr. Carson Huang, who headed the Agro-Processing Project, will also be leaving soon. Mr. Fernando Yeh, head of TTM, thanked both men for jobs well done.

Following the meeting TTM hosted an open house of the agro-processing facility at Central Farm where attendees were treated to baked goods, products of the staff.

Dear Belizean farmer,

Please allow me to introduce myself. My name is Alex Kaminsky I am VP of Sapphire Agriculture LLC based in the United States. The company I work for provides fertilizer to our markets in the Caribbean.

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BEYOND THE BACKYARD

Just Kidding

By Jenny Wildman

"High on the hill was a lonely goat herd.." A very, happy, catchy song that got me wondering why we do not see more goats. It is claimed that goat is one of the most eaten meats in the world yet we hardly ever see one here, let alone find someone who has ever tasted it. We see a lot of those long legged unkempt Barbados black bellies roaming freely in villages and I believe some Dorper in Cayo. Those are sheep and come with a distinct indicator: the tail hangs down. Goats have a perky tail pointing up, unless sick or in distress. Most sheep have woolly fleece although some tropical breeds have hair not wool; goats have hairy coats.



My friend was raising ADGA Nubian goats for milk production. One successful farmer suggests a cross of Boer and Kiko goats for making excellent meat and recommends goat rearing as a profitable business. Goat is a popular meat in other Caribbean locations and many may have sampled delicious Jamaican curried goat. Once only in ethnic markets, it has now found its way to menus with fancier cuisine carrying a label that sounds more palatable. So perhaps on your travels you have tried chevon, cabrito, or capretto and not pictured its curiously intelligent visage.

My goat rearing friend says that they are very humanlike in their family rearing and behaviour. She found that sheep and goats do not communicate and stick to their own herds. They are a different species. Ovis, the sheep, and Capra, the goat, and human meddling and animal experimentation have not come up with much - more stillborn or infertile offspring. Hello Dolly! We know that goats have a calming effect on other animals and have been used to lead lambs to the slaughter and quieten race horses. The expression "gets my goat" meaning "that irritates me", originates from the goat being stolen causing anxiety or anger to the owner and the other dependent animals.

We have moved from being an agrarian society to one relying heavily on imports and packaged foods. Eating organic pasture-fed livestock with less exposure to toxic chemicals should surely be healthier for humans and the environment. One could become extremely philosophical about this but in a nutshell survival may depend on returning to a more practical approach to safely feeding our families. So goats should be perfect addition to the

home farm. As the song says, they like hilly dry terrain. I am told they are fairly easy to take care of and seem far less trouble than the mechanical weed eater that is always out of plastic cord.

Given the potential for milk, cheese, meat, grounds keeping and fertilizer, they seem like an excellent endeavor. Your investment will be in fencing, housing and penning them at night. They are ruminants and need plenty of roughage but like to reach for food rather than graze like sheep. They require a regular consistent diet to keep them healthy. Mineral supplements and salt are needed and it would seem the correct balance of mineral intake would reduce parasitic infection. A soil test will show what minerals may be deficient and may be included in the herd's diet from other sources. Worming to prevent a variety of gastrointestinal nematode infections would be worth investigating prior to launching into too many goats as supplies will not be readily available. You can keep 10 goats to an acre and they are easier to raise than sheep but more apt to climb and jump with a curious nature that can get them into mischief.

One of the joys of animal rearing is the resulting kids. Goat gestation is about 5 months and, ahh, who does not love the sight of babies. Whether for the milk or the meat, goat rearing can be very rewarding (so I hear). For eating, the younger animals are best and apparently the castrated males. Goat meat is very versatile. It can be prepared stewed, baked, grilled, fried, minced, roasted, jerked and even raw depending on the cut. Slow braising at low heat is perhaps the best. It has a savory flavour with less fat than beef or lamb and is high in iron and protein. Elsewhere it is used in ceremonial feasts and often served at Easter and after Ramadan. Knowing the preferences of the area and the strict cultural rules for the handling and slaughtering of animals is essential to understanding the market. The lawful killing methods, Halal, are zabiha for Muslims and kosher for Orthodox Jews. There is already a growing demand for goat meat; therefore its production could be a viable export market and I am sure many people here would buy once they have tried it.

Maybe it is my age or perhaps the involvement with agriculture that has broadened my circle and opened the gate to new ideas. I was a vegetarian for many years but woke up one morning with the desire to eat a whole cow. Now having tried everything from ragout of raccoon (excellent) to barbecued snake (interesting), I have refined my desires of the flesh. I simply want to be a goat aficionado so will be happy when someone enters this market.

"Lay eedl lay odl-oo"

Have fun, stay well and send any comments

to Jenny Wildman

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No Hormones No Preservatives

Pesticide Control Board (PCB) Celebrates 25th Anniversary

By Dottie Feucht

The impetus for the establishment of the PCB was the export of bananas as a result of an exportation act adopted by the government in 1985. Although 14 members were to comprise the board, it was not until 1988 that funding allowed the hiring of a staff for its administration. Annual funding of \$500,000 is supplemented by license fees and a 2% importation fee of all pesticides. Licensing, which began in 1989, used to be by ingredient but by 1995, it was switched to brand. The board still has 14 members: 4 come from Ministry of Natural Resources and Agriculture (MNRA), Ministry of Health, Department of The Environment and Belize Agriculture and Health Authority (BAHA); 4 from large agro-producer/grower associations such as citrus (CGA), bananas (BGA), sugar cane (BSCFA), and vegetables; and 6 from other stakeholders: labour, Caribbean Agriculture Research and Development Institute (CARDI), Prossers, Brodies, and an independent member appointed by the minister of MNRA.

Dr. Anil Sinha, Vice-Chairman and acting Chairman of PCB, gave a brief history of PCB at the 25th anniversary meeting on November 28, 2013. He said that with the increase in crops over the years is also an increase in insect pests, noting the current serious greening disease threatening the citrus industry. But the increase in pesticides has its own threats. The Taiwan Technical Mission (TTM), MNRA, and BAHA are looking at the problems associated with food safety, especially pesticide residue on produce. Local monitoring has disclosed residues on produce in the markets in Belize. Miriam Ochaeta-Serrut, Registrar of

Pesticides at PCB, said the residue on products for export must meet the importation standards of EU, US, Canada, and the Asian market; all these countries check incoming produce. We must do the same for products in the local market. She also noted that the mortality of bees is on the rise in Belize. Beekeepers are keeping records to assist in a study of the problem. PCB has conducted a campaign for the responsible use and disposal of pesticides. Miriam said there are 1/2 million tons of obsolete pesticides in Belize. Agricultural practices have a direct effect on marine biological pollution.

In his talk, Jose Alpuche, Chief Executive Officer of MNRA, emphasized the need for a proper perception of agriculture, operated by directive of policy, sustainable food production and management and eco-friendly farming. He put forth the notion of compensation for farmers' contribution to eco-sustainability.

Dr. Vyjayanthi Lopez, Plant Production & Protection Officer for the Caribbean, Food & Agriculture Organization (FAO) of the United Nations, admonished that short term advantages must be evaluated against the long term. *Cide* means kill; kill pests, kill humans. Farmers using chemicals without assessing all the effects is irresponsible. She presented a positive side for consideration, termed *farming systems that save and grow*, using 7 management practices: minimum soil disturbance, permanent organic soil cover, species diversification, use of high-yielding adapted varieties from good seed, integrated pest management, plant nutrition based on healthy soils, and efficient water management.



* Photo: Pesticides Registrar Miriam Serrut receiving award

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GETTING BELIZE STARTED SINCE 1960.

Addicted to Round Up

By Maruja Vargas

Globally, the use of pesticides and herbicides has become commonplace. Alarming, the usage is doubling every five years exponentially. In 1990, 35 million liters of pesticides were sprayed on fields in the US alone; this past year (2013) over 300 million liters were sprayed!

In an article from the 5th October 2013 **Amandala**, "Trade Gap Expands": "\$1 of each \$5 dollars of imports is attributed to consumer goods, the largest expense in this category being pesticides, medicines, cigarettes and vitamin supplements".

Chemicals are often applied by spray (e.g., from backpacks or airplanes), where aerosol can be dispersed by wind or overspray can runoff into aquatic ecosystems. Sprayed chemicals enter the transpiration cycle and are taken up high into the atmosphere into the clouds and may be carried long distances from the original point of spraying, later coming to earth in rainfall. The use of these chemicals and their overspray has given rise to a multitude of studies of the toxicological effects of pesticides on non-target species, as well as the impact of pesticide drift into freshwater ecosystems.

In 2010, a preliminary University of California Los Angeles (UCLA) study of pesticide drift in the Maya Mountain Protected Areas showed EVERY sample in Maya Mountain reserves, regardless of location, to be positive for glyphosate. The study further speculated that contamination might be heavier closer to farming areas. In addition to glyphosate, the UCLA study also conducted tests for organophosphates and carbonate, and found all sites positive for all these chemicals.

Because montane cloud forests near agricultural areas have a propensity to accumulate chemicals used on nearby crops (Daly et al. 2007), it is of prime importance to determine the type and amount of pesticide drift reaching the Maya Mountain Protected Areas. In Belize, municipal water exists only in portions of the country, and at least part of the population gets its drinking water from stream water coming from the Maya Mountain Protected Areas. The study concluded by stating that further study is needed for a greater understanding of how species respond and how these residues affect pesticide concentrations downriver at the level of villages, where water may be used by humans.

More than 30% of all herbicides sprayed anywhere on the globe contain glyphosate—the world's bestselling weed killer, the patent of which is owned by Monsanto USA. Branded glyphosate-based herbicides include Accord®, Rodeo®, Roundup®, and Touchdown® among others.

The herbicide doesn't destroy plants directly. Glyphosate itself is only slightly toxic to plants. Glyphosate wages a form of biological warfare on the crop and its field. Glyphosate annihilates beneficial soil organisms such as *Pseudomonas* and *Bacillus* bacteria that live around the roots. Since these beneficial bacteria facilitate the uptake of plant nutrients and suppress disease-causing organisms, their untimely deaths mean the plant gets even weaker and the pathogens multiply at accelerated rates. In addition to weakening plants, glyphosate also *changes the makeup of the soil* and dramatically promotes the number of disease-causing organisms, primarily fungi of the class, *Fusarium*, which in turn overrun the weakened crops with deadly infections. **These fungi are the actual plant assassins, not the glyphosate itself.** Purdue pathologist, Don Huber, points out that "If you apply certain fungicides to weeds, it destroys the herbicidal activity of glyphosate"; that is to say, the cause of the ultimate death of the plant is eliminated, leaving the pesticide containing glyphosate ineffective.

Pesticide exposure occurs from inhalation, absorption through the skin, and oral exposure in the mouth or in the digestive tract. Typical sources of pesticide exposure include food, beverages and water,

home and personal use items, environmental and occupational exposure. You can lower your pesticide exposure nearly 80% by avoiding the 12 most contaminated fruits and vegetables produced under commercial conditions: apples, grapes, peaches, nectarines, strawberries, berries, celery, sweet bell peppers, hot peppers, potatoes, cucumbers, cherry tomatoes, spinach and leafy greens.

Glyphosate acts as a chelator of vital nutrients, depriving plants of the nutrients necessary for healthy plant function. It's also possible that glyphosate is significantly altering the nutrient content of our food through its chelating mechanism, leading to widespread mineral deficiencies in animals and humans.

The implications of glyphosate-based herbicides are far reaching in any commercial farming operation, given the impact on all crops that may be planted on the treated land for many years into the future. The chemical, which has long been touted as a safe part of global food production, is now at a crossroads. Regulators in the United States and Canada are conducting a formal review of glyphosate's safety, even as lawsuits are pending and some groups are calling for a global ban.

In September 2013, El Salvador banned the use of many chemicals including glyphosate, with a delayed activation of the ban, allowing farmers time to find alternatives. This action was largely due to a lengthy in-depth study of the diseases (including CKD kidney disease) that had become endemic in El Salvador and other Central American countries especially among sugar cane workers and also those people living close to the fields where these chemicals were applied. So the ultimate question.....**WHY do folks use these lethal chemicals? The answer: IT IS EASY!** Everyone uses what they consider to be a 'little bit'. We have forgotten how (or become too lazy) to pull weeds, use a little boiling water on the unwanted vegetation or apply some vinegar or hot pepper solution, or use the time-tested method of cultivation in commercial fields.

It is time to stop poisoning ourselves, our livestock, and our pets in the food we eat and the water we drink that is contaminated by these lethal chemical residues.

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Sustainable Harvest International- Belize (SHIB) Agricultural Training in Toledo and South Stann Creek

After an extensive 5 year training program, 15 Toledo and Stann Creek farmers were awarded certificates of completion at the Organic Fair in Punta Gorda in October, 2013. Although the core training, based on principles of environment, agro-



ecology, food sovereignty, improvement of livelihood and learning capacity, is the same, the farmers receive customized training based on their needs. For example, families have a work plan that focuses on the first two phases of work, with focus on family nutrition, sustainable and holistic farming (includes soil conservation, reduction or elimination of external inputs), diversification, improved ecosystems, and sustainable livelihoods. SHIB's mission is to provide farming families in Belize with the training and tools to preserve our planet's tropical forests while overcoming poverty. Here's an interview with Yasmin Ramirez, SHIB Marketing Officer who explained the SHIB training program:

1. *Who does the training?* Training is done by SHIB field officers and Country Director. They are all Belizeans. The field officers hold associate degrees in natural resources management and have additional agronomy training received in Honduras and Nicaragua. All of them are registered organic inspectors. The country director is a renowned agronomist in Belize.

2. *Who are the "field officers"? Are they the extension officers from Ministry of Natural Resources and Agriculture (MNRA)?* No, they are not from MNRA. Our field officers are hired for/by SHIB **only** but they do work in conjunction with other organizations and MNRA from time to time.

3. *How do you measure success?* Our success is measured by an analysis that is done annually by outsiders. We are evaluated by the way we impact our beneficiaries under our five core principles which are covered/implemented throughout the five phases of training. The core principles are not taught one by one, but together because they are all important and interconnected:

Phase 1: Selection of communities and families based on predetermined criteria, and preparation of families for the next five years of work, including work plans and training.

Phase 2: Improvement of family nutrition and food security through crop diversification and the teaching of sustainable farming techniques. (appropriate technology: wood conserving stove, solar latrine, solar drier, backyard garden etc.)

Phase 3: Identification and implementation of agricultural practices to improve household income (identification of crops) through crop diversification and commercialization at local levels (introduction to micro credit and commercialization.)

Phase 4: Increase of income of participant families through the sale of farm produce and other goods in local and regional markets, while enhancing work plans to focus on business skills and securing sustainable social and economic conditions.

Phase 5: Development of entrepreneurial skills and ability to commercialize their products at fairs and local / regional markets; then graduation!

4. *How long has SHIB been training in Belize?* We have been in Belize since 1999 and are planning to stay here to combat poverty while we promote reforestation. SHIB has been conducting the numerous training we do since its inception. In 2012 we graduated 10 farmers, in 2013, 15.

5. *"They have reforested more than 2 acres" - Does that mean each of the 15 farmers? Was that done because the farmers had slashed and burned those acres?* Yes, each of them reforested more than 2 acres. They do it because they know the importance of preserving and protecting our tropical forests. They reforest land that they cut down, or sometimes reforest areas that were used by people who lived there in the past but moved on to other places.

6. *If farmers or co-ops in Cayo or any other district wanted to have a training program would a trainer go to that district?* Yes. We conduct training country-wide. You can call our office or send us an email to make arrangements.

7. *How long does the training usually last?* The amount of time depends on the type of training being done.

8. *The farmers already know many things.... Do you conduct an assessment to find out the areas in which they would benefit the most?* Yes, we would consult about the problem the target group is facing and find possible alternatives and solutions and base the training on that. It is important to note that the trainings are a learning field for both trainer and trainee. The farmers learn from us and we learn from them.

For more information about SHI Belize and organic agriculture in Belize you can call our office at 722 2010 or send an email to yasmin2oramirez@gmail.com.

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Spanish Lookout's Expanding Rice Industry

Belize Ag Report visits with Tropical Country Rice

By Beth Roberson & Dottie Feucht

Tropical Country Rice (TCR), the company behind the rice label of the same name, supplies about 40% of the domestic rice market. Their milling facility is based in Spanish Lookout, with rice fields located within that Mennonite farming community and other lands in Cayo District. Two other Mennonite communities, Blue Creek and Ship Yard, both in the Orange Walk District, grow and handle a bit more of the market share and the remainder of rice production is cultivated for most part by smaller farmers in Toledo District. Total domestic rice consumption in Belize is estimated to be approximately 1.8M lbs/month (21.6M lbs/year).



Overview

About 4,500 acres of rice are grown by approximately 30 farmers who utilize TCR to mill and market their rice. Average yield varies between 3,500 to 5,000 lbs. per acre. That yield figure is for 'paddy rice' or un-milled rice. Paddy rice mills out from as low as 45% to as high as 70% in milled white rice, depending on the quality of the paddy rice. About 600 acres are flooded fields, and approximately 625 acres are irrigated by pivot (mobile pipe irrigation, see cover photo). Flooded fields give the highest yield but fields that are flooded can be used for only one crop per year. Under pivot, the same fields can grow rice in the summer and beans in the winter. Each pivot irrigation rig can service about 125 acres, and there are 5 of them currently in use for rice in Cayo.

History

Rice has been grown in Spanish Lookout since the mid 1990's and increased after the purchase of Castile land behind Banana Bank, as some of Castile is flat, making it suitable for rice production. Much rice was planted in 1997, but due to an overproduction of rice in the whole country, prices plummeted to the low \$30's cwt. In the following years only a few farmers continued. This same year TCR started their own rice mill which was a simple one pass mill. Corn is easier to dry and store than rice. To dry rice, which is about 18 to 20% moisture at harvest, it must be dried to 14 to 15% before it enters the storage tanks. Once in the tanks, it is slowly dried down with ventilator fans to 12.5% moisture. Farmers dry and store their own rice until it is processed at Tropical Country Rice. Extended rainy humid weather increases drying costs. In Cayo, drying/storing costs are borne by the producers, and is only one of several factors to be considered when comparing Cayo rice prices to those paid to Toledo farmers by Government of Belize Marketing Board.

Rice Varieties and Hybrids

Some of the rice varieties favored here are Louisiana State University's Cypress and Cheniere. In recent years farmers have been changing over to RiceTec's hybrid rice seed. Currently there are five different hybrids, including three

Clearfield hybrids grown. Hybrid seeds are available by order from Grain Line, who imports these from RiceTec (see ad on page 13). The Clearfield™ (BASF product) hybrids are treated twice with Kifix, which kills all weeds. (Note: this herbicide also kills rice which is non-Clearfield and is not resistant to the chemical.) One recurrent pest challenging farmers is the 'wild red rice' which was noted by Cayo rice farmers after the floods of 2008, when it is presumed to have entered Belizean fields via the Belize River. This pesty red rice sometimes has black short kernels or has no rice at all in the husk (shell).

Milling Procedure

Paddy rice goes through 7 machines to become polished white rice. The first machine is the precleaner which cleans the paddy with sieves and suction. The second, the paddy husking machine, separates the husk from the grain. Next is the paddy separator, which separates those that still have husks to be redone. Brown rice goes through only these first processes. Rice destined to be white polished rice next enters the whitener where the bran is removed. After the whitener, rice goes into the polisher, which gives it a smooth glossy finish and then on to the sifter which removes bits and vacuums the rice. The final machine is the grader, which removes half grains and quarter grains. Purchasers may go to the mill to purchase any number of 100 pound bags of white rice; brown rice is only made on order and can be made in a minimum amount of 20 lbs while the purchaser waits. Rice byproducts are also available; see list at end of article.

Outlook

Hopes are for a better rice year in 2014 than 2013. The Cayo rice harvest of 2013 was about 35% to 40% lower than anticipated, due to the drought during early grain fill and excess rains toward the end of the crop, both increasing



disease pressure. Belize has never been a major rice exporting nation although some was exported to the Caribbean in 1998. An interesting comment made by Inter-American Institute for Cooperation on Agriculture (IICA) Belize Country

Representative Dr. Muhammad Ibrahim, when queried, 'What does Guyana*have that Belize does not regarding rice production?'. His unhesitant reply was 'Guyana has a long culture of rice cultivation'. This indicates that we have a distance to go in rice's learning curve and insurmountable obstacles to increased rice production or eventual rice exports by Belize do not exist.

Rice byproducts, available at TCR include:

Rice husks: no charge, but customers load themselves

Rice bran: \$18.00 per 100 lbs

Rice bits: \$20. per 100 lbs

Rice quarters: \$30. per 100 lbs

Continued on page 13

Expanding Rice.. Continued from page

12* Guyana is often compared to Belize, as CARICOM's only other net exporter of ag commodities. Curiously, both Belize and Guyana are classified as LDC, Less Developed Countries.

Editor's Note: Thank you to Jerry Friesen of Sp. Lkt. Rice Growers and Ray Dueck of TCR, who met with the authors several times for this article. We could not produce our publication without this type of collaboration. TCR is located at Rt. 40W, Spanish Lookout and their phone is 675-9421.

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A GOOD FUNGUS?

Many are familiar with the potato blights of Ireland and France that wiped out the potato harvests, rotting the tubers close to harvest, which changed the course of history drastically. PHOTOPHTHERA by name, which means PLANT DESTROYER, was the fungal villain causing those famines. Does a good fungus exist, one that can help plants? Yes, absolutely yes.

In the news of late, we read of 'good bacteria' located in our stomachs and intestines, being responsible for people's immune system – some credit up to 90% of our body's ability to fight off diseases, being related to these gut bacteria. Similarly, we also read of plants' abilities to fight off diseases, protected by elements in the soil. As with the bacteria – also not visible to the naked eye, both fungus and bacteria have been overlooked and misunderstood.

Many notice during the hardest parts of the dry season here, along the edges of row crop fields, when the crops themselves might be wilted for lack of water, that the weeds along the edges appear to be green and vibrant, standing tall and strong. We wonder, 'interesting these weeds don't need as much water as those crops.' In fact, **those weeds often do need water but have access to water that the crops do not.** How can that be? Think of snakes here in Belize: most of us know that the black snakes (colubridae) will fight off and actually eat baby fer-de-lance (tommy goffs) snakes. If one kills off the 'good' snakes, that might almost be an invitation to more venomous snakes, such as fer-de-lances, asking them to come move in.

A similar situation exists with fungus. Microrrhizal fungi



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(myco= fungus, rhiza= roots) have many helpful traits, such as increasing both water and mineral uptake, then storing them for later use by the plants (to whose roots they are attached). Think of them as tiny sponges, soaking up the water during times of plenty and just holding it until the plants to which they are attached somehow signal them 'SEND THE WATER PLEASE!' Microrrhizal fungi are native to most of the world – we have or have had them in our soils. IF we have killed off these 'good' fungi, then we have created a habitat more suitable for the 'bad fungi', just like in the snake situation. Thirsty mineral deficient plants are weak plants and more susceptible to disease. Soil science is complicated, compounded by the fact that much of the action is at a micro level we can't see with the naked eye – we only see the results, good or bad. Soils that have been damaged may require more than just re-inoculation of this 'good fungi' to be restored to health. Many keys to understanding soil science have been revealed in the last 50 years. Fascinating and profitable rewards are available to those who meet the challenges by understanding them, enabling them to get the best of the constant challenges of plant pests and diseases.

Microrrhizal fungi are sold commercially in most parts of the world (mycorrhiza.com or just google it – even Amazon.com sells it), and its application (inoculation) has been used to rehabilitate and restore soils. It comes as powder and liquid and PCB (Pesticides Control Board) informs us that there are no restrictions on its importation. If you have used Microrrhizal fungi here in Belize, or if you know of an agent or distributor for it in Belize, kindly let us know at the Belize Ag Report (belizeagreport@gmail.com or 663-6777) so we can share that information.

Consortia - The Coming Secret for Success of Small Businesses in Belize

By Percy A. Lewis

Many small business owners in Belize have become curious, having heard about the success of consortia in other countries. *An export consortium is a voluntary alliance of businesses (or other) operating under an agreed set of rules, the first of which could be that members bring all their produce to the organization, a move intended to dissuade opportunistic behaviour.* Notwithstanding, the main purpose for this kind of consortium is to promote and export goods and services into the foreign market. This umbrella group requires that members such as small farmers share the huge costs associated with marketing goods, while allowing them to keep their individual profits. As well, members find a consortium attractive because it does not require them to divulge company secrets to the group, such as negotiated prices and contract terms with their individual clients.

Apparently, a number of small farmers have determined not to wait for the government to bell this cat. After all, the government of the day has already created the enabling environment and is doing a lot for businesses broadly through initiatives like Belize Trade and Investment Development Service (BELTRAIDE). Furthermore, consortia require a lot of attention and day to day management which BELTRAIDE, by design, may not be intended to provide. BELTRAIDE's focus is probably more outward, bringing investment into the country. **This creates business opportunity for a local agency to serve as a repository for consortia, helping businesses with common products form into groups and assisting them as they go through the stages (as the saying goes) of forming, storming, norming and performing.**

Many small farmers need organizing in order to maximize production and profit; they need the necessary knowledge and financing; they need to meet the foreign regulatory requirements; and they need to produce the quantity or quality that will keep foreign investors; hence their need for consortia. In the agriculture sector alone, it has been reported that over 50% of farm owners own less than 20 acres of land. Farmers that are vested in grains are just one example of a group in the agriculture sector that is ripe for a consortium.

Belize can establish all sorts of consortia for wood products, animal products, meat products (perishables), live animals, processed foods, arts and crafts, pets, fruits, grains, and furniture, as well as services consortia for hotels and schools. The Organization of American States (OAS) recently came to terms with a consortium of schools that standardized the product marketed to meet the needs of persons applying for OAS scholarships all across North, Central, South America and the Caribbean. **Broadly speaking, the concept is simply about forming groups that have common products or services and that agree to be governed by sets of rules, notwithstanding being able to retain their companies' secrets.**

Overseas technical expertise to establish consortia is being offered by the United Nations Industrial Development Organization (UNIDO), an organization that is currently assisting countries in Africa, Latin America and Asia with similar initiatives. UNIDO, working with a local counterpart (agency) and the blessing of the government, can assist by helping to form the groups into consortia, providing training, assisting with the drafting of favourable institutional and regulatory frameworks, as well as helping local organizations reach the benchmark of international practice. There are several non-government organizations that

may be suitable as local counterparts to UNIDO, to develop local businesses into consortia; the Belize Enterprise for Sustainable Technology (BEST) is perhaps one of them – given its aim to help small businesses and provide them with training.

The answer to the question, “Why form consortia?” is to participate in legal entities that are sustainable and keep members in business. The secret to their success is the safeguards they put in place. With structures like consortia, Belizean businesses would no longer have to be concerned about succeeding in the international marketplace, because they'd be able to pre-empt all sorts of encumbrances with written rules. The condition that members must agree and sign on to the list of rules is key, and the charter should contain penalties in the event that rules are broken. Once again, the rules serve as disincentives (for example) for those who are opportunistic, those who, without rules, would sell their products to entities offering better prices. Rules force them to bring all their goods to the consortium; rules force them not to become dormant; thereby the consortium can meet its commitment to its buyers and remain sustainable. Also, the lack of trust has long haunted Belizeans trying to do business together; consortia (rules) negate that risk.

Different business frameworks are designed to address different needs and choosing one over the other depends on what the group is trying to achieve. A fisherman who joins a cooperative doesn't have to worry about administration; he only has to drop off his catch at the warehouse, abide by the charter, remain active and receive his checks periodically. It is the ideal structure for him because he doesn't have company secrets to protect and the organization gives him a secure commitment. On the other hand, a businessperson joining a consortium often doesn't want to share profits, wants to retain company secrets (including negotiated prices and contract terms with clients), resists domination and wants to retain the company's identity; however he/she will agree to share marketing costs and sign on to rules that foster trust and dissuade opportunistic behaviour (which are commonly experienced practices contributing to the failure of the past). **The hand of consortia is knocking: businessmen and women must take the bull by the horn, come to the table and collaborate with the competent authorities in order for small businesses to experience tremendous growth.** The forming of consortia is the coming secret for the success of small business in Belize.

Editor's Note: Mr. Percy Lewis has a Masters Degree in Business Administration and Sustainable Development, and post -graduate training in climate change, diplomacy and international business. He is currently a Foreign Service Officer working with the Ministry of Foreign Affairs and has received on-the-ground training in places like Germany, Austria, India, Japan and several countries in Latin America and the Caribbean. Mr. Lewis grew up in the Stann Creek District, a predominantly agricultural based community and he has renewed interest in small farming.



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Toledo Cacao Growers Association (TCGA) Holds 20th AGM

By Beth Roberson

Cacao producers from 42 Villages in Toledo and Stann Creek Districts gathered on Saturday January 18th, 2013 for TCGA's 20th AGM held at the Julian Cho Technical High School auditorium in Punta Gorda Town, Toledo District.

From the Industry Report

During 2013, production decreased by 53.5%, (2012 having been an all time high producing year for TCGA at over 54MT and 2013 production was 26MT. Multiple factors caused this decrease including cyclical production, farm rehabilitation, and the challenges of Moniliasis (fungal disease). Nevertheless TCGA remains very positive as they move toward sustainability and improved product quality and increased quantities. During 2013, 10 satellite drying facilities and 3 centralized fermenters were built and over 50 training sessions were held. About 300 acres of cacao were rehabilitated.

Report was given on the Maya House of Cacao & Chocolate Museum, located at mile 18 on the San Antonio Rd. This is a joint project of TCGA and the European Union and should be open to the public before the end of 2014. Facilitating cacao field rehabilitation, Caribbean experts assisted in the training/employment of 20-25 youths to use power tools which they used over 6 -9 months while rehabilitating approximately 200 acres of cacao. In field management, over 50 farmers went through the Farmers' Field School Method training, which included

Mr. Luciano Sho



MNRA CEO Mr. Alpuche

propagation, production, disease control, crop management and fermentation. Additionally, 50 women were trained in "developing and strengthening household-based and cottage-based industries" and "3 women had exchange visits with other Caribbean women's groups processing cacao". 50 community members were also trained in business basics relevant to agriculture, agro-processing and eco-tourism. Ten solar drying facilities were built from funds provided by both TCGA and Green and Black's Organic and installed in 7 communities. Each solar dryer has a capacity to dry 3,000 lbs and should service 5 families.

Financing

The Inter-American Development Bank's Multilateral Investment fund (IDB/MIF) began a 3 year project with TCGA, with the theme "Closing the Gap between Mayan Farmers and the Global Organic Cacao Market". Besides training, the project has assisted TCGA with their nursery, reaching 10,000 seedlings and with management of the 5 clonal gardens, each of which has 6 varieties of high production and tolerance to Moniliasis. Plans are for the nurseries to plant and graft 80,000 cacao plants to be sold to farmers in 2014. Post-harvest training was provided to over 200 farmers and 13 farmers attended training at FHIA (Honduran Foundation for Agricultural Research) in Honduras. Report was made in detail as to the Bio-Char project, and as in most new endeavors, much was learned identifying the shortcomings; changes were made to move forward. Regarding the challenges of Moniliasis, the report stated that "while there are no known mechanisms to combat Moniliasis, TCGA's approach of vigorous farm rehabilitation has minimized effects by at least 10%". They also explained that while the rehabilitation efforts had contributed to the production decrease of 2013, that over the next 5 years, production should increase.

Continued on page 27



Toledo Cacao Growers Association

The Toledo Cacao Growers Association (TCGA) is a not-for-profit organization established in 1984 that seeks to improve the socioeconomic standard of its members through a diversified system of production incorporating sound ecological practices. Today more than 1,100 subsistence farmers (primarily in the Toledo and South Stann Creek Districts) are engaged in cacao production. Its members are divided into 52 communities in the Toledo, Stann Creek and Cayo Districts that produce some 50 tons of cacao beans annually.

Service to Members:

1. Trainings in Cacao Production (Improved farm management techniques)
2. Technical support/consultation through the extension department
3. Organic and Fairtrade Certification
4. Wet bean purchase and pick up
5. Farm Rehabilitation
6. Sales of polythene bags, selected high yielding seeds and tree saplings
7. Grafted trees (during transplanting season only)

8. Drying facilities and cascading fermentaries
9. Guaranteed purchase of quality fermented and dried cacao beans

Markets:

- Export**
1. Mondelez International
 2. Choco del sol
- Domestic**
1. The Belize Chocolate Company Ltd
 2. Goss Chocolate
 3. Ixcacao (formerly Cyrila's Chocolate)
 4. Cotton Tree Chocolate
 5. Che'il Chocolate

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2. Proposed site must be inspected and approved by TCGA
3. Complete Membership Application form and pay \$5.00 Application Fee and \$10.00 annual fee
4. Abide by TCGA's organic terms and conditions



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Agriculture Prices at a Glance- \$\$\$\$ FEB 2014

A-B denotes the difference between 1st preference & second 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

T	A	B
BELIZE CATTLE		
Young str. & bulls - 750-1100 lbs	S 1.70 - 1.80	1.60 - 1.70
Cows & heifers for butchers	S 1.45	(thin) 1.40
Heifers for breeding 500-800 lbs	S 1.50	1.35 - 1.45
Young grass cattle - 350-650 lbs	S str. 1.80	Heifers 1.45
U.S. CATTLE		
U.S. price - corn fed - 1000-1200 lbs	H US\$ 1.363	
U.S. price - feeders 600-800 lbs	H US\$ 1.71	
U.S. price - aged butcher cows	H US\$ 0.82 - 0.92	
BELIZE HOGS		
Weaner pigs - 25-30 lbs - by the head	S \$90.00 - \$100.00	
Butcher pigs 160 - 230 lbs	S 1.75 - 1.85	1.65 - 1.75
BELIZE SHEEP		
Butcher Lambs	S 2.00 - 2.25	1.50 - 1.75
Mature Ewes	S 1.75	1.50
BELIZE CHICKEN		
Whole sale dressed	H 2.48	
Broilers - live per lb	S 1.27	
Spent hens	S .95	
VEGETABLES		
Local Potatoes lb	S/L 1.00 - 1.10	.70 - .75
Local Onions lb	H 1.50 - 2.00	
CITRUS		
Oranges per 90 lb box-lb. solid basis	L 9.0118 (1.5274 Pps) 1st Est. 2014 price	
Grapefruit - per 90 lb box	Price Pending	

T	A	B
GRAINS, BEANS & RICE		
Belize yellow corn	H .225 - .25	.215 - .22
White corn	S .325	
Corn/local retail (low volume)	L .29	
US corn @ US\$ 4.32 - per 56 lb bu	L \$ BZ 15.43/cwt + 8¢ frt. to BZ	
US non-GMO yellow corn US\$ 4.82 - 5.32/bu	L \$ BZ 17.21 - 19.00/cwt	
Guatemala corn price/Peten	S .2250	.21
Belize soy beans	S .59	.57
US soy beans @ US\$ 12.85 per 60 lb bshl	L \$ BZ 42.82/cwt + 8¢ frt. to BZ	
Belize milo (none available)		
Red kidney beans	H 2.55 retail price	
Little reds & black beans	S 1.50 - 1.60 farm price	
Black eyed peas	S .65 - .67 farm price	
Paddy rice per pound	.40 - .53 farm price, dried	
SUGAR/HONEY		
Sugar cane, ton		first estimates 2014 crop: \$53.08
Bagasse		pending agreement
Honey per lb (Cayo)	S 2.50 (approximately 12 lbs/gal)	
SPECIAL FARM ITEMS		
Eggs - tray of 30	S 6.75 farm price; retail .30 - .33 per egg	
WD milk per lb to farmer	S contract .50; non contract .45	
Raw milk (farmer direct sales)	S 8.50 gal (5 gal + 8.00 gal)	
CACAO		
Cacao beans (TCGA) /lb	H 2.65 dried fermented	
Cacao beans (TCGA) /lb	H 1.00 wet beans	
US Cacao beans, New York, metric ton	H US\$ 2,200.00	

A hefty 15% tax imposed by the Mexicans on cattle being legally exported from Belize into Mexico is still creating an obstacle to cattle movement northward and slightly depressing local cattle prices. GOB is aware of this and plans to address this when they meet with Mexican officials to discuss overall trade between our nations. Rain, rain, rain - from October 2013 til print time (late Jan 2014): Belizeans, especially of the West and North areas, have been heavily inundated with higher than normal rains and flood conditions. Farmers especially in the West suffered delays to planting schedules resulting in some cases in changes in the winter crops (traditionally various beans) planted: drastic reductions (some cases to half) in acreages risked from late planting and some changes (switching from 120 day to 90 day crops {subject to seed availability}). Domestic needs for beans are met first before exports. Headline stories about our unusual drastic weather, Oct 2013 to present, have given consumers and all Belizeans an increased understanding of the challenges and constraints to growing food. Retail market prices for local vegetables have gone through the roof (when they are even available) as vegetable crops suffer various rots and new seeds/plantlets are drowned. Until drier times, keep the sun in your hearts, Beth Roberson.

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

Homemade Health

GlutenFree - To Be or Not to Be?

Marguerite Fly Bevis, R.N., B.S.N.

For a long time I thought the gluten-free diet was just another fad or only for people with Celiac Disease. After I read a book called "Wheat Belly: Lose the Wheat, Lose the Weight, and Find Your Path Back to Health," by William Davis, MD., I decided to drop wheat from my diet. The results are remarkable enough to share, so others can enjoy this simple trick for feeling better, enjoying decreased joint pain, increased energy, and yes, weight loss without much effort.

The wheat we eat today is a far cry from the original product. "Einkorn wheat, ancestor of all modern wheat, harvested by hunter-gatherers in the Fertile Crescent 10,000 years ago is a 14-chromosome wild grain. Emmer wheat, of Biblical times, bore 28 chromosomes. Modern wheat has 42 chromosomes and has been changed (hybridized, genetically modified) more times than any other grain. What other changes occurred deep within the gene structure of the plant? The truth is that little testing was done on the effects of these hybridized or modified plants on the human body. The testing that was done and modifications made were to increase yield and profits without concern for how it changed the nutritive value of the product.

Have you ever wondered why there are so many more obese people today than there used to be? Why do so many more children have autism than they did 30 years ago? Why are so many suffering with joint pain and arthritis? What is the one thing all these people had in common? A diet based on wheat, whole wheat, bleached and unbleached. We were convinced that eating "whole grains" was heart-healthy and that they should replace fats in the diet. Unfortunately, "they" were wrong. Two slices of whole wheat bread have a higher glycemic index (72) than 6 teaspoons of sugar (59-65), or one chocolate Milky Way (41), higher than ice cream (36). Continually eating wheat products 3-4 times a day over the years has increased the production of insulin, the fat production hormone, in our bodies. It is no wonder we see so many with "Wheat Bellies."

What exactly is gluten? Gluten is what makes dough pliable, stretchable, and moldable. Gluten is made of proteins, which can vary from wheat strain to wheat strain. Gluten has been genetically manipulated over the years for desirable characteristics such as firmness, bendability, and crust formation. However, along with its ability to make cakes lighter, gluten has become one of the most destructive proteins in our diet.

Scientists discovered 25 years ago that one of the proteins in modern strains of wheat, called Gliadin, has an appetite-stimulating effect. These proteins actually make wheat addictive. The more wheat you eat, the more you want. Wheat is now found in basically all processed food. Nearly all frozen, canned and packaged foods contain wheat in some form. Why? It is there to stimulate your appetite and increase their sales.

Wheat affects all the organs of the body. Its effect on the brain is similar to the effect of opiate drugs. Some people have a difficult time eliminating wheat from their diet because of its addictive properties. But those who eliminate wheat from their diet report improved mood, fewer mood swings, improved energy, concentration and deeper sleep. Actual brain damage is possible, resulting in cerebral ataxia. The cerebral cortex, the center of memory and higher thinking, the brain's "gray matter," can also be affected by the immune battle with wheat, resulting in encephalopathy, or brain disease. Gluten encephalopathy manifests as migraine headaches and stroke-like symptoms, such as loss of control over extremities, difficulty speaking, or problems with vision.

Dr. F. Curtis Dohan is credited with the earliest work linking wheat to schizophrenia. A psychiatrist during World War II, he observed that men and women from Europe, Canada, and the United States required fewer hospitalizations for schizophrenia when food shortages made bread unavailable. When the shortages ended after the war, hospitalizations increased. Dr. Dohan also observed similar changes in New Guinea. Prior to the introduction of Western culture, schizophrenia was almost unknown among the hunter-gatherer inhabitants. As the New Guinean population began to consume wheat products and beer made from barley, Dr. Dohan noticed the incidence of schizophrenia increased almost sixty-five percent. During the 1960's, Dr. Dohan was working at the VA Hospital in Philadelphia. He decided to remove all wheat products from the meals served to schizophrenic patients. After four weeks without wheat, the patients demonstrated reduced auditory hallucinations, fewer delusions, less detachment from reality. When wheat was added back to the patients' diet, the symptoms returned. Psychiatrists at the University of Sheffield in England later reported similar findings.

There is evidence that Autistic children can benefit from removing wheat from their diet. There is no evidence that wheat causes autism or schizophrenia, but there is evidence that these conditions are exacerbated by the ingestion of wheat.

Do you have any of the symptoms of wheat intolerance? Hypertension, high cholesterol, obesity, arthritis, acid reflux, irritable bowel syndrome, fibromyalgia, migraine headaches, depression, diabetes, and various forms of neurological impairment are all symptoms that people have received relief from just by eliminating wheat from their diet. Wheat affects the skin by advancing aging effects: wrinkles, lost elasticity, hair loss, acne, skin rashes, oral ulcers, and psoriasis.

Continued on page 19



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Homemade Health... Continued from page 18

If you suffer from any of these ailments, or you just want to lose a few pounds, you should consider dropping wheat from your diet. If you suffer from irritable bowel syndrome or Celiac disease, you should avoid all forms of gluten, including potatoes, rice, and corn. Realize that wheat is found in everything from canned cream soups to "healthy" frozen dinners. Avoid gluten-free products that substitute potato starch, rice starch and other starches equally bad for you. Once you've decided to drop wheat, you may notice that, if you cheat, you may experience some abdominal or other discomfort, depending on your sensitivity. Eventually, you will not miss wheat except at social gatherings. Gather around the cheese and veggie dips. Stay away from cakes, cookies, and pies, unless you make them yourself using using coconut flour, ground flaxseed meal, or nut-flours instead of wheat flour. Also be aware that wheat is found in beer, some vodkas, and whiskey. For the gluten intolerant, these must be avoided, but wine and vodkas prepared from grapes, potatoes or corn (Chopin, Ciroc & Smirnoff, respectively) and rum will fit into the gluten-free lifestyle.

Replace wheat with lots of vegetables, nuts, meats, eggs, avocados, olives, cheeses, and healthy fats like coconut oil and olive oil. Eat fruit in moderation, being aware that fruit's high sugar content can raise your blood sugar. Avoid highly processed, ready-to-eat food. Substitute ground flaxseed flour, amaranth flour, nut flours or coconut flour for wheat flour in your favorite recipes. There is a great opportunity for someone in Belize to begin producing coconut flour, the preferred flour for replacing wheat in baking because of its taste and texture.

You will notice very quickly that you no longer require frequent snacks. Over time, weight will begin to fall off effortlessly until

you reach your optimum weight. You will begin to notice less joint pain, better lung function, and improved digestion with an absence of gas, cramping, and bloating. Your energy levels will increase and you will generally feel better and sleep better.

You can wait for science to prove these claims or you can start right now, today, to feel better, without spending any extra money, or expending much effort. Your blood sugar and blood pressure levels will begin to equalize. Isn't it time you started feeling better?

Write to me with comments or questions at marguerite@pobox.com

Disclaimer: If you are ill, please see a doctor or nurse. This information is not intended to substitute for medical care.

Gluten-free Granola

2 cups grated fresh or dried coconut
1 cup black or regular sesame seeds
1 cup pumpkin seeds
1/4 cup panela, melted
3 tablespoons coconut oil
1 cup chopped pecans, cashews, walnuts or almonds
For chocolate flavor, add 1/4 cup cocoa to the melted panela.

Melt the panela in a saucepan over low heat, stirring frequently to avoid burning. Add the coconut oil and mix together. In a separate bowl, mix grated coconut, chopped nuts, sesame seeds, pumpkin seeds. Pour melted panela & coconut oil over the dry mixture and stir well. Can be eaten as is, or baked for a crunchier texture. Use as a snack, dry or with coconut milk in place of cereal.

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Belize Livestock Producers Association (BLPA) An Organization on the Way Up By Alistair Macpherson

After several years of semi-stagnation and lack of enthusiasm in the cattle industry, there is a revival taking place, thanks in no small part to the Cattle Sweep taking place within Belize.

It is no coincidence that almost to the day when all the agreements were signed and it became clear that the much talked about and anticipated Cattle Sweep was actually going to happen, the price of Belizean cattle started to rise and rise quickly, from around 95c/lb. up to a high of around \$2.15 in the middle of last year. Currently the price stands at around \$1.85/lb. and will hopefully hit the same highs as last year depending on supply and demand throughout the course of the coming year. One thing is for certain: if we can keep the momentum going with the Cattle Sweep, complete this massive project and become certified free and clear for TB and brucellosis, we will not be visiting those dark old days of 95c/lb. again anytime soon.

The sweep, as we write, has almost completed round 1 and has already started up north with the second sweep, the Blue Creek farmers blazing the trail and now patiently awaiting round 3! Once the few stragglers that are proving to be very elusive and difficult to catch and test are completed in the south, all the vet teams will be moving back up north to help out up there and things will again move forward at a reasonable pace. It looks as though the original estimates of around the 100,000 head of cattle in the country will be very close to the mark and it is expected that very close to that figure will have been tested by the time all is said and done. The few that are left are mainly because of logistical problems of actually catching these wild animals in the bush in certain areas, being unable to reach animals on the wrong side of flooded creeks and rivers and also due to several farmers actually hiding their animals to avoid taking part!

As many of you know, the first sweep was not without problems and controversies; however, I hope that many lessons were learned and these problems are ironed out in time for the second visit of the teams to the farms. One of the major hurdles now facing the teams is the motivation and cooperation of the farmers themselves. Many of the farmers who cooperated with the first



sweep and filled their part of the bargain by being prepared and having their cattle corralled and ready when the teams showed up saw neighbors who did not cooperate, did not have adequate handling facilities and have been boasting to all who would listen that they did not pay for the sweep, are saying "Why should I bother when my neighbor didn't help or pay their fair due and they are getting away with it?" Belize Agriculture and Health Authority (BAHA) has declared that court action will be starting against these farmers. Compliance with the sweep is the law and must be obeyed by all. All of these farmers who are either not complying and/or not paying their \$10.00 per head, are more than happy to collect double the money they were earning before the sweep took place. However, by not contributing and helping out, they are causing future problems as the industry struggles to maintain these price levels. These farmers must and will be held accountable by BAHA as they are jeopardizing the whole industry not just for now, but



for the future generations of cattle producers.

Other than the sweep, BLPA has been very busy working for the producers over the last few months and several changes have been made at board and management level. With our new acting chairman, Mr. Abdala Bedran, and CEO, Alistair Macpherson, relationships with several organizations including Ministry of Natural Resources and Agriculture (MNRA), International Regional Organization for Plant and Animal Health (OIRSA), Inter-American Development Bank (IDB), Tropical Agricultural Research and Higher Education Center (CATIE) and, most notably, Inter-American Institute for Cooperation on Agriculture (IICA), have been renewed and strengthened. All of these organisations are fully committed and will be bringing a huge amount of support to the BLPA over the course of the coming year. This support will be invaluable in the institutional strengthening of the BLPA and will allow us to become, with the support of our members, a fully sustainable organization and will further allow us to get on and be doing what we are supposed to be doing on behalf of our members and the industry as a whole, that is, promoting our industry, both at home and abroad, finding markets, education training, arranging better deals for our members, giving our members a plausible voice with government and others. Oversight of our industry, representation on various boards and committees offer a wide range of services and benefits to our membership.

At time of writing we are halfway through a series of consultative and informative meetings with farmer groups being held in each district. All district meetings will have been held by print date for this issue. These meetings have been enthusiastically supported with good turn outs and lively discussion taking place.

Continued on page 21

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Belize Livestock... Continued on page 20

Points raised and discussed included the following:

1. Recent changes at BLPA
 2. Brand registration and membership
 3. Update on Cattle Sweep, including the role of BLPA and its members. – Benefits of sweep
 4. Belize livestock registry (BLR) and what it means
 5. Funding of the BLPA and BLR going forward; farmers' responsibilities (including paperwork and documentation)
 6. What members can expect from the BLPA going forward
- Farmers have expressed satisfaction with progress that has been made in the last few months.

Our AGM will be held on the 22nd of February 2014 as usual at the BLPA compound in Belmopan (47 ½ Mile, George Price {formerly Western} Hwy) with registration starting at 9.00 A.M. All are welcome. Many of the points addressed in the district meetings will be revisited and updates given on all. There will be guest speakers from IICA, MNRA and others who will be informing members on their plans to help BLPA and our industry reinvigorate itself over the coming months and years and lead to a profitable and sustainable livestock industry that not just the members, but the whole of Belize, can be proud of.

So please look out for the ads regarding our remaining meetings and please put 22nd February in your diaries. BLPA ---MOOOOING FORWARD.

Editor's Note: Alistair schooled in agriculture in Aberdeen, Scotland, his native land. He has worked primarily with the livestock industry but also in fish farming, grains and fruit packing/export in many countries around the globe. He has resided in Belize for over 9 years. We appreciate Alistair's perspectives and enthusiasm for the livestock industry at such a vibrant point in its development.

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National Conference on Agro-Biotechnology and Biosafety in Belize

By Dr. Anil Sinha

Mr Anil Sinha participated in the National Conference on Agro-Biotechnology and Biosafety which was held on 10 December 2013 at George Price Centre, Belmopan. It was organized with the support of IICA, FAO and CARDI. The objectives of the National Conference were (i) to provide scientific information on the topic of biotechnology and biosafety, and (ii) to support the interest of the Belizean government to develop a platform for discussion among the key stakeholders to develop and inform Belize's strategy as it relates to biotechnology and biosafety. The conference was attended by a total of 83 participants from a wide cross section of agricultural stakeholders from the public and private sectors and international development agencies and civil society which included farmers, industry leaders and representatives of producer associations, concerned citizens, academia, government technicians and policy makers, the media among others. Dr Pedro Rocha, Coordinator, Area of Biotechnology and Biosafety, IICA, Costa Rica and Dr Juan Izquierdo Fernanadez, Consultant, FAO made key scientific presentations on the topics. Mr Francisco Gutierrez, Director of Plant Health, BAHAMA made presentation on "Drivers and lessons learnt in the development of the current National Biosafety Policy in Belize. Mr Hugh O'Brien, Representative, Grain Growers Association in Belize made presentation on the perspective of benefits of use of biotechnology in Belize while Mrs Miriam DeShield, Representative, Concerned Citizen made presentation on the perspective that some biotechnology in Belize is not beneficial.

Mr Anil Sinha moderated Question and Answer Sessions and also gave conclusion of the conference. Those conclusions were:

1. There is a need for capacity building in understanding agro-biotechnology, especially the scientific background, so that sound scientifically-based decisions can be made.
2. There is a need for an independent review of hard scientific literature, both for and against GMO, especially as it relates to health, to support capacity building on the issues.
3. There is a need for a socio-economic assessment, including pest management and related costs associated with the use or non-use of GMO and their impact on the export of organic cacao, fair-trade sugar, marine products and tourism.
4. There is a need to identify niche markets that offer higher prices for non-GMO corn and soybeans.
5. Based on the above needs and other new issues that may be identified as those needs are fulfilled, Belize's Biosafety Policy of 2009 needs to be reviewed and recommendations made to the Government of Belize for appropriate legislation, implementation and monitoring.
6. There is a need for capacity building related to the process of risk assessment for technical development and application.

7. There is a need to develop a mechanism for communication at all levels of the agriculture sector on biotechnology and GMO.
8. There is a need for research and development in increasing productivity and reducing the costs of production on a sustainable basis, including genetic improvement, mass selection of varieties, efficiency in soil nutrient management, adaptable and validated Integrated Pest Management (IPM) options.

Belize's National Agriculture and Food Policy

By Dottie Feucht



In early December, 2013 major stakeholders came together at the George Price Center in Belmopan to provide input for the development of a national policy and strategy for creating an enabling business environment for agriculture. Sponsored by the Ministry of Natural Resources and Agriculture (MNRA), International Institute of Cooperation for Agriculture (IICA), and Food and Agriculture Organization (FAO), the attendees were divided into 5 groups to discuss the challenges and opportunities and provide recommendations for the national policy.

The common themes that emerged were (1) the need for more information flow and dialog between farmers and government agencies to identify market niches, agricultural barriers to increased production, high quality products, and eco-friendly practices and (2) the effects of price controls and tariffs on agricultural production.

Agriculture contributes approximately 11% to GDP and provides a base of employment and income for over 75% of the population of Belize. The MNRA recognizes the potential of the agriculture sector on the local, regional and global levels and is actively seeking to develop the means to assist farmers, cooperatives, and businesses to be proactive in achieving supply/demand successes.

Dr. Jerome Thomas, FAO representative for Jamaica, Bahamas, and Belize gave a regional perspective on business opportunities and competition. Dr. Dowlath Budhram, IICA representative, presented the emerging trends, major constraints and new challenges and opportunities for the sector. He spoke frankly about the adverse effects of regulations, costs of doing business, and protected markets in Belize. His concern for trends in health and eating habits was summed up in his remark, 'When the price of a coke is less than milk... this is a problem.' See article by Dr. Budhram on page 3 of this issue.

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Seed Toxins And The Purpose Of Life

By Jo Carpenter

The purpose of life for any organism, animal or vegetable, is to achieve immortality by producing offspring; that is, reproduction ensures the continuation of the species through the perpetuation of its genes. Natural selection determines that the more successful survival strategies result in gradual evolutionary development. For an animal, this might entail being the fastest runner, having the sharpest teeth or the most intelligence, all of which enable the creature to stay alive long enough to mate, hopefully repeatedly. But what does this mean for a plant that can't run, fight or think its way out of danger?



Plants have also evolved a range of self-defense strategies to increase the probability of reproduction. One of the most creative of these is to produce substances that are noxious to predators that might otherwise consume, digest and obliterate the all-important regenerative seed.

These poisons or toxins, including fear-inducing ricin and cyanide, are present in some of our most common and seemingly innocuous human foodstuffs. Apple seeds, for example, as well as the pits of many other fruit contain the substance amygdalin. (You may recognize 'amygdalin' from the Greek for almond 'amygdalē', which also gives its name to the amygdala, the almond-shaped structure in the brain). Amygdalin in a modified version known as laetrile or Vitamin B₁₇ was once marketed as an anti-cancer drug though this research is now considered to be entirely discredited. Nowadays amygdalin is more renowned for its ability to react with enzymes to form hydrogen cyanide (HCN), also called prussic acid, which has been used in pesticides, to coat whaling harpoons and even as a weapon of genocide under the name 'Zyklon B' during the Holocaust. HCN is also found in the roots of the cassava plant and is used by some millipedes as a chemical defense.

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So, how is it that we can eat fruit seeds, pits and kernels without being rendered violently ill? If you look at an apple seed you'll notice that it's hard and shiny and very difficult to crack without a blunt instrument. It's cleverly designed – or perhaps, evolved – to slide through the digestive system intact, to be deposited at the other end surrounded by fresh organic fertilizer. Perfect growing conditions. The toxins remain inert and harmless inside the seed during its passage through the gut unless the outer casing is punctured.

If you are in the habit of chewing your apple seeds or throwing the whole apple into your juicing machine, don't worry unduly. An adult would need to consume approximately one cupful of apple seeds at one sitting to ingest enough amygdalin to suffer cyanide poisoning. Kernels or pits of the *prunus* genus, including peaches and apricots are considerably more toxic, depending on the species. Eating ten or more peach pits is close to the danger zone for adults and a lesser number is dangerous for children.

Red kidneys bean (*phaseolus vulgaris*) are familiar to most cooks as a potential danger in the kitchen if not soaked and boiled before eating, though other members of the *phaseolus* family can also be toxic, if less potently so. If in doubt, check with an expert authority before preparation and consumption of any seeds or beans.

Below is a selective list of plants with poisonous seeds.

COMMON NAME	LATIN NAME	TOXIN	COMMENTS
Apple	<i>malusdomestica</i>	hydrogen cyanide	Cyanide poisoning can result from the consumption of large quantities of seeds.
Apricot	<i>prunusarmeniaca</i>	hydrogen cyanide	Cyanide poisoning can result from the consumption of large quantities of pits.
Bitter almond	<i>prunusamygdalus</i> <i>var. amara</i>	hydrogen cyanide	Only applies to bitter almonds. Sweet almonds, <i>Prunusamygdalus var. dulcis</i> , are not toxic.
Broad bean, fava bean	<i>Viciafaba</i>		Can provoke a reaction in some people of Mediterranean origin who suffer from a hereditary condition known as 'favism'.
Castor oil plant	<i>Riciniscommunis</i>	ricin	Used for the production of medicinal castor oil but highly poisonous in small quantities if beans ingested raw.
Cherry	<i>prunuscerasus</i>	hydrogen cyanide	Cyanide poisoning can result from the consumption of large quantities of pits.
Jequirty bean, rosary pea, crab's eye, love bean, prayer bead	<i>Abrusprecatorius</i>	abrin	Used for jewelry and decoration in many cultures. Highly poisonous if consumed.
Kidney bean (particularly red, but also white 'cannellini' beans)	<i>phaseolus vulgaris</i>	phytohaemagglutinin	As few as four raw beans can cause poisoning. Soaking and boiling required.
Lima bean, butter bean	<i>Phaseoluslunatis</i>	linamarin	Some varieties can decompose into hydrogen cyanide in the gut if not properly prepared.
Peach	<i>prunuspersica</i>	hydrogen cyanide	Cyanide poisoning can result from the consumption of large quantities of pits.
Plum	<i>prunusdomestica</i>	hydrogen cyanide	Cyanide poisoning can result from the consumption of large quantities of pits.

Home Production and Use of Cassava Flour

By Deborah Harder



Much information is available on the cultivation of cassava, an important tropical staple food. This article will focus on a less-well-known and underexploited use for cassava; the versatile flour which can be made from this root crop.

We have heard that there used to be a factory in Belize that produced cassava flour for sale. Families in Upper Barton Creek and daughter settlements have been producing cassava flour for home use for over 40 years. Drying cassava for flour takes effort, but it's an enjoyable job the whole family can help with. It's a good way to spend time together while producing a useful food! Cassava flour can be used successfully to make pancakes, muffins, cakes, cookies, corn bread and other quick-rise baked goods. Its by-product, cassava starch, also has many uses.

To make cassava flour, we dry cassava in the dry season when we have dependably sunny weather. January and February are the best months. The mature cassava roots are first harvested and peeled. To make full use of a sunny day, this job can be done the day before and the peeled roots left overnight in tubs, completely covered with water. The next step is to shred or chop up the roots finely. There would be a variety of methods for this which would work, but in our communities it is most commonly done either by using a hand operated rotary shredder of the type known as Salad Master, or by the horsepower using the machine designed for chopping sugar cane for feed. The more finely shredded the cassava is, the more starch can be extracted. The resulting shredded pulp is washed in two or three changes of water to wash out the starch. While cassava can be dried with the starch intact, the washing process yields a flour which is lighter, with less of the "rubbery" consistency which whole cassava naturally has. After the cassava pulp is removed and the water has become quite starchy from several batches of pulp, it should be left to set in containers so the starch may settle. Before being set aside, any settled starch should be stirred up from the bottom and the water poured through a fine strainer to remove any remaining shreds of cassava from the water. Starch particles are extremely fine and will pass through the strainer. When the water is left to set, after an hour or so there will be a thick layer of starch at the bottom of the container and the water, which will be a watery yellow instead of white, can be poured

off. The gooey starch at the bottom can be scooped out and crumbled onto pans to dry in the sun. Once you have worked with wet starch you will understand how a thing can be both gooey and crumbly! Starch is indeed a fascinating substance.

As the cassava is washed and squeezed out, it may be spread on clean sheets of tin to dry in the sun. At least once over the course of a sunny day it should be stirred around by hand to ensure even drying. Drying of starch can be done in one day but the shredded cassava, squeezed out firmly after washing, usually requires 2 sunny days. It should be covered at night with tarps or additional tins. The cassava is sufficiently dry when it is brittle instead of flexible. Dried cassava and cassava starch should be stored in tight containers when completely dry and crispy.



The final step is to grind your dried cassava. We do this with a standard Corona grinder powered by water, horses, or by hand. Cassava is softer than any grain and when well dried is easier to dry than corn, wheat or anything else we grind. If not finely ground enough it may be sifted before using. The courser siftings may be used in place of bread-crumbs or rolled oats in recipes where such things are used as a binder, for example in meat loaf, casseroles or any patties.

Now you are ready to use your cassava flour. You may try any of your favorite recipes using cassava flour instead of white or whole wheat flour. I have found that in general a thinner batter works better for cassava, so try adding a little more milk or water than the recipe calls for. A portion of corn meal, up to one half – in muffins or other quick breads seems to blend well with cassava, counteracting cassava's "gluey" nature. Corn tortillas are actually improved by the addition of cassava flour, half a cup or more per hopper of corn. Since cassava contains no gluten (an advantage for those with gluten sensitivity) it cannot be used alone in yeast bread, but a portion of cassava flour can be successfully added to bread recipes.

A very acceptable rolled pastry dough, for example for pie crust, can be made using one part cassava flour, one part corn meal and one part white flour in your favorite recipe. Cassava starch, which does not need to be ground, can be used in place of corn starch or flour as a thickener in stews, gravies and puddings. Sprinkle it, chunks and all, into boiling fruit juice or sweetened milk for a tapioca effect. In fact, do you know where tapioca came from? It is made from our humble friend, the cassava. How wonderful that God has given us such a prolific crop that can be used in such a variety of ways! Let us show our thankfulness by reducing our dependence on imported white flour products which are costly and so much less wholesome.

Here are some recipes to get you started; two using cassava flour and one for a Paraguayan specialty made from cassava starch called chipas, a tasty little cheese roll.

Continued on page 25

Cassava flour... Continued from page 24

CARROT COCONUT MUFFINS

2 c grated carrots
2 c cassava flour
1/2 c sugar
1/4 c melted butter
1/2 c orange juice
1/2 tsp salt
1 tsp baking soda
3 eggs, beaten
1 c coconut

Mix wet ingredients in bowl; mix dry ingredients separately, then add. Fold in carrots and coconut. Fill in muffin tins and bake at 350 degrees for about 20 min.

CORN BREAD

1 c corn meal
1 c cassava flour
2 eggs, beaten
1/4 c sugar
1/4 c fat
1 tsp baking soda
2 c sour milk

Mix wet ingredients in bowl; mix dry ingredients separately, then add. Pour in hot greased iron skillet and bake at 350 d. for 30-35 min. This batter may also be fried by spoonfuls in hot fat to make pancakes.

CHIPAS, A Paraguayan Cheese Roll

1 c oil or lard
1 c milk or whey
2 c shredded cheese
4 eggs
4 tsp salt

Mix these ingredients together and add cassava starch to a thick pudding consistency. Then add enough corn meal to make a soft dough. Roll egg sized pieces of dough on a board to make 1/2" thick ropes. Traditional chipas have the ends pressed together in little rings but any shape may be formed. Bake in a very hot oven (400 d or more) till golden and puffy.

Editor's Note: *Mrs. Deborah Harder resides in the Upper Barton Creek Mennonite community (Cayo), where her family operates Variety Nursery. We look forward to more articles from her about food production focusing on self-sufficiency in Belize.*

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DEACERO

Mighty Moringa The Miracle 'Tree Of Life'

By Mary Susan Loan

This article is the first of a series on leguminous trees that grow in Belize. A leguminous tree is defined as a tree belonging to or relating to the *Fabaceae* family of flowering plants that bear pods. Botanist Linnaeus initially classified



moringa as a leguminous tree and it has since been reclassified. Not until 2002 has moringa been properly confirmed the sole genus of the flowering *Moringaceae* of the thirteen species of moringa. It is being included in this series as moringa has similar properties to leguminous trees and is an amazing, highly nutritious, versatile tree.

Moringa oleifera, also known as widow's tree, drumstick tree, clarifier tree, benzoil tree, mother's best friend or miracle tree, is native to northern India, in the foothills of the Himalayan mountains and parts of Africa and Asia. Moringa trees thrive and are now widely cultivated in tropical and sub-tropical climates around the world. Moringa was utilized by ancient Romans, Greeks and Egyptians. Thanks to several horticulture projects during the past decade, including The Australian High Commission and Belize-Michigan Partners, moringa is becoming a common and popular tree in Belize. (see Belize Ag Report, July/August 2009 issue p.17).



Moringa is popularly known as a 'miracle plant' because of its nutritional and medicinal properties. Virtually all parts of the tree have been used for centuries for hundreds of purposes, including in traditional Indian medicine. Moringa flowers and leaves are brewed to make a healing tea, or are pressed into juice for treatment of urinary tract infections, cold symptoms, as a supplement for breastfeeding to help increase milk production, as a weight loss support, diuretic, treatment for lung and liver diseases, HIV, cancer, high blood pressure and to relieve everyday aches and pains and skin infections. It is advised to cook the moringa flowers and buds prior to consuming. Moringa leaves are generally eaten raw, cooked lightly or dried and ground, then sifted into a fine powder. All contain every essential amino acid and are a high protein food source for people, animals and fish. Moringa has a delicate watercress or spinach-like taste. The immature seed pods, known as drumsticks, are prepared by par-boiling and then adding to curry and other dishes. Immature seeds may be eaten like peas or toasted like nuts. Mature seeds yield a high quality oil which is known as ben oil, which is clear and odorless and resistant to rancidity. Moringa seed oil is also emerging as a bio fuel source. After the oil is extracted, seed cakes are used to purify water. Moringa roots are shredded and prepared as a horseradish substitute; however, unless properly prepared, they contain nerve paralyzing properties. Moringa leaves are also used as a domestic cleaning agent and as a treatment for snake and scorpion bites.

Dr. Chris Bennet, of Partners of America, a proponent of moringa in Belize explains that moringa offers an inexpensive, high-quality

protein, iron, vitamins A, C, E, and a calcium source for people of all ages in Belize. Numerous medical and nutrition journals and books have documented the benefits of moringa. Moringa contains over ninety nutrients and at least forty-six antioxidants. One tablespoon of moringa powder provides 14% RDA protein, 23% iron, 40% calcium and 100% vitamin A for a child aged one to three years old.

The moringa tree is an attractive, fast growing, drought and pest-resistant, low density perennial evergreen softwood which branches freely and generally grows to be less than thirty-three feet tall when it is not pruned. It is advised to prune back the tree often to allow easy harvesting within arm's reach. Moringa tree branches are sometimes used as living fence posts. The bark is light-colored and surrounded by a thick cork. When in bloom, the tree fills with numerous lightly fragrant cream-to-light-pink tinged colored flowers, which can be cooked or made as a tea. The tree is easy to plant from seed, or branch cuttings. The most common planting method is to "shove a moringa branch eighteen inches into a hole and cover – it will grow", usually twenty feet in height and four feet in width in only one year's growth. Moringa trees are also easily started from seed. Simply plant seeds about one inch deep in black plastic starter bags filled with soil and transplant when trees are about one foot high. Moringa seeds can also be planted directly in sunny areas where they will grow. Sprouting generally occurs by week one or two. Flowering usually begins approximately six months after planting and is followed by pod fruit production, which grows in number each year from few pods in the first year to a thousand or more pods after year three or four. Moringa trees provide good shade for intercropping with vegetables on the ground and provide support for climbing plants to grow on. The trees attract honey bees which in turn pollinate crops planted close to the trees. Composted moringa leaves are high in nitrogen. Moringa trees prefer light sandy soil and do not like to sit in water. Trees planted in heavy clay soil will benefit from sand, rice hulls or other elements that allow the soil to drain. Moringa flowers are a natural pesticide.

"Moringa shows great promise as a tool to help overcome some of the most severe problems in the developing world – malnutrition, deforestation, impure water and poverty. The tree does best in dry regions where the problems are worse".



(Andrew Young, United Nations Ambassador)

Advisory: Do not go overboard with your first moringa leaf culinary adventure – start with a handful of leaves sprinkled on food or mixed in a salad or 'smoothie'. Too much moringa can have a slightly laxative effect for some, according to a Belize moringa grower.

See website: moringatreeoflife.com for additional information about moringa. Look for Free All Things wfm.web@gmail.com for a free Moringa E-book to learn more about moringa – one of the most nutrient dense plants on earth. To obtain seeds and braches to plant, just ask around to find out who is pruning their moringa trees and plant yourself a 'backyard' tree. loanmarysusan@gmail.com

TCGA Continued from page 27

Also "TCGA commenced identification of local varieties that show tolerance to pest and disease". Budwood from these and imported clonal stock, kept in TCGA's clonal gardens, are both used in their grafting program.

1,537 acres are now certified organic, with an additional 92 acres pending certification through Soil Association Ltd. "TCGA is certified by Soil Association with accreditation to the Canadian Organic Regime (COR), who guarantees certification for North America National Organic Programme (NOP).



Ms. Romula Cal

Sales

In 2013, 40% of the year's beans were sold to local chocolate companies, The Belize Chocolate Company, Ixcacao, Cotton Tree Chocolate, Cheil Chocolate and Goss Chocolate, and 60% was sold as to Mondelez International (52%) and Choco del Sol (8%). The proportion of domestic use to export increased, partly because of decreased bean production and also because at times TCGA's stock ran out. Directors changed TCGA's former policy of selling all production to one buyer, opening options for sales to new and multiple buyers.

Question was put to the floor if TCGA owed any member any money. None replied and there may be justified pride within the association for their conservative financial situation. Farmers are paid in full on the spot for their beans, at delivery to TCGA.

Guest Speaker, CEO of MNRA, Mr. Jose Alpuche

Mr. Alpuche opened his remarks with note that TCGA's mission and the mandate of MNRA are very similar, ensuring future collaboration between the two. He assured TCGA members that cacao remains a priority interest to MNRA. He advised that TCGA must continue to change, and this change must not be government led – rather TCGA and its farmer members must own it. "Why are we exporting raw beans and not finished product?" was one of Mr. Alpuche's questions for listeners to consider. He opined that TCGA might in the future decide to modify itself to include cacao processors. Another idea was that cultivation areas be sought in areas outside the South, to mitigate the effects of bad weather, disease etc.

Overall he advised cacao farmers "to think outside the box and become known not just for the high quality beans already produced but also for high quality end products..... to ensure success..... and the continuation of the noble cacao bean of your forefathers to still be produced in Belize".

Elections & Comments from the floor

Elections to fill the 3 director's positions were filled with re-election of two: Ms. Benita Paquiul and Mr. Eugenio Ah, and with election of former director, Mr. Elodio Rash. Ms. Benita Paquiul, before accepting the nomination, asked if any women cacao farmers from the floor were willing to assume the position, but none spoke up. The Chairman remains Mr. Alvaro Pop, with other positions as follows: Vice Chair - Ms. Benita Paquiul, Treasurer - Mr. Cayetano Ico, Secretary - Mr. Elodio Rash and Councilors - Mr. Eugenio Ah, Mr. Juan Cal, Mr. Justino Ical, Mr. Victor Cho and Mr. Martin Chen.

Comments throughout the meeting from the floor and some from some directors at the head table were in either Maya Mopan or Maya Ke'chi dialects. Some were translated by the speaker, and many not. Some of the comments, mainly from directors past and present included the following views:

- Encouragement to growers to reinvest half of their cacao income to improvement and expansion in cacao
- Urge for Toledo cacao growers to nurture this cacao industry, so that they will not lose their current central role in of the cacao industry, "as happened with the cane industry which also began in the deep South"
- Plea for growers to not be swayed or tempted to sell beans to competing companies which utilize subsidies to influence prices, but rather TCGA members should remain loyal to the grower's

own co-op which has the growers' long term interests more to heart.

Awards

- Most Productive Farmer, a repeat winner: Mr. Luciano Sho of San Antonio, who has one of the largest cacao farms, with 21 acres in production.
- Female Farmer of the Year: Ms. Romula Cal of Crique Lagarto, who manages a 3 acre plot by herself.
- Best Management Practice: Mr. Oswaldo Choc of Aguacate.



Mr. Oswaldo Choc

Pricing

CEO Mr. Armando Choco remarked briefly on the history of world (NY market) prices (expressed in USD/MT) and local bean prices (expressed in BzD/lb) paid by TCGA to members. 2004 world price: \$1,700, TCGA: \$1.38; 2013 world price: \$2,038, TCGA: \$2.50; current Jan 2014 world price: \$2,200, TCGA: \$2.65, which was set at the meeting for dried fermented beans and \$1 for wet beans, up from \$0.90. Fairtrade's certification gains TCGA a premium of \$400USD/MT and these funds are used to finance the many farmer programs and the AGM.

TCGA's estimate for 2014 production is 45MT (99,208 lbs). The domestic market and the demand on the world market for organic Fairtrade beans is extremely bright and TCGA plans to remain proactive for its members ensuring improvements and growth in this vital southern sector.

Editor's Note: The Belize Ag Report thanks the TCGA Manager, Directors and members who welcomed our two reporters to their meeting. Look for an interview with Production Award winner Mr. Luciano Sho in issue 25.



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AG BRIEFS



Jorge Alarcon, Managing Director of **Marine Farms Belize** reports that their state-of-the-art cobia (*Rachycentrol canadum*) hatchery

in Dangriga continues operation and exported 170,000 cobia juveniles in 2013, mainly to Panama. There are no plans yet to re-open the Belizean open sea sites (feeding juveniles to market size), which were severely affected by Hurricane Richard in November 2010.

World record corn yield of 454 bu (25,424 lbs) per acre was set by David Hula of Charles City, La, USA in 2013 season, using Pioneer P2088 YHR seed. The US average yield for 2013 was 158.8 bu (8,892 lbs).



In **Spanish Lookout** the average corn yield for 2013 was 4,474 lbs per acre, down from 4,607 lbs in the 2012 season.



After extensive and lengthy negotiations between the **Belize Sugar Cane Farmers Association (BSCFA)** and **Belize Sugar Industries (BSI)**, which delayed the start of the cane season about two months, lingering contractual disagreements were finally settled allowing

harvesting and delivery of cane to the factory to start January 20th. The main sticking point was payment to the cane farmers for the bagasse by-product, used to generate power. Farmers will now be paid for the bagasse, but the price is still undetermined. Other discussions involved improvements to the sugar roads, which have deteriorated due to extreme weather, so BSCFA felt that the agreed 2M\$ was insufficient to repair necessary cane roads. Also because of the rains, the cane quality may be lower due to reduced sucrose content.

CEO for the Ministry of Natural Resources & Agriculture, Mr. Jose Alpuche tendered his resignation in December 2013, to be effective in 3 months. His departure will be lamented by the ag sector, as Mr. Alpuche's honed skills include those of a diplomat (formerly MFA) and a keen understanding of both the production and marketing aspects of Belizean agriculture.

General Mills announced late 2013 switch of some **Cheerios to non-GMO**. As there are no GMO oats, Cheerios have always been made with non-GMO oats; now the corn starch and cane sugar will be non-GMO in the 'original' Cheerios (other Cheerios such



as Honey Nut may still contain GMO ingredients). Post followed suit in early 2014 with news that their original Grape Nuts cereal will also go non-GMO and Grape Nuts will carry the Non-GMO Project's Verification Seal.

The clock is still ticking as **citrus production falls in many countries due to HLB (Citrus Greening Disease)**. Research continues



around the world for resistant trees or treatments for the disease which is incurable to date. Belize's citrus exports fell in 2013 and USDA forecasts 10% decline in production for the US again this year.



In December 2013, the USA's FDA (Food & Drug Administration) made recommendations for a **voluntarily phase out of the use of antibiotics as growth enhancers (as opposed to medication) in meat animals**. A FDA study released in 2011 found that animal agriculture consumed 80% of antibiotic use in the US. The CDC

(Center for Disease Control) estimates that every year 23,000 Americans die from infections which are resistant to antibiotics. Dr. Steve Solomon of the CDC states that "The more we use antibiotics today, the less likely we are to have effective antibiotics tomorrow". Antibiotic resistant bacteria is a spreading public health problem worldwide.

Three Minnesota brothers, Charlie Bards, Kent Cavender-Bares and John Bares have developed a **robot for nitrogen fertilizer application**. In tests with corn, their **ROWBOT** goes between the rows and its sensors study the individual plants and then adjust how much fertilizer is applied to each one. Since the application is gauged, it should result in less overall application, so can



Continued on page 29

Local and Regional Fuel Prices



	Cayo, Belize	Quintana Roo, Mexico	Peten, Guatemala
REGULAR	↓ \$10.89 Bz/Gal	\$7.77 Bz/Gal <i>No Change</i>	↑ \$10.76 Bz/Gal
PREMIUM	↓ \$11.29 Bz/Gal	\$8.14 Bz/Gal <i>No Change</i>	↑ \$12.11 Bz/Gal
DIESEL	↑ \$10.51 Bz/Gal	↑ \$8.03 Bz/Gal	↑ \$10.55 Bz/Gal



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The EMTs are trained to meet or exceed standards set by BERT and are retested every year. We've also been giving First Aid classes to schools and other organizations.

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Ag Briefs... Continued on page 29

reduce costs of over application and also reduce that costly run-off becoming waterway pollution. The weight of the 2 ft. wide, 7 ft. long ROWBOT is also considerably less than traditional fertilizer rigs, causing less soil compaction. The brothers kid that their invention might be considered "the Roomba of the corn field".

Lime prices in the Mexican state of Michoacan have risen 300%

in less than a month, as that is the only state producing limes which has not been badly affected by the weather (because it is not on the coast). Some losses due to violence in the state have affected transportation costs, also raising prices. Veracruz, one of the world's largest lime producing areas with more than 42,000 ha, (product valued at 114.1MUSD) has announced that it will begin lime exports to Korea in 2014.



SNIM (National Information and Market Integration System) has noted that **prices of Mexican potatoes and white onions have increased up to 84%** in the first days of 2014, due to weather problems during harvest.



Independent Seed Companies report trends returning to non-GMO seed use, stating reasons of increased production and profit. Spectrum Seed Solutions (spectrumseed.com) president predicts non-GMO corn could be 20% of the market within 5 years. President of Canadian firm De Dell Seeds (www.dedellseeds.com) who also sells in US says that "demand {for non-GMO corn seed} has never been higher..... growing faster than we can handle". Mark Seed (www.markseed.com) owner reports that 4 yrs ago his corn seed sales were 70% GMO/30% non-GMO, but now those numbers have reversed. President of B & M Seed (www.bigcob.com) say his customers are realizing "they can get the same yield levels as they would in GM corn in many situations and increase their profitability". Non-GMO corn seed can be \$100 to \$150USD cheaper than GMO seed. The market for

non-GMO food grew from \$1.3 billion in 2011 to \$3.1 billion in 2013.



And you thought you had it bad...

US raisin growers are compelled by an antiquated (depression era) law, to turn over (without compensation) 47% of their crop to the USDA each year. The USDA 'holds them in reserve', which serves to manipulate the supply and market price, in addition to creating hardship for the growers from financial loss. One grower from Kerman, California, has challenged this law by refusing to turn over any of his 2013 crop to the gov't, claiming it violates the US 5th Amendment. The USDA levied fines of \$650,000.USD, (with interest now exceeding 1M USD) and demands also 1.2M lbs of free raisins from the grower. Many hope that The Raisin Administrative Committee, created under the Agricultural Marketing Agreement Act of 1937, will finally be de-activated and its policy discontinued.

BLPA will host its AGM on Saturday, February 22, 2014 at their headquarters located at Mile 47 1/2 George Price Hwy, Belmopan. Registration begins at 9: A.M. Information call 822-3883.



The 3rd bi-annual Spanish Lookout Commercial/Industrial Expo will be held Friday, Feb 28th and Saturday March 1st, 2014 at Countryside Park, Spanish Lookout. Information, email businessschamberspl@gmail.com.

The National Agriculture & Trade Show, NATS, announced dates for the 2014 show as May 2-4th. For information call 822-2241 or email nats@agriculture.gov.bz



"When the price of a coke is less than milk... this is a problem."

Dr. Dowlat Budhram, IICA see pgs. 3, 22



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Issues, Challenges.. Continued from page 3

international markets, particularly North America and Mexico; a large natural resource base; preferential market access from certain trade agreements; duty exemptions to investors and protection of local industries from unfair competition; and accessibility by foreign ownership of land.

A policy concern for many years has been the likely negative implications that trade liberalization and cheaper imports have on small farmers. This is a legitimate concern given that the majority of Belizean farmers are in the small-farm group (even those engaged in sugar and citrus production). A range of options needs to be pursued but with the longer objective of improving the production efficiency, competitiveness and viability of small farm production.

These include some protection provided in the short run to domestic production that are uncompetitive with cheaper imports, a more cautious approach to trade liberalization and enhancing rural and community development strategies to complement initiatives to improve the small farm sector.

New Challenges and Issues

Although the Belizean economy and its agricultural sector have undergone many changes in the last two decades, most of the policy and strategic options recommended in the last two decades are still relevant for improving its performance and advancing its development. However, the sector faces new challenges and issues, in addition to those that have been discussed above. These result from a new set of dynamics that have been evolving in the global environment that have impacted the Belizean economy and its agricultural sector in various ways, as well as the impacts of policies and strategies pursued by the government over the years. The challenges and issues can be grouped into two sets – external and internal.

External

There is a range of new challenges and issues that are externally generated but directly affect Belize's agriculture or are transmitted indirectly through the economy to the sector. Globalization has accelerated in the last decade and there is greater interdependence between countries which affect agriculture in multiple ways. The economy has become more vulnerable to external shocks (investment financing and capital flows, commodity and energy price changes, etc.) and trade flows. Globalization has intensified market competition, preferential export markets are disappearing fast and the traditional regional trading blocs are gradually becoming less important and are giving way to global competition for markets.

Agriculture has become globalized in the process also. Rapid changes are taking place in the food system: more competition, greater diversity, increased demand for quality, year round availability and safer food products. The emergence of food chains is becoming increasingly important: off-farm food systems, more industrial (processing, etc.), greater commercialization (marketing, retailing, branding) of food products. Information and communication technologies are playing a larger role, from planning at the farm level to all aspects of the value chain and the emergence of precision agriculture. Climate change is becoming an increasing threat and affects the sector in multiple ways. In addition, there are trans-border issues (transmission of pests and diseases, etc.) which disregard geographic borders of countries that threaten agricultural production and trade.

National

At the national level, several challenges and issues affect Belize's agriculture. Macro policies have created more instability in the economy affecting inflation, the national debt, unemployment, investment flows, uncertainty, etc. Sustaining growth in the medium and longer range is a critical strategic objective which also

contributes to agriculture's performance and its development. The external factors discussed above require that the Government have a more regional and global vision of agriculture and constantly assess how these affect the sector and its preparedness to address them.

The economy has been growing over the last three decades and this has implications for agriculture through changes in food demand and the sector's responsiveness to a growing economy among others. Per capita income has increased by more than 50% in the last 20 years with implications on the sector and its food system primarily through changes in food preferences and consumption patterns. At the same time, poverty has increased, crime and violence are on the increase and health and nutrition issues have become increasingly important in the country's development debate. Agriculture has a critical role to play in both poverty alleviation and contributing to improving food, health and nutrition security. Climate change effects require that Belize develop a more climate smart agriculture and one that can continually adapt to the challenges of climate change.

Among Caribbean countries, Belize's agricultural sector has much potential for development but this can be realized only with the design and implementation of good agricultural policies and strategies, complemented with a sound macroeconomic policy. The need for good policies and strategies is often not fully recognized as public institutions get absorbed in day-to-day operations and respond continuously to short-term requests for assistance and problem-solving. In the case of the agricultural sector, the Ministry of Natural Resources and Agriculture (MNRA) has a critical role in providing policy direction and a strategic orientation to the sector to address its short and longer issues and challenges.

A comprehensive approach is needed to address the multiple challenges and issues facing Belize's agriculture. Some recommendations include: (1) ensure sound economic management of the country through the pursuit of appropriate macroeconomic, trade and agricultural sector policies; (2) formulate an agricultural development strategy, identifying the principal policy objectives and measures to be adopted for the sector, and priority areas to be targeted; (3) improve the sector's competitiveness in open markets; (4) improve the system of incentives to attract both local and foreign investment; (5) increase investments in research and development and the role of technology and innovation in the sector: transfer of new technology to the sector; (6) invest in support services and basic infrastructure; (7) re-engineer the public institutions supporting sector including the MNRA, Belize Agriculture and Health Authority (BAHA), Marketing Board, etc.; (8) strengthen MNRA's capabilities to plan, execute, coordinate and monitor sector policies and programs; (9) adopt innovative approaches to develop an efficient small farm production system which can contribute significantly to rural poverty alleviation and food security; (10) develop new approaches to financing agriculture; (11) simplify regulations and bureaucratic procedures so as to reduce the costs of doing business; (12) provide a more facilitative regulatory framework; and (13) above all, have the political will to take action and implement policies accordingly.

Editor's Note: Dr. Budhram is a native of Guyana and has been employed by IICA for the past 25 years as an international professional. He has occupied various positions in IICA including senior management positions in the last 15 years at IICA's Headquarters. He has been working on development, policy and institutional issues for more than 20 years in the Caribbean and several Latin American countries and his expertise includes policy and planning, sectoral strategies, program and project monitoring and evaluation and institutional analysis. He studied economics in Guyana and did graduate studies in agricultural economics and management in England and the U.S.



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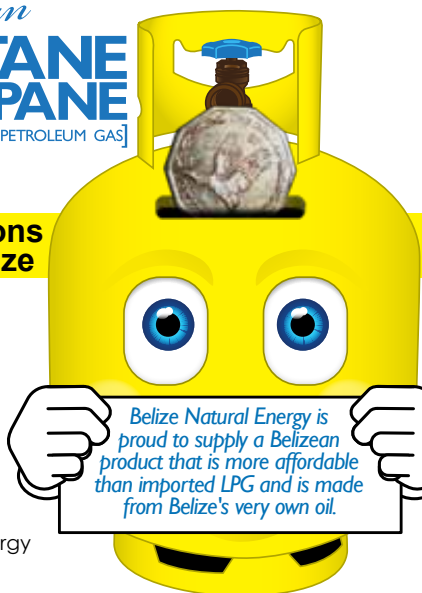
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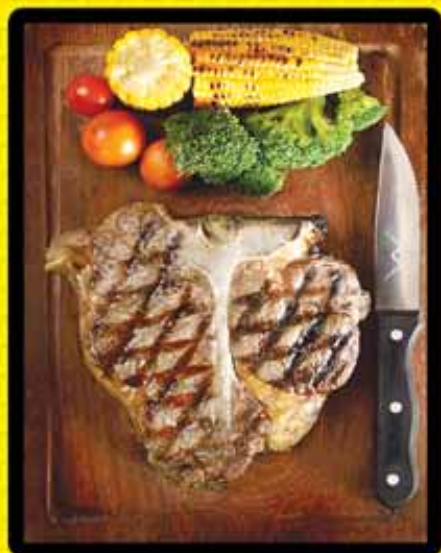
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