2022 ANNUAL TECHNICAL REPORT

Ministry of Agriculture, Food Security and Enterprise

Contents

A Message from the Minister

Hon. Jose Abelardo Mai
Minister of Agriculture, Food Security and Enterprise

Greetings to all as we continue the hard work that keeps our nation going. The past year has shown us that our efforts are not in vain. We rebuild and restore the agriculture sector, our economy and rekindle hope in our people.

Much has been accomplished in the past year. Building on efforts started in the previous year, we have reached out to our neighbours, Mexico and Guatemala, and established lasting relationships that are bearing good fruit. President Andres Manuel Lopez Obrador has gifted Belize with a tariff-free import regime for food products and included our country in their *Sembrando Vida* program. We have participated in trade summits that are sure to benefit Belize. We have a strong relationship with Mexican institutions such as the National Institute for Forestry and Agriculture Research (INIFAP), as can be evidenced from their many visits to Belize to establish research to benefit soybean and coconut production. Furthermore, our technicians have visited the INIFAP centres in Mexico to receive training.
We have also established close ties with the Ministry of Agriculture, Livestock and Food (MAGA), Department of Peten, Guatemala, with several exchange visits that will surely grow our cooperation with Guatemalan agriculture. Our mutual visits have shown there is much to share and a willingness to cooperate with each other for the benefit of both countries.

We have even reached out to El Salvador to seek export markets for our Belizean products. Achieving success in agriculture is all about ensuring we have markets for our products, and the efforts to access that country's markets continue.

While we have established international relationships in agriculture, we continue our efforts to ensure the success of our traditional and non-traditional products at home. We keep working with citrus and banana as they face challenges to the viability of those industries. We have seen the shrimp industry overcome some of their struggles and now they stand poised to succeed. We continue our work with sugar to ensure that our sugarcane farmers receive just treatment and a fair share of their industry. We have seen an explosion of interest in the non-traditional crops like soursop and coconut, a scenario that can only spell out good things for our country.

All of this is in keeping with the #planBelize goals and the Medium Term Development Strategy (MTDS) we shared with the Belizean public. I am proud that we have kept our promises to expand exports, improve trade agreements with our neighbours, work with all the traditional and non-traditional industries, diversify and eat what we grow and produce what we eat. Belize has been

secure in its food supply, and we continue growing to supply export markets, while improving our efficiency and diversification efforts at home.

I continue thanking our hard-working technicians and other staff for their dedication, commitment, and contribution in making this year another successful year, another year of numerous achievements. I am confident that with this level of support the Ministry will achieve even more this coming year. Remember, as long as we have to eat, agriculture will also remain everybody's business.

I also challenge all to work even harder this year. We have kept a relentless pace over the past two years, and we need to increase those efforts to grab opportunities and ensure the improvements we have made in our sector of the economy continue to benefit all Belizeans. The work never ends, and we never stop working. Agriculture is everybody's business.

A Message from the Chief Executive Officer

Servulo Baeza

Our Ministry continues being the heartbeat of the Belizean economy. Despite challenges with resources and staff, climatic situations beyond our control, market forces that sometimes pressure the sector in the wrong direction, and the general unpredictability of agriculture, we have prevailed and kept our place as a fundamental pillar of the Belizean economy.

The past year has seen mobility and change in a few positions, such as the promotion of Dr. Victoriano Pascual from Director of Climate Change and Water Management to Acting Chief Agriculture Officer. Mr. Andrew Harrison and Mr. Barry Palacio have both retired, though Barry returned as Coordinator for Fruit Trees and Non-Traditionals. Ms. Faye Garnett has moved on to greener pastures, as has Mr. Gary Ramirez. Change is constant, and sometimes is the only constant in agriculture.

As in most years, budgeting for the Ministry is tight. Despite this, we have managed to complete most of the output targets set for this year. A major milestone for this year that I have spoken about, sometimes calmly and sometimes with varying degrees of frustration, has been the pace of projects. We are committed to our outside partners and need to keep moving, and I feel this year we have indeed moved with some success. Our Sembrando Vida commitments are on target, as are our deliveries with the covered structure project and the school gardening initiatives. The collaboration with Mexico particularly has yielded good fruit as the soybean and coconut programs have been very productive. The cool storage units were delivered, and most are in order; we distributed Contingency Emergency Response Component (CERC) assistance to farmers and are in process of planning the Climate Resilient and Sustainable Agriculture Project (CRESAP). Several of our other goals have also been successfully undertaken; we have carried out a very well attended National Agriculture and Trade Show, for example, and have also had our Annual General Meeting. Good things have been happening in our Ministry.

We continue to work on strategic partnerships with our neighbours and with our partners here in Belize. We must ensure our farmers get all the support they need as they plant and grow Belize. BMDC has been doing a fantastic job of marketing vegetables such as onions and carrots, and I am sure their ventures into rice will be just as successful. We must continue the pace we have set thus far with the projects our ministry is accountable for, and work with the new ones in the pipeline such as CRESAP. These specially funded projects offer valuable help for our farmers, and everyone knows the sector can use all the help it can get.

We have seen several industries falter and then get up; shrimp is one such success story as we are proud to see this industry making a comeback right now. Citrus and bananas are now faltering, and we must work with them to ensure they get all the help they need. Our efforts in the areas of non-traditionals also seem to be getting good results, as soursop, for example, seems to have captivated the public's imagination. Honey production is on the upswing, more co-operatives are being formed than before, and we are poised to start sending products to El Salvador. The work is cut out for us.

List of Abbreviations

ASR----------	American Sugar Refineries
BAIMS----------	Belize Agriculture Information Management System
BGA----------	Banana Growers Association
BAHA----------	Belize Agricultural Health Authority
BBS----------	Belize Bureau of Standards
BLR----------	Belize Livestock Registry
BLPA ----------	Belize Livestock Producers Association
BMDC----------	Belize Marketing and Development Corporation
BPA----------	Belize Poultry Association
BSCFA----------	Belize Sugar Cane Farmers Association
BSE----------	Bovine Spongiform Encephalopathy
BSI----------	Belize Sugar Industries
CARICOM----------	Caribbean Community
CARDI----------	Caribbean Research and Development Institute
CDF----------	Caricom Development Fund
CERC----------	Contingent Emergency Response Component
CFZ----------	Corozal Free Zone
CIAT----------	International Centre for Tropical Agriculture (based in Colombia)
CGA----------	Citrus Growers Association
CPA----------	Certified Pesticide Applicator
CPBL----------	Citrus Products of Belize, Limited
CRESAP----------	Climate Resilient and Sustainable Agriculture Project
CRIP----------	Climate Resilient Infrastructure Project
DANA----------	Damage and Needs Assessment
DFC----------	Development Finance Corporation
FAO----------	Food and Agriculture Organization
GoB----------	Government of Belize
HACCP----------	Hazard Analysis Critical Control Point
HPAI----------	Highly Pathogenic Avian Influenza
ICDF----------	International Cooperation and Development Fund
IICA----------	Inter-American Institute for Cooperation on Agriculture
INIFAP----------	National Institute for Forestry and Agriculture Research (Mexico)
IPDM----------	Integrated Pest and Disease Management
ITC----------	International Trade Centre
JICA----------	Japan International Cooperation Agency
MAFSE----------	Ministry of Agriculture, Food Security and Enterprise

MAGA----------	Ministry of Agriculture, Livestock and Food (Guatemala)
MTDS----------	Medium Term Development Strategy
NATS----------	National Agriculture and Trade Show
NDV----------	Newcastle Disease Virus
PHF----------	Pesticides Handling Facility
PCB ----------	Pesticides Control Board
PDNA----------	Post Disaster Needs Assessment
OIRSA----------	International Regional Organization for Agricultural Health
OHC----------	One Health Commission
RCF----------	Revolving Credit Facility
CRDI----------	Centre for Research, Development and Innovation
SENASICA----------	National Agro-Alimentary Health, Safety and Quality Service (Mexico)
SIA----------	Sugar Industry Act
SIB----------	Statistical Institute of Belize
SICB----------	Sugar Industry Control Board
SIMIS----------	Sugar Industry Management Information System
SIRDI----------	Sugar Industry Research and Development Institute
TCP----------	Technical Cooperation Program
WB----------	World Bank
WOAH----------	World Organization for Animal Health (formerly OIE)

Executive Summary

The Vision of the Ministry of Agriculture, Food Security and Enterprise is to have an industry that is competitive, innovative, diversified, and sustainable. Its mission is to grow and to continue as an economic pillar, ensuring food and nutrition security, diversifying business opportunities, reducing poverty and enhancing human resources capacity in a sustainable and competitive environment. Broad objectives include ensuring greater efficiency and effectiveness in the structure and institutional management systems of the agriculture and food sectors in Belize. This will be achieved through well-defined roles of regulatory and promotional bodies, enhancing greater collaboration among key stakeholders, and the establishment of clear policy incentive frameworks for the production, utilization, climate-smart adaptation and marketing of agriculture and food products. This is expected to enhance the sustainable growth of the sector, to ensure food and nutrition security, to improve farmer/processor income, to create employment, and to attract private sector investment and participation in the sector. The Ministry recognizes five pillars needed for success in agriculture:

- Production, Productivity, and Competitiveness.
- Market Development, Access, and Penetration.
- National Food and Nutrition Security and Rural Livelihoods.
- Sustainable Agriculture and Risk Management; and
- Governance

For the past year, the agriculture and food sectors have been one of the main pillars of the Belizean economy, contributing approximately $650 million annually to economic output, representing 88% of domestic exports, and directly employing 16.8% of the Belizean population. While tourism is now safely back on its feet, agriculture remains the backbone of the economy, having floated the Belizean economy through the worst of the post-COVID recovery efforts and leading the way in innovation and adaptability to global change.

During 2022, the agriculture industry continued experiencing success. International cooperation agreements with Mexico and Guatemala have yielded technical exchange programs that have been extremely beneficial to our productive sector; we have been beneficiaries of a tariff-free regime for agriculture and food exports courtesy of President Andres Manuel Lopez Obrador of Mexico. The livestock sector continues thriving as cattle continues being exported and the price of beef has appreciated, ensuring hard-working livestock farmers get their due. The ovine sub-sector is making strides in marketing its products nationally, while honey production and producers continue the rejuvenation of that industry. We have safeguarded the poultry industry with appropriate legislation and keeping a high alert for diseases and pests. The Ministry continues its strict vigilance of local market issues and changing situations to ensure vegetable producers are getting the best possible opportunities for sale of their produce while ensuring the Belizean public gets quality produce.

Meanwhile new opportunities are being constantly explored in the research, production, and manufacturing of potatoes, soybean, pineapples, plantains, coconuts, pitahaya, and soursop. Training in cultivation, production and processing techniques for higher efficiency and yields continues in these areas, with our international partnerships assisting greatly to this end. Diversification from the traditional crops of sugarcane, citrus and bananas is at its most successful ever, as we now have soursop, coconuts, pitahaya and other non-traditionals beckoning our farmers.

The Belizean public continues being very supportive of our farmers, influenced heavily by the Ministry's focus on raising the level of awareness of the public to the availability of Belizean agricultural products and production markets in the country. This support for Belizean food products continues helping the economy tremendously and has kept foreign exchange at home.

The country has maintained production of vegetable commodities necessary to ensure our national food security, and imports have been reduced substantially, ensuring sustainable livelihoods for our local farmers and entrepreneurs. Carrots, onions, potatoes, lettuce, broccoli, and cauliflower are grown, marketed, and consumed successfully, notwithstanding the hiccups experienced at the beginning and end of each season. The Belize Marketing and Development Corporation continues to play a strong hand in leading these efforts, as even this entity has a newly found purpose and a drive in turning the wheels of the Belizean economy.

In agriculture production the risks are many and so are the challenges. Nevertheless the sector continues to adapt and grow and find ways to diversify agricultural production and improve food standards to ensure Belizean products are of the finest quality. The Ministry continues working with farmers and agricultural cooperatives to improve their conditions by introducing contract-farming practices with their buyers. Financing, high-energy costs and tax burdens continue being major challenges, and MAFSE continues to find ways to support, mitigate and reduce costs for agricultural production. We continue working with line ministries and departments such as Trade, Investment, Finance, Customs and organizations like the Central Bank, the DFC, and Credit Union League, aiming to strategize and develop packages which can ease the cost of doing business in Belize and make finance available and accessible to the farming community.

We continue actively and continuously lobbying international partners to ensure grants and projects are directed at supporting the development of farmers and producers. Successful interventions like CRESAP have supported farmers in increasing production, productivity, and the adaptation of climate-smart technologies. Ongoing initiatives include training and capacity building for farmers in all the sectors of production including grains, roots and tubers, legumes, livestock, aquaculture, vegetables, and fruit trees. The Ministry also works arduously to encourage other public or private stakeholders in developing school, urban and rural gardens, and aquaculture.

1. Introduction

The Ministry of Agriculture has existed since 1961 when a Ministerial system was introduced to the country's legislature. From the days of mahogany cutting to chicle export, to sugar and now newer export commodities like livestock and grains, agriculture has always been a strong foreign exchange earner that has underpinned the economy of Belize. Currently directly impacting approximately 13,000 farmers and countless Belizean citizens, agriculture affects the entire country's economy.

In the 2021 Annual Technical Report we highlighted achievements such as the re-structuring of the Ministry for greater efficiency, forging links with the Mexican Ministry of Agricultura, a first for Belize, and exemplary success of sectors such as livestock, with increased export numbers and establishment of formal export markets. The Belize agriculture industry on a whole carried the country on its back on the way to recovery from COVID, as the post-pandemic recovery got into full swing. While the tourism sector started its full- scale recovery, agriculture continued to perform as a strategic, growing sector, contributing approximately $590 million annually to economic output, representing 80% of domestic exports, and directly employing 17.9% of the Belizean population.

This year the trajectory toward success in the agriculture sectors continues. The report will show that most sectors stabilized or did well, this despite challenges that affected performance of some industries such as citrus and bananas. Notwithstanding, the agriculture sector is well on the way to being the pillar of the Belizean economy it is made out to be- a strong sector, providing income earning opportunities for farmers and producers, ensuring the food security of the nation, and forging international linkages with our neighbouring countries.

This year's report is organized in a similar manner to last year's, with the exception that the report from last year included lessons learnt, goals and conclusions/recommendations in line with each program of the Ministry. In this s report, these sections will be integrated and condensed into one Ministry-wide section. We have also included a message from our CEO, Mr. Servulo Baeza.

For any questions, please contact Mr. Luis Pook at luis.pook@agriculture.gov.bz.

2. Mission Statement and Priorities of the Ministry

The Ministry of Agriculture, Food Security and Enterprise's mission is to continue as a key economic pillar, ensuring food and nutrition security, diversifying business opportunities, reducing poverty and enhancing human resource capacity in a sustainable and competitive environment. This is in keeping with the Ministry's profile as a partner with regional and international organizations such as the FAO, CARDI, OIRSA, and IICA; it is in keeping with the mandate of #planBelize, where 11 points are declared for the #planBelize Agriculture Policy as 11 outputs to be achieved in the next 5 years.

1. Food security- Encourage import replacement and substitution, support export expansion and strengthen the linkages of tourism with our local productive sectors.
2. Tax cuts- Review the entire tax system and enact reforms to have a simplified, fair, efficient, and development-driven system.
3. Trade- review, improve and aggressively implement our trade policy agreements in our region.
4. Exports- Work with the associations of the four traditional exports, i.e., sugar, citrus, banana, and shrimp to develop a strategy for development.
5. Financing- Support farmers in accessing affordable financing.
6. Diversification- Diversify production and the support the adaptation innovative climate-smart systems.
7. Research- Increase the collaboration of Research and Development with partners and renowned universities.
8. Grow more- Encourage rural and urban communities to grow and produce more of what we eat and promote implement a Buy Local Campaign.
9. Teach- Lobby for agriculture and agri-business to be taught in schools.
10. Storage- Improve storage and logistics facilities for farmers.
11. New markets- Improve trade and market intelligence for international access and find niche markets for the export of the non- traditional commodities.

The overall goal of this policy is to increase, diversify and sustain agricultural production, food security, income, and employment generation in Belize. To achieve this goal, the Ministry has designed programs and projects, as presented in the Medium Term Development Strategy (MTDS) actions, with specific targeted outcomes related to:

- Increased Production, Productivity, and Competitiveness.
- Development of Market Access and Penetration.
- Achievement of National Food and Nutrition Security.
- Implementation of Sustainable Agriculture practices and implement Risk Management measures.

- Improved Governance of the Ministry

The Mission of the Ministry aligns well with #planBelize's stated goals "to increase, diversify and sustain agricultural production, food security, income, and employment generation in Belize. This goal will require increasing farm-level capacity, improving technology and innovation, raising labour productivity, and being regionally competitive. Achieving this goal will enable Belize to increase exports, reduce food imports and improve the livelihood and well-being of rural communities." Point for point, the goals mirror each other and provide for easy synthesis of the present policy framework currently employed by the Ministry of Agriculture, Food Security and Enterprise.

The Ministry has also placed high priority on completing various specific actions as reflected in the #planBelize Medium Term Development Strategy. These include:

- revision and updating of national sector policies, laws, and regulations for key sectors, such as sugar.
- rebuilding of the agriculture sector through teaching agriculture in schools and advocating the importance of agriculture, promoting the growth of crops in school and at home, producing their food snacks, and explaining why as a society, Belize must invest, be productive, and apply more business principles in agriculture.
- support and facilitation of farmers in accessing credit from financial institutions.
- Implementation of the Climate Resilient and Sustainable Agriculture Project to increase food production capacity and the adoption of climate-smart, green agriculture.
- implementation of projects enhancing food security and job creation, conserving natural resources and mitigating vulnerabilities to climate change by providing technology, inputs, and financing to some 2,000 farmers for the establishment of agro/silvo/pastoral systems across Belize.
- forging partnerships with renowned universities, regional and international institutions to mobilize investment for research and development to adapt technology
- Belizean farmers and processors should be able to replace or substitute at least 50% of food imports within 5 years.
- duty exemptions for the agriculture sector

These specific actions are directly aligned with the #planBelize objectives set out in the present Government's manifesto. They are explicit actions intended to be completed within the coming one to two years. As such they are an action plan for the Ministry in the medium term.

3. Main Achievements of the Ministry

3.1 Traditional Exports

The main objective in the traditional export sub-sector which includes sugar, banana, and citrus, is to improve the competitiveness of the export commodities along the value chain to satisfy the domestic market, national food security and to increase exports to generate foreign exchange earnings and employment. These industries target primarily the export market.

Sugar production experienced an insignificant growth of 0.9% whereas sugar cane delivered to millers experienced a decline of 5% in 2022 compared with the 2022 figures. Sugarcane deliveries decreased from 1.893 million tons to 1.803 million tons, and sugar production increased from 177,875 metric tons to 179,421. Approximately 300,000 tons of cane were not harvested particularly in the Cayo District. Acreage decreased 1% from 103,358 to 102,093. Rainy weather conditions affected the delivery of sugar cane at the mills thus impacting on the amount of sugar production. Annex 1 provides detailed information.

Banana exports decreased by 13% from 5.37 million boxes in 2021 to 4.66 million in 2022. Acreage under cultivation remained almost the same from 7,809 in 2021 to 7,800 in 2022. Yields were significantly constrained by limited fertilization, disease management and irrigation due to cost of inputs skyrocketing. Increased input costs are attributed to the impact from the COVID pandemic and the ongoing invasion of Ukraine by Russia. Coupled with these was the limited amount of labour available to perform cultural practices in the plantations. Input availability and application is fundamental for the recovery of the industry. The largest producer Fyfe's is lobbying for legislative reforms of the Banana Industry Act with the objective of attracting more investors in the industry. Annex 2 has detailed production information.

Citrus production continued its downward trend. Orange production fell by 2% from 1.334 million boxes in 2021 to 1.308 million boxes in 2022. Harvested acreage increased by 5.34% from 18,811 in 2021 to 19,816 acres in 2022. Grapefruit production increased by 24 % from 115,029 boxes in 2021 to 143,188 boxes in 2022. Grapefruit acreage harvested was 1,150. Limited labour availability to reap oranges and grapefruit contributed to fruit loss and a reduction of fruit harvested and delivered to the factory.

Total acreage of orange cultivation in 2022 was 26,805, consisting of 19,816 in mature groves (more than 7 years old), 3,112 of immature groves (between 3 to 6 years) and 3,878 of young groves (less than 3 years). Total acreage of grapefruit cultivation in 2022 was 1,800 consisting of 1,150 in mature groves (more than 7 years), 405 of immature groves (3 to 6 years) and 245 of young groves (less than 3 years). Total acreage under citrus cultivation is 28,605.

Of importance is that new groves were planted with new accessions of HLB tolerant varieties which appear to be growing well and are expected to perform better than the traditional varieties. There are high expectations that these new varieties with sound management practices can increase production and assist with the revitalization of the citrus industry while diversifying into other crops such as coconut, soursop and pineapple continues. Annex 3 has detailed production information.

#planBelize contemplated providing support to the traditional export subsector to make them more competitive, viable and resilient to climate change. In the sugar industry GOB commenced the revision of the Sugar Industry Act and attempted to get both the Belize Sugar Cane Farmers Association (BSCFA) and the Belize Sugar Industries/American Sugar Refineries (BSI/ASR) to negotiate a new Commercial Agreement for the purchase and manufacturing of sugarcane. For the citrus industry, government provided a Bz$15 million loan facility through the Development Finance Corporation (DFC) for citrus farmers to rehabilitate or plant orchards based on the recommendations from a citrus working group. For the banana industry the Ministry is working closely with the Ministry of Economic Development to identify technical and financial assistance for the industry. Through the Republic of China on Taiwan assistance was identified to provide the banana industry with know-how to deal with the dreaded TR4 which can wipe out the industry should it make its way to Belize.

The BZ$15 million loan facility which the GOB made available through the DFC demonstrated the government's commitment to revitalize the citrus industry.

3.2 LIVESTOCK

Cattle

MAFSE has placed much emphasis on increasing cattle exports. This policy was institutionalized and put into action on 11 November, 2020, and allowed for the Guatemalan export market to be reactivated, as it had remained closed. The opening of the Guatemalan export market gave a golden opportunity to Belizean cattle producers to sell much of the cattle they had accumulated over the years primarily because of the closure of Jalacte and Bullet Tree export exit points to Guatemala. Since the opening of these two exports exits, Belizean cattle producers have benefited tremendously from the sale of cattle to Guatemala, setting the figures of cattle exports at a record high for two consecutive years.

In 2022, the cattle industry sub-sector successfully exported a total of 32,447 head of beef cattle. The export of cattle to Mexico and Guatemala generated more than BZD 35 million to the economy of Belize. In 2021, a total of 41,315 head of beef cattle were exported to Mexico and Guatemala generating over BZD 40 million to the Belizean economy. The cattle industry

is a major subsector that will continue to positively improve the quality of life of 6,000 cattle ranchers and impacting the lives of approximately 30,000 Belizeans.

The Belize Livestock Registry has reported that the current national cattle herd stands at more than 175,000 head of cattle. 70% of the cattle ranchers in Belize own between 1 and 50 animals, making it a high priority commodity for the Ministry of Agriculture as it is within the threshold of a small income generating enterprise. The beef cattle strategy is built upon three major pillars: Capacity building and institutional strengthening, Information Management, and Technology and Innovation Transfer. The objective is to develop the industry to be more productive, competitive, sustainable and climate-resilient.

Other major achievements to be highlighted in the cattle subsector include:

1. Diversification of Belize's export base through compliance with the World Organization for Animal Health (WOAH) requirements for Bovine Animal Health and the requirements established by Mexico for the export of live cattle for immediate slaughter and fattening. The formal agreement between the two neighbouring countries was successfully accomplished.
2. The present sanitary status in Belize with respect to Bovine Tuberculosis and Bovine Brucellosis was successfully determined as low prevalence for both diseases.
3. The livestock farm registry and an Animal Identification System with proper movement control was updated to meet the regional OIRSA Traceability Standards, TRAZAR – AGRO.
4. The cattle industry successfully retained equivalency and mutual recognition in the Official Animal Health Service of Belize and Mexico.
5. A one year 15% tariff waiver on cattle exports to Mexico was successfully accomplished.
6. The Livestock Genetic Development program was restructured in early 2021 and instituted as part of the beef and dairy genetic development program and has yielded positive results. To date more than 100 bulls of improved genetics were introduced from Mexico into Belize to upgrade the genetic pool among cattle ranchers in the entire country of Belize.
7. 12 artificially insemination beef animals of the Brangus breed were weaned at Central Farm, and 14 embryo transferred Brangus and 2 Braford beef animals were weaned at Blue Creek. There are the immediate results since the Ministry adopted a revitalized cattle improvement policy "to increase productivity and quality of meat of the beef cattle industry in Belize through innovation and technology transfer, engaging primarily improved reproductive technologies."
8. Three extension officers were successfully trained in reproductive technology in cattle production in Peten, Guatemala. This is as an integral part of the bi-lateral agreement signed between the MAGA of Peten, Guatemala, and MAFSE, Belize.

9. Close collaboration with OIRSA has allowed us to maintain the Belize Cattle Traceability updated and relevant. The integrity of the Belize Livestock Registry (BLR) has successfully been maintained and has enabled making timely and informed decisions.
10. As a result of sustained negotiations and close collaboration with OIRSA, this regional organization was able to employ a veterinarian to replace the SENASICA veterinary, whose responsibility will be that of similar functions carried out by the SENASICA veterinary. This will reduce the cost of inspection of beef cattle at quarantine point to at least 50%.
11. The close collaboration with the Belize Livestock Producers Association (BLPA) has allowed formal upgrade of two cattle corrals, one in Toledo and one in Orange Walk, to provide personalized livestock services to cattle producers.
12. The Surveillance of Bovine Spongiform Encephalopathy (BSE) remains active so that soon Belize can be recognized free of this disease and open other avenues for potential export markets.
13. A total of 15 technical officers and more than 500 farmers benefited from training carried out in 2022 in close collaboration with BAHA, OIRSA and BLPA in various thematic areas of livestock production such as: reproductive technology, animal health, animal nutrition, export requirements and protocols, climate resilient, and animal husbandry.
14. Each cattle breeding stock at the National Livestock Breeding Centre (NLBC) in Central Farm was assigned a special Certificate Breeding Record (CBR) certificate. When the animal is sold, the new owner is provided with the certificate, similarly like a pedigree.
15. Approximately 25 cattle producers benefited from the bull rental breeding program in Central Farm and Orange Walk Agriculture Station.
16. The Livestock National Director of MAFSE actively participated at the Ohio Select Sires Conference in USA. Here is where all experts in beef and dairy cattle genetics come together to exhibit major advancement in genetic development.

Sheep

The sheep industry is another initiative of the MAFSE to diversify the agriculture sector. The sheep subsector is predominantly dominated by small producers and from an income generating activity and food security stand points, the Ministry will continue to promote it**.** The total number of sheep recorded in 2021 was 17,323 heads and a total of 461 sheep farmers countrywide. From the results, Cayo District is the major producer of sheep with 163 farmers and a total head count of 5,576 sheep. Second is the Orange Walk District with a total 71 farmers and a total head count of 3,904 sheep. Third in production is the Belize District with a total 113 farmers and a total head count of 2,981 sheep. Fourth in production

is the Corozal District with 52 farmers and a total head count of 2,378. Fifth in production is the Stann Creek District with 36 farmers and a total head count of 2,143. The least producing district is the Toledo District with some 26farmers and a total head count of 341. To expand production, productivity and more in particular to improve the quality of lamb and mutton, the Ministry has collaborated in institutionalizing a state-of-the-art National Sheep and Goat Breeding Centre in Central Farm.

The National Sheep and Goat Breeding Program

As of 2022, the National Sheep and Goat Breeding Program at Central Farm currently has a herd of 214 animals and has successfully produced 192 pedigree animals with improved genetic that have been made available at affordable prices to sheep producers to improve their local herds. Small stock farmers have benefited from a total of 11 training courses that include: sheep traceability, culinary skills, animal husbandry, animal health, and animal nutrition. A total of 296 small stock producers and 11 technicians benefited from the training. A major milestone achievement for the sheep industry is that OIRSA has opened the TRAZAR AGRO platform to start the Sheep Traceability System.

Poultry

The poultry Sector is a major contributor to food security, income generation, and employment. Belize is fortunate to be self-sufficient in broiler meat and eggs. The total industry output for 2021-2022amounted to BZD 122,776,363. For the year 2021-2022 Broiler meat produced accounted to 39,398,307 lbs generating a total revenue of $94,950,401, followed by 4,906,170 dozen of eggs and generating a total revenue of BZD 12,510,733. Live broilers accounted for 7,783,160 lbs and generating a total revenue of BZD12,219,561. Turkey production on the other hand accounted to 595,393 lbs and generating a total revenue of BZD 2,322,032 while hens processed yielded 230,070 lbs and generating a total revenue of BZD 462,440. Live hens amounted to 345,774 lbs and contributing to a total revenue of BZD 311,196.

The Ministry continues to support this major industry primarily in areas of food safety and animal health and has facilitated the creation of an enabling legislative environment. Additionally, the MAFSE works hand in hand with poultry stakeholders to seek potential markets in the CARICOM community. At least one export attempt has been carried out from which many lessons have been learnt in how to streamline export processes and protocols.

Another area where we have made a lot of advancement is in the mobilization of resources through projects and strategic collaboration with our partners in development, regional and international collaborators, to enhance surveillance of poultry diseases that are of quarantine and economic importance. Considering that food security, food safety, animal health, human health, and environmental health are of paramount importance, the MAFSE is an active

member of the One Health Platform which was launched and adopted in 2022 by the various line Ministries that include: Ministry of Health, Ministry of the Environment and MAFSE.

Under the One Health Platform there are some projects that have been developed in close collaboration with the funding agency and have been successfully approved. The following are projects or collaborations that have been successfully approved:

A strategic partner and collaborator, FAO under the FAO Technical Cooperation Program under the "TCP/BZE/3901 Belize Agriculture Sector Policy with Focus on Seed, Backyard Poultry, Marketing and Indigenous Territories", makes provision for a poultry passive surveillance protocol and communication plan to be implemented for Avian Influenza and Newcastle diseases. The objective of this project is to increase capacity among poultry farmers inclusive of women and youth to pilot the passive surveillance protocol for both diseases in the Stann Creek and Toledo Districts. The program was approved by FAO headquarters for a total funding of USD 34,000

The second strategic collaboration is with OIRSA where Ministry's technical personnel particularly from BAHA developed a plan of action with the objective to prevent the highly pathogenic avian influenza to enter OIRSA member countries including Belize. The total funds that will be made available to implement the plan of action to prevent HPAI into Belize is USD 60,000. The funds will be utilized to create public awareness, training of technical officers from BAHA and MAFSE, and update the biosecurity manual of backyard poultry, among other relevant but important thematic areas in poultry production.

MAFSE is committed to the One Health Platform recently established in Belize and is a signatory of the Quadripartite Collaboration in One Health. The recently established One Health Committee (OHC) is a critical platform to communicate and coordinate a collective effort in confronting zoonotic diseases that are of quarantine and socio-economic importance in livestock sector. Given Belize's high alert status for Highly Pathogenic Avian Influenza (HPAI), a poultry disease with zoonotic potential already impacting many countries in the Americas, MAFSE has decided to prioritize HPAI projects. This is even more critical as HPAI has been reported in neighbouring countries, Mexico (Yucatan) and Honduras (Puerto Cortez). Both FAO and OIRSA projects will support enhancing surveillance as a first line of defence against HPAI.

Another important milestone achievement was the series of consultations that was carried out to update archaic poultry legislation in existence. The MAFSE, through strategic collaboration with BAHA, has now enacted poultry legislation to regulate the industry so that it remains productive, competitive, and sustainable despite the major threats such as highly infectious poultry diseases, high cost of inputs, market uncertainties, inflation, and poverty, just to name a few challenges. Despite the challenges, the Ministry is committed to support the poultry industry in every step of the poultry value chain for this industry to continue producing a wholesome and good-quality poultry and poultry products. The policy directive

is to support local industries and as much as possible to produce what we eat and become less dependent on imports.

Dairy

The dairy sector in Belize continues to grow, despite the challenges of market displacement and unfair competition from imports. Belize's dairy industry has always been under greater challenges than other agro-industries; the sector faces major unfair competition from milk, cheese, and other dairy products imported from highly subsidized markets such as Mexico, the United States, and the European Union. The current situation is that the dairy sector is traditionally domestic, catering for a small market. To exacerbate the problem, the effects of COVID-19 led to dumping of milk amounting to an estimated loss of BZD 96,859 and the market contraction of cheese by 53% at the end of July 2020. In January 2021, the Western Dairies Processing Facility decided to cut back milk production by 20%, representing a monthly loss of over 358,732 lbs. of milk at a value-added loss to the dairy industry of just over BZD 500,000 per month. The processor and farmers experienced major losses due to market contraction and the availability of large volumes of imported dairy products in the local market.

The Belize Dairy Industry has concerns over the fact that commodities which Belize can produce are still being imported, and that import tariffs are being applied to inputs for dairy. The current duties applied to all imported commodities above range from 0% to 20% with duties on milk and cheese ranging the lowest, 0% and 5%, respectively. Investment by local producers in increasing production output is limited by the large market share held by imports. For example, imported cheese and yogurt dominate over 85% of the domestic market demand. Over 50% of the milk and sour cream market is also dominated by imports. MAFSE is confident that once the above-mentioned demands can be met, there will be a need to manage what is produced locally versus what is imported. The Ministry's policy is to support local production and become less dependent on imports, which highlights the need to regulate importation to give local producers the opportunity to penetrate and retain a fair share of the domestic market. The industry recognizes that this can be achieved if adequate product shelf life and quality meet market preference.

Despite the challenges faced by the dairy industry, the MAFSE was able to achieve the following milestones in close collaboration with dairy stakeholders:

- ✓ Reduced the stock of cheese in inventory from 127,000 lbs in 2019 to 67,000 lbs in 2022 by regulating and managing imports.
- ✓ A total of 8,823,223 lbs of milk was received at the processing facility in Spanish Lookout for 2022.
- ✓ A total of 333,000 lbs of mozzarella cheese was produced and 252,000 lbs of cheddar cheese was produced for 2022.
- ✓ The Ministry facilitated the dairy industry to introduce ultra-high temperature technology at the Western Dairies Spanish Lookout plant.

- ✓ With the introduction of the UHT technology and the investment in a UHT processing facility, the dairy industry was able to improve the quality of milk and increase the milk shelf life from 13 days to more than 100 days. This is no doubt a major achievement.

Another major achievement is the development of a comprehensive 5-year Belize Dairy Strategy to guide the development of the industry. The Belize Dairy Industry is an important sector of Belize's agro-Economy that contributes to food security, income generation, employment, and foreign exchange earnings. The National Dairy Strategic Plan 2021 - 2025 highlights the priorities that need to be addressed to improve the dairy sector, by making it more productive, competitive, profitable, and sustainable. The MAFSE, in partnership with the private sector is confronting the prevailing challenges caused by the COVID-19 pandemic to create a more enabling environment to achieve the desired results of the National Dairy Strategic Plan. The industry aims to improve quality, increase production, sustainability and profitability through innovative policy and regulatory decisions, availability of relevant information, technology adaptation and innovations adoption and dissemination. One main point of the transformational agenda for the dairy sector will be to access necessary capital for investment in infrastructure and technology to produce a high-quality dairy product. This will be supported by an appropriate policy and regulatory environment, to secure greater local market share and reduce dependency on imported dairy products. The National Dairy Strategic Plan 2021 - 2025 is the result of a public-private partnership between the Government and the dairy farmers of Belize.

Honey

The honey industry continues to steadily develop with the support of the MAFSE and the Belize Marketing and Development Corporation. The industry is small but growing. It is an industry with more than 190 beekeepers countrywide. Current production stands at over 150,000 lbs. of honey annually. The average production is at 50 lbs. per colony. One major development of the honey industry is that BMDC has establish a very good working relationship with those honey producers who adhere to good beekeeping Agricultural and manufacturing practices. BMDC has contractual arrangements with each producer and the honey raw product is collected at the main BMDC processing facility in Orange Walk. To disseminate good honey production practices, technology, and innovation, the Ministry has successfully established two model apiary units, one in Central Farm and one in Stann Creek. The Corozal Agriculture Department works closely with the Centro Escolar Mexico Apiary unit to provide oversight and training to students and beekeepers of the Corozal District. The Caricom Development Fund and AMEXCID Mexico projects continue to support the development of beekeepers along the honey value chain.

Aquaculture

1. Sales of fingerlings to shrimp farms were limited as the tilapia breeders suffered a major disease outbreak which was eventually brought under control.
2. 236,159 fingerlings were sold in 2021 and 75,000 fingerlings were sold in 2022.

3. Three training workshops in tilapia production were held in 2022.
4. Work commenced on the establishment of an experimental aquaponics system in Central Farm
5. The completed value chain analysis document recommendations within the FAO Value Chain Project was initiated.
6. The Aquaculture Unit's work in Belize was recognized in the 2021 September-October issue of Hatchery International Magazine. The plan is to produce an article for 2022 and 2023.
7. The registry of tilapia producers in the country of Belize was updated. To date there are more than 90 Tilapia producers in the entire country of Belize. In the year 2021 there were 103 tilapia producers
8. 32.29 acres of water surface area was allocated to small scale fish farming in 2023.
9. Tilapia processing will continue to form part of value adding, a major activity at the Central Farm Tilapia Hatchery Centre.

3.3 Grains

Like 2021, the main objective in the grains and legumes sub sector was to improve the competitiveness of the commodities along the value chain to satisfy increasing domestic demand, national food security and exports to generate foreign exchange. During the year rice, red kidney beans and cowpeas experienced slight reduction in acreage planted and production. Yellow corn, black beans, soybeans, and sorghum experienced major growth in acreage planted and production. See Annex 2 for details.

In grains, yellow corn production grew by four percent (4%) from 21.52million pounds in 2021 to 22.43 in 2022. Acreage reduced insignificantly from 52,377 in 2021 to 52,170 in 2022. Rice production decreased by eight percent (8%) from 33.04 million pounds in 2021 to 30.43 million pounds in 2022 despite a slight increase in acreage of three percent (3%) from 6,531 to 6,744. Sorghum production increased significantly by sixty one percent (61%) from 28.39 million pounds in 2021 to 45.63 million pounds in 2022. Acreage for the same period increased by twenty-one percent (21%) from 12,614 to 15,200. Favourable weather conditions and price factors were attributable to increased acreage.

In legumes, red kidney beans production decreased by four percent (4%) from 14.08 million pounds in 2021 to 13.45 million pounds in 2022. Acreage planted reduced fourteen percent (14%) from 16,679 in 2021 to 14,270 in 2022. Sluggish export sales to CARICOM led to reduced acreage planted and farmers planting more corn. Black beans production, however increased by twenty nine percent (29%) from 4.87 in 2021 to 6.27 in 2022 while acreage increased by forty five percent (45%), from 5,234 to 7,590. The increase was primarily in the Toledo district destined for the Guatemalan market. Cowpea production reduced slightly by

two percent (2%) from 3.85 million pounds in 2021 to 3.75 million pounds in 2022. Acreage decreased significantly by forty three percent (43%) from 7,915 In 2021 to 4,512 in 2022. Full recovery from damage caused by thrips remains to be achieved. Soybean production experienced significant growth by fifty seven percent (57%) from 38.16 million pounds in 2021 to 59.82 million pounds in 2022. Acreage planted saw a significant twenty five percent (25%) increase from 28,851 in 2021 to 36,115 in 2022. Annex 3 contains production data.

In general, #planBelize contemplated an enabling environment for increased productivity and to restore confidence in the agriculture sector. Despite the COVID 19 pandemic, the Russia/Ukraine conflict and climate change related challenges, the agriculture sector experienced growth, cost of production increased significantly due to elevated input prices such as fuel, pesticides, and fertilisers. MAFSE along with the Government of Belize (GoB) worked tirelessly to address the challenges and for the farming sector to remain engaged. Proofs of this are the investments in soybean processing facilities in Spanish Lookout and Blue Creek to produce soybean meal and oil for the domestic and export markets. Mexico has expressed interest in sourcing soybeans from Belize. A project funded by Mexico is currently testing various soybean varieties for adaptability to Belize's agro climatic conditions as well as providing technical assistance for soybean production.

3.4 Agro-Processing Unit

The unit was present and participated in the virtual launch of the ITVET Stann Creek Agro-processing program. This initiative is in collaboration with the University of Belize, ITVET, Vancouver Island, Parkland College, and the Marine Institute. The program seeks to access and promote the skills to access the green economy to those enrolled in the program at ITVET Stann Creek. The Unit was tasked to assist in this program by providing the technical training to the staff of ITVET and students enrolled in the program for them to become trainers of trainers within the Stann Creek District. The unit was able to provide six (6) training sessions to 25 students of ITVET Stann Creek and Agriculture & Natural Resources Institute (ANRI). Over a period of 4 months the students were trained in basic food safety as it relates to food processing, introduction into HACCP concepts, introduction to standard operating procedures within processing facilities, Good Manufacturing Practices (GMPs), basic business management, as well as they participated in practical product development training to learn how to manufacture *salsa casera*, pickled jalapeno, preserve fruits, cassava flour, mixed fruit jam, and fruit juices.

The staff of the unit attended the Export Competitiveness Forum 2022 that was held in May 2022. This forum was made possible with the support from the Commonwealth Secretariat. Belize's private and public sector worked closely to develop a roadmap detailing the new approaches to increase export competitiveness by focusing on some key pillars.

In September of 2022, the coordinator, Earvin Gentle, attended a workshop in Taiwan from September 22nd to October 5th. The title of the workshop was "2022 Workshop on Value-Added Agricultural and Fishery products." Participants from across the world were invited to the workshop which led to sharing of experiences and networking with participants from countries across the world.

In October, extension officer Anna Howe participated in a Food Processing and Packaging Design training held in Taiwan from October 18th to November 1st, 2022. The purpose of the training was to provide participants with the technical skills and knowledge in food processing and packaging design to enhance capacity building and entrepreneurial capacity. The training was supported by the International Cooperation and Development Fund (ICDF) of Taiwan and delivered by the National Kaohsiung University of Science and Technology. It was offered in 2 phases, i.e., practical and theoretical. After attending the training session, an important benefit for Belize is the knowledge of industrialization which has been enhanced, and the ability of the officer to now identify and operate essential machines and equipment in agro-processing.

Food and Nutrition Security

Several extension outreach capacity building training sessions were conducted in collaboration with the Unit, Extension, Cooperatives, and processors. These training sessions were mainly but not limited to salsa casera (7 sessions), fruit jam (5), fruit juices (3), pickled jalapeno (2), coconut oil (7), alternative flour production (6), and Good Manufacturing Practices (8). In total, 38 training sessions were executed to approximately 240 participants ranging from ages 16 to 75 years old across both genders, with 54% of the participants being female.

The Agro-processing Unit prepared and submitted a project through the Ministry of Foreign Affairs for support by ICDF Taiwan program titled, "Empowering Women and Youth to Generate Income Through Agro-processing and Value Addition of Locally Grown Seasonal Fruits and Vegetables". It was approved at a total cost of BZD 39,460. The goal of the project is to strengthen the capacity of thirty participants from across the country, mainly women and youth, in product development and value addition of targeted commodities.

Diversification and Value Addition

The unit, located at Central Farm, forms part of the fruit and vegetable value chains and as such all the units at Central Farm at some point in time must network with the unit to either process, package or market their produce. Some of the resultant collaborations include:

- The unit worked with the Coconut Hybridization Program to develop coconut-based products such as coconut oil, coconut water, coconut flakes, and coconut milk.
- The Horticulture Unit has worked along with the unit to deliver fresh vegetables to the unit that resulted in the development of salsa casera, pickled jalapeno, and dried

seasonings, just to name a few. The unit generated approximately BZD 200 in the sale of these products.

- The Fruit Tree Program provided seasonal fruits that were processed into puree, then either used to develop fruit jam or fruit juices. The sale of these products generated approximately BZD 500.

Infrastructural Improvement

This past year the Ministry supported the unit by improving the building that houses the industrial food dehydrator. The building was renovated to accommodate the machinery for the dehydration, milling, and packaging of carbohydrate storage crops to be transformed into alternative flour. The upgrade in progress will enable the Unit to support the school feeding program that MAFSE is currently engaged in with Ministry of Health, Education and Fyffes. The improvements align with the food safety regulations set by BAHA for processing facilities. Roofing, electrical, and plumbing issues were also addressed.

Apart from the actual building conditions being improved, the Ministry also supported the maintenance and servicing of the machines that are used more frequently. Such machines are the industrial food dehydrator, the pin grinder, and the fruit de-seeder/pulper. These machines needed replacement motors as the ones that were on the machines have reached the end of their lifecycle.

3.5 Policy Unit

The Policy and Statistics Unit of MAFSE is responsible to draft, amend and evaluate the achievement of the goals of the #planBelize agriculture policy and the implementation of the MTDS action plan. The unit manages the Belize Agriculture Information Management System (BAIMS) and the Belize Agriculture Price Information System (BAPIS) which are both used for planning, coordinating, and implementing various projects. The unit also coordinates with both the public and private sector to discuss matters affecting the agriculture sector through stakeholder meetings, sector/industry meetings and liaising with stakeholders on matters relating to market access, trade and investment.

In 2022 the Policy and Statistics Unit, along with the Extension Department, managed to register approximately 1,304 new farmers on the Belize Agriculture Information System (BAIMS). The following distribution (*Table 1*.) was extracted from the BAIMS 2022 database.

District	# of Farmers
Belize	107
Cayo	398
Corozal	264
Orange Walk	172
Stann Creek	137
Toledo	226
Grand Total	**1,304**

Table 1. BAIMS Registry 2022

From the start of registration on BAIMS in late 2018 up to December 31st, 2022 approximately 14,934 farmers have been registered. *Table 2* illustrates the National Registry from 2018 to 2022 and *Table 3* illustrates the demographic distribution (male, female, other (companies, organizations and schools) from 2018 to 2022.

District	# of Farmers
Belize	801
Cayo	2,918
Corozal	4,021
Orange Walk	3,435
Stann Creek	990
Toledo	2,769
Grand Total	**14,934**

Table 2. National Registry up to 2022

Gender	# of Farmers	Percent
Male	3,344	22%
Female	11,504	77%
Other	86	1%
Grand Total	**14,934**	**100%**

Table 3. Demography on National Registry up to 2022

The national registry saw an uptake in registrations after the implementation of the Contingency Emergency Response Component (CERC) Project in 2021. Many farmers who were not registered at the time made efforts to visit the district offices to get registered. This was also caused by the impacts of COVID19 pandemic when many people lost their jobs in various other sectors especially the tourism industry in 2020/2021 and turned/returned to agriculture. A heat map of farm density throughout the country is illustrated below in Figure 1, which clearly indicates locations of high-density productive zones.

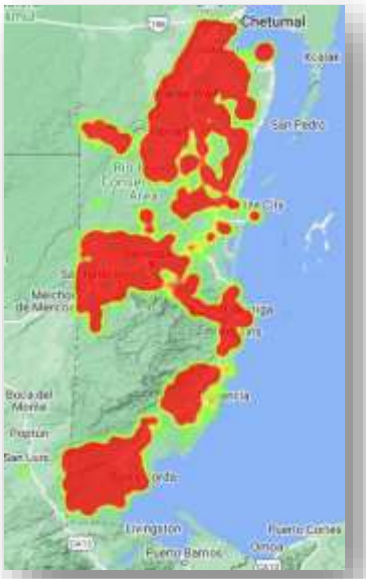


Fig 1. Heat Map of Farms in Belize 2022 (Source: BAIMS)

The Policy Unit also assesses production data, industry performance and provides insight into economic performance. The overall data is compiled into the annual national production report, which is an exercise that is carried out from January to February on a yearly basis. The draft statistical report is presented to the stakeholders for final vetting, which includes key industry producers, MAFSE technical team, Central Bank of Belize, and the Statistical Institute of Belize (SIB). This report is key in monitoring GPD performance which is used as a guideline to monitor the input of the agriculture sector into the #plan Belize Policy for Agriculture.

Other key datasets that are gathered by the Policy and Statistics unit are the market price collected on a weekly basis from 7 markets across Belize. The market datasets are collected using the BAPIS platform and are published weekly on the website www.agriculture.gov.bz and Facebook page https://www.facebook.com/maf.gov.bz . The list includes 48 priority commodities and data illustrated is the average price at each market location showing difference in prices in previous week.

Other key achievements of the Policy and Statistics unit in 2022 include the compilation of all Damage Assessment and Needs Analysis (DANA) reports for both Hurricane Lisa (November 2022) and Floods associated with Hurricane Julia (October 2022). In both instances of natural disaster, the Policy Unit has taken the lead in ensuring all data captured is also reflected in the BAIMS registry. During the floods associated with Hurricane Julia, it was estimated that 297 farmers were affected with 2,723.6 acres damaged, equivalent to BZD 8.9 million in losses. Likewise, it was estimated that during Hurricane Lisa, 780 farmers were affected with an estimated 4,512 acres affected and approximately BZD 19.8 million in damages. The unit has also taken the lead in participating in the Post Disaster Needs Assessment (PDNA) that initiated in December 2022 and is expected to conclude in February 2023. This PDNA will identify gaps and make recommendations to strengthen the need for proper data collection using internationally recognized methods which will lead to seeking financing from International Financial Institutions (IFI's) for recovery after a natural disaster. Hurricane Lisa

DANA has also been shared with the World Food Program (WFP) with finances identified to assist farmers with post hurricane recovery. The project concept was initiated in 2022 and expected to conclude in the first quarter of 2023.

The unit has also carried out an exercise dubbed the "Pre and Post COVID Agri-input Price Assessment". The assessment monitored prices for fertilizers, seeds, agro-chemicals, shipping, and transportation including other agro-inputs over a period of 4 years (2019 – 2022). The assessment shed light on understanding the inflation rates, percentage, effects of COVID and the effects of the Russian/Ukraine war on the agro-productive sector.

3.6 Centre for Research, Development and Innovation

Sweet Pepper Varietal Trial – Central Farm

In Belize, sweet pepper is the most planted vegetable under protective structures by small farmers. The hybrid varieties that are imported by seed suppliers and that are locally grown are harvested as mature green as demanded by Belizean customers. Most of these varieties are for open field production but are now being grown under protective structures. This has created an increase in yields and for several periods during the year, there is an oversupply to the local market. The tourism sector demands other sweet pepper cultivars such as red, yellow, and orange. Some farmers are now starting to grow these cultivars for this niche market. The seeds for these varieties of coloured peppers for protected production are more expensive. Both seed suppliers and information on characteristics of these varieties are limited. The use of protective structures has definitively increased yields and enhanced fruit quality and reduced pesticide use, but it has its challenges. The main challenge to grow sweet peppers under a protective structure is the high temperatures in the structures.

Eight (8) sweet pepper varieties from six (6) local suppliers were evaluated under a tropical greenhouse in Central Farm during the months of December 2021 to April 2022. The objective of the trial was to evaluate the agronomic potential of selected sweet pepper varieties available in Belize. The results of this project familiarized local producers with varieties suitable for production under protective structures.

Coconut Hybridization

The management of 10 acres of coconut gardens continued in 2022 and resulted in the production of approximately 2000 MayPan seed nuts (hybrids). At the time of reporting, there were 1,699 seedlings of which 1,298 seedlings were categorized as ready for transplanting and 401 seedlings are at germinating stage. In addition to the production of hybrid nuts, Yellow Malayan Dwarf and Panama Tall coconuts were also produced.

An important activity also included the rehabilitation of the seed gardens which entailed replanting and the removal of overgrown and diseased palms. Replanting was done in three seed gardens. Daily observations of the seed gardens resulted in several trees tagged for

removal due to pest and disease damage or presence. Specifically, 17 Yellow Malayan Dwarf and 5 Panama Tall palms were removed from garden 1 and garden 2; these palms were either infected with red ring disease (majority) or phytophthora.

95 overgrown palm trees were also removed from seed garden 3 which was previously a pure stand with Yellow Malayan Dwarf plants.

Coconut Germplasm Bank

The coconut germplasm bank currently has 7 entries, namely 2 hybrids (Chactemal and MayPan), 2 dwarfs (Yellow Malayan and Bronze Malayan), and 3 talls (Panama, Michoacan and Colima). The Michoacan tall was planted in 2022. Thus far, the Yellow Malayan Dwarf and Chactemal hybrid have started flowering and data is being collected on the number of spathes produced.

In addition to observing the growth and production parameters of its entries, the germplasm bank also serves as a demonstration model for the intercropping of cover crops. In November 2022, four types of tropical cover crops were planted: jack bean (*Canavalia ensiformis*), velvet bean (Mucuna pruriens), Mexican sunflower (*Tithonia diversifolia*) and madre cacao (*Gliricidia sepium*). The purpose of this demonstration model is to collect data on the benefits (or disadvantages) of establishing cover crop species in coconut gardens.

Fruit tree germplasm and production models

In addition to the coconut germplasm collection, the program continued with the management of over 17 acres dedicated to a collection of assorted fruit trees and root crops which also serve for germplasm collection. During 2022, much emphasis was placed in addressing actions that would enhance the program's work, particularly in soursop and pitahaya. The program focused on increasing the availability of pitahaya planting material and in improving the management practices in the soursop demonstration field.

Pitahaya Germplasm Collection

Considering the importance that pitahaya plays as a prioritized non-traditional fruit crop for the MAFSE, a pitahaya germplasm plot was established with the first entries being Purple Haze, Hawaiian Yellow, Taiwanese Red and Local White. Furthermore, a nursery was built with funds from the OIRSA.

With support from the InterAmerican Institute for Cooperation on Agriculture (IICA), the pitahaya collection expanded and now includes more than 25 entries. Also, the pitahaya nursery was stocked with an imported white pulp pitahaya known as Tepich, considered of high productivity and acceptability in the Mexican market. Furthermore, two local pitahaya collectors were contacted and visited, which resulted in their agreement to provide stems to the MAFSE to serve as entries in the germplasm collection.

Soursop production model

The MAFSE has benefitted from a series of training on improved management practices in soursop, and as such the recommendations are being implemented in Central Farm in the field planted with Salvadoran and Mexican types. Considering that this field was practically abandoned due to limited human resources, field observations indicate a high incidence of fungal disease (Anthracnose) and insect problems (mealybugs, mites, scales, etc.). Furthermore, pruning was not being done in a timely manner resulting in overgrown trees. During the latter part of 2022, activities implemented included regular pruning, fertilization, pest and disease control, hand pollination, and bagging of fruits.

Preliminary evaluation using two types of bags (plastic and net bags) for the bagging of hand pollinated fruits was carried out. The results show better results with the use of netting bags and the fruits had a more vibrant colour, had no pest damage, and had quality fruits in terms of size and appearance. On the other hand, the plastic bags used were impregnated with pesticide, but pest problems persisted. These pests caused damages due to fruit borer, mealybugs, and scales, and the skin colour of the fruit was a darker green.

Soil Amendment Production

Approximately 20 loads of sheep manure and 12 loads of straw were transformed into nutrient rich soil amendments and for mulching of fruit tree in the Agricultural Biodiversity Plot and coconut palms in the germplasm bank. Further, 881 lbs. of humus, 3,900 lbs compost and 1,000 lbs of bokashi were produced. The compost produced was used for the establishment of seedbeds and for fertilization of pitahaya plants in the germplasm collection. The vermiculture system also produced Red California earthworms that were sold to interested persons (3.5 lbs = $105).

The interest in soil organic amendment production has increased of late, which has resulted in several training sessions organized and facilitated on station for some 20 persons trained.

CDF Project

The Agronomy Program was tasked to execute the activities under the CDF project aimed at building resiliency to climate change through the adoption of improved technology in production. Through this project, thirty tunnel structures 18ft x 60ft, are to be built across all six districts, and capacity building of farmers and extension agents on the management of crops under these systems. Farmers were identified by the respective agriculture departments in each district and a list was submitted to a panel for vetting against a set of criteria that had to be met by the beneficiaries.

To date, a total of sixteen structures have been constructed: Corozal District with structures in the villages of Xaibe, Chunox, Patchakan and San Narciso. In Orange Walk District, seven structures were built in the villages of San Carlos, Yo Creek, San Estevan, San Lazaro, San

Pablo and Nuevo San Juan. In Belize District, five structures were erected and the areas include Bomba, Corozalito, Lucky Strike, Freetown Sibun, and Hattieville Villages.

World Food Day 2022

World Food Day 2022 was celebrated on October 22nd at ANRI in the Stann Creek District. We were able to identify the areas where the program's involvement would have the most impact and began working on budget, location, human resources, and the equipment needed to get the job done.

The activities, led by Mr. Harold Wesby and Mr. Oscar Salazar, were to construct a prefabricated tunnel (20'x 20') vegetable seedling nursery and the repairs to the Tropical Greenhouse (55' x 80') including establishing a sweet pepper plot and establishing an open field vegetable garden (60' x 80'), all of them with an irrigation system. A budget was submitted to the Ministry in August 2022 with its respective quotations for the acquisition of materials. A total of 1,720 vegetable seeds (cabbage, lettuce, broccoli, cauliflower, Chinese cabbage, pack choy, tomato, sweet pepper, string beans, and cucumber) for the plot were sown on August 23rd. This was then followed by the cleaning of the area as it was in the worst condition. Materials and inputs were received in September and work was focused on the greenhouse repairs and land preparation for the open field garden. The constant rains during the month complicated and delayed work. Drainage had to be constructed for work to continue. It was until the first week of October that the projects assigned were completed.

National Agriculture and Trade Show

The National Agriculture Show was held on the weekend of May 27th – 29th, 2022. A total of 2,100 seeds of assorted vegetables (lettuce, cherry tomato, Chinese cabbage, cucumber, zucchini, hot pepper, string beans, eggplant, tomato, sweet pepper) were sown in March 2022 to plant the demonstration plot. Since the vegetable demonstration plots had been abandoned for two years and had suffered flood damages, much time was invested in repairs in such a short period of time. Mr. Wesby and Mr. Salazar shared the responsibilities to complete the tasks on time, which included the vegetable garden plot, the alternative planting area and two tunnels. At the event, a booth was also set up to showcase the work being done in coconut, fruit tree crop diversification, and soil amendment (bokashi, vermi-compost, compost).

Training and Workshops Conducted and Attended

The program was very active in 2022 in providing training to different beneficiary groups in a variety of technical topics. A total of 633 persons from different parts of the country participated in 32 training activities and this training benefitted farmers, youth, school-aged children, extension agents and cooperative officers.

In addition to providing training, the officers attached to the program also benefitted from the training attended both locally and abroad. The training was made possible through the

various cooperation agreements and collaboration between the MAFSE and regional/international partner agencies.

Vegetables

During the year 2022, a total of 25,000 seeds of various vegetables were sowed for different activities, as follows:

9,240 seeds for sale of seedlings generating a revenue of $1,338.

15,352 seeds for seedling donations for the Minister of Agriculture, National Agriculture & Trade Show, Schools, and World Food Day

700 seeds of sweet pepper, broccoli, and cauliflower for ongoing trials.

During the year an assortment of fruit trees were sold including seeds of legume crops used as cover crops or green manure. The total value of trees sold was BZD 16,435.25.

Type	Number sold	Value (BZD)
Assorted Fruit Trees	642	$5,489.
Agroforestry Trees	669	$1,059.
Legume seeds	335	$1,049.
Coconut (Dwarf)	2005	$5,237.
Coconut (Hybrid)	443	$3,551.
Coconut (tall)	10	$50.

Table 4. Value of Fruit Trees sold at CRDI

Although the sale of fruit tree provided a good contribution to cash income, the sales for the seedling batch in February and July were very low; thus, many seedlings were left to be donated to the interested staff and some planted in the office backyard garden. The marketing for seedlings needs to be improved; Central Farm social media like Facebook is dormant. There is a need for proper management of social media to increase seedling sales.

EXTERNAL PROJECTS

IICA-MAFSE

The Inter-American Institute for Cooperation on Agriculture (IICA) through its Unique Fund Program, provided both technical and financial support to MAFSE to initiate the development of a germplasm collection for non-traditional fruit trees (including pitahaya, coconut, passion fruit, avocado and soursop), as well as for the coordination of technical capacity building and facilitate field exchanges between partner institutions and industry stakeholders (public and private) for the advancement of the non-traditional fruit tree industry in Belize.

The activities consisted of conducting a rapid assessment and baseline information of soursop, coconut and pitahaya production in Belize and sourcing germplasm of coconut and pitahaya for the establishment of a germplasm bank.

INIFAP-MAFSE

The cooperation agreement with the Mexican National Institute for Agriculture, Forestry and Livestock Research (INIFAP) was signed in October 2021 and aimed at technical cooperation in soursop, coconut, pitahaya and soybean. Implementation started with field visits and in-country work in February 2022. Since then, the following activities have been accomplished:

1. Establishment of soybean varietal on-farm demonstrations in Little Belize and San Carlos;
2. Soybean varietal trial in Central Farm;
3. Establishment of coconut demonstration field at Yalbac Village, Cayo;
4. Virtual and in-person training in soybean, coconut, pitahaya, and soursop production and management;
5. Participatory diagnostic workshops on current production challenges and opportunities of soybean, soursop, coconut, pitahaya, and diversification of sugar cane farms;
6. Collation of information for the development of productivity potential maps for soursop, pitahaya, soybean, and coconut.

3.7 Project Execution Unit

The table below presents a list of the projects so far undertaken by the Ministry in conjunction with partners for 2021-22.

	Project Name	**Funding Agencies**	**Funding assigned (BZD)**	**Percentage Completed**
1	Breeding Sheep and Goat Production and Guidance System Enhancement Project (Ph. II Project)	Taiwan ICDF, GoB	$6,000,000.	86%
2	CARICOM-FAO-Mexico Initiative 'Cooperation for Climate Change Adaptation and Resilience in the Caribbean' subproject Resilient School Feeding program: GCP /SLC/018/MEX.	FAO	$400,000.	41%
3	Honey Production Redevelopment Support Project (Expansion of the Honey Production Sub-sector)	CDF, GoB	$953,330.	73%

	Project Name	Funding Agencies	Funding assigned (BZD)	Percentage Completed
4	Covered Structures for Agricultural Production	CDF, GoB	$596,867.	14%
5	Technical Assistance for Inclusive, Sustainable and Resilient Food Systems in the Rural and Peri - Urban Areas of the Cayo District, as a Response to COVID -19	FAO	$660,000.	95%
6	Follow-up Cooperation for Training on Development of Agricultural Cooperatives and Improvement of Management Capacity	JICA UNWOMEN ENGENDER GoB	$69,850.	100%
7	Managing Belizean Agriculture Resilience (M-BAR)	FAO	$90,000.	18%
8	Co-operatives' Rapid Response to COVID19 and the 2020 Floods in Belize (UNDP-GEF-SGP/BEST/Dept. of Co-operatives)	GEF BEST Beneficiary GoB	$510,000.	63%
9	Belize: Climate Resilient Sustainable & Agriculture Project (CRESAP)	World Bank FIs Beneficiaries	$91,400,000.	1%
10	Digital Agriculture Services for a Sustainable and Inclusive Agri- Food System and Value Chains.	FAO	$500,000.	2%
11	Belize Agriculture Sector Policy with focus on Seed, Back Yard Poultry Marketing and Indigenous People Affairs	FAO	$400,000.	3%
12	Farmers´ Organizations for Africa, Caribbean and Pacific - Action in the Caribbean (FAO4ACP - Caribbean)	FAO	$8,732,000.	35%
13	Sustainable Development of Resilient VCs - Implementation of CARICOM COVID-19 Agri-Food Recovery Plan	FAO	$800,000.	70%
14	Strengthening Belize's Evidence Base and Systems for Crisis Response	FAO, UNCF, UNESCO, WFP, UN SDG	$604,894.	99%
15	Mesoamerica without Hunger Programme: Improve Food and Nutrition Security and encourage healthy eating habits in Belize through strengthening the school feeding programme	FAO	$1,100,000.	100%
16	Sembrando Vida	AMEXCID	$6,000,000.	1%
17	The Implementation of Cash-Based Transfer (CBT) Distribution through the Government's Agriculture Platform in the Framework of WFP'S Caribbean Multi Country Strategic Plan 2022-2026 (MCSP)	Italian Government Church of Jesus Christ of Latter Day Saints WFP	$726,800.	1%

	Project Name	Funding Agencies	Funding assigned (BZD)	Percentage Completed
18	Driving innovative financing and sustainable investments toward food system transformation and achieving SDGs in the Caribbean	ICDF	$600,000.	1%

Table 5. Projects undertaken by MAFSE

3.8 Cooperatives Department

The main achievements of the Cooperatives Department include the following:

- Registered four (4) new cooperatives: Orange Walk Beekeepers in Orange Walk District, Concepcion Vegetable Farmers and Northern Sustainable Agro-Producers in Corozal District, and Sayab Farms in the Cayo District.

- Reviewed and re-ordered training manual to include topics on collective leadership and financial literacy.

- Rebuilt financial management and records system to make it easier for small producers to keep better records.

- Edited standard by-laws from a twelve-page document with fifty-eight articles to a three-page document now with twenty-two articles.

- Audited ten co-operatives: Belize Bus Owners, Bus Terminal Market Square Taxi, First Stop Taxi, Golden Crops, Cayo Quality Honey, Valley of Peace Consumer, Placencia Producers, Placencia Tour Guides, Maya Freshwater, & Marigold Women.

- Execution of the project entitled: Co-operatives Rapid Response to COVID19 and 2020 Floods in Belize along with GEF-SGP/UNDP and BEST delivering seven greenhouses, one roto-tiller, one water catchment, ten sewing machines, one stove with oven, one freezer, and one root-crop washer, to eleven beneficiary co-operatives.

- Training programs for co-operatives were conducted countrywide as follows: six on the benefits of organization for small scale producers and service providers; nine on co-operative administration and management; three on the conduct of meetings and minutes taking; and four on introduction to finance and accounting procedures in a co-operative enterprise.

- Facilitated six exchange and information sharing visits among farmer co-operatives.

- Seven (7) new enterprises expressed interest in registration as co-operatives.

3.9 Belize Marketing and Development Corporation

The main achievements of BMDC are summarized under four (4) strategic objectives (SO) with their respective actions and results.

SO 1: Reduce agricultural-based food loss and waste and improve national food security

Target: Achieve at least one (1) successful impactful activity that positively contributes to SDG 2: Zero Hunger.

Honey Contract Farming Pilot with Orange Walk Beekeepers Cooperative Society Limited (OWBC).

Through BMDC's Honey Buying Centre, the beekeepers of the northern districts of Belize can deliver their honey with assurance of being paid 100% for honey when tested to be of acceptable quality. BMDC was able to pilot a contract farming arrangement with 26 beekeepers of the Orange Walk Beekeepers Cooperatives Society Limited (OWBC) on May 3, 2022. This will allow BMDC and the Cooperative to plan production, secure stable prices, and attract new markets together for the Belize Jewel Brand Honey. This activity successfully removes the risk of food loss and waste for the apiculture industry. BMDC will document the contract farming pilot, which will serve as a best practice and lessons learnt guide for future contract farming activities. The activity partners are MAFSE and Orange Walk Beekeepers Cooperative.

Farmers Assistance Program

The Corporation was able to provide the following assistance to farmers for this reporting period:

- Purchased 229 cases of lettuce from lettuce producers from 6 communities.
- Purchased 2,770 bags of onions from Bomba United Farmers Coop. Ltd valued at BZD 181,500.
- Purchased over 337 sacks of potatoes from the community of Upper Barton Creek.
- Provided 50% subsidy on seeds to Orange Walk onion producers.
- Donated BZD 20,000 for fertilizers.

The activity partners are MAFSE and the Department of Cooperatives

SO 2: Improve local and international market access for farmers through actionable marketing programs.

Target: Successfully provide at least two (2) new market opportunities to farmers by July 2023.

El Salvador exportation program

One of the main projects that the BMDC has been spearheading on behalf of MAFSE is the export project to El Salvador. Formal relations have been established with both the Ministry of Agriculture and Livestock of El Salvador and the Salvadoran major importers to ensure this market is accessible to our local farmers. BMDC was successful in all the foundational work for these trade arrangements, and now only two main activities remain, the PRA and organizing suitable supply with participating farmers. BMDC has since organized a taskforce to fast track the PRA process for onions, carrots, pineapple, and citrus. This activity hinges on both #planBelize's goals and SDG 9, to achieve industry development.

The activity partners are MAFSE and the Belize Agricultural Health Authority (BAHA).

Establishment of BMDC San Pedro Depot

On December 2, 2022, BMDC achieved the momentous inauguration of its San Pedro Depot. This activity is expected to positively impact all farmers who can provide high quality goods to the San Pedro market to be distributed through the depot. BMDC as the marketing arm of the MAFSE is now in the position to contribute tangibly to several other interconnecting activities such as lowering Belize's food import dependence, export income retention from tourism, and national food security.

The activity partners are San Pedro Town Council and the Agro-processing Unit, MAFSE.

SO 3: Improve the Corporation's institutional strength to deliver high quality services and outputs.

Target: Achieve effective development in the Corporation's operations, equipment and assets, and organizational structure.

Modernization of BMDC Honey Facility

The corporation has successfully completed a facility inspection and site evaluation with BAHA, started facility refurbishment with additional stainless-steel equipment expected to be completed by February 2023, and employed a youth from a rural community. The activity partner is BAHA

Modernization of the Administrative and Accounting System: The Corporation has successfully improved its institutional strength by reinstituting a structured HR system, convening of regular structured managers and staff meetings, reinstated performance appraisals, modernized an online accounting system legally registered with Intuit (QuickBooks) and accounting best practices standards, and submission of monthly financial reports to the Board of Directors.

BMDC Branches Expansion and Upgrades

In this report, BMDC highlights the strategic branches' improvements that will enable the Corporation to be more effective and efficient:

Big Falls Branch: Revised the price structure from dry to wet weight payment and made a 38% increase in purchase price of paddy to benefit farmers, conversion of weight scale from analogue to digital, digitalization of printing system for rice paddy delivery reports to rice farmers, acquisition of a forklift for load transportation and a tractor with a bush hog for facility maintenance, and the renovation of the Big Falls Branch facility accommodations.

Orange Walk Branch: Installation of two 48 ft cold storage reefers, complete renovation of the branch for improved storage and office spaces for sales, marketing and administration, and purchase of a 6-wheeler reefer truck.

Belize City Branch: Remodelling of office space to host a printing department with industrial printing capacity and complete refurbishment of the Belize City warehouse.

SO 4 Enabling more impactful results through project financing options and partnerships.

Target: Engage in more results-based partnerships and projects.

3.10 Belize Agricultural Health Authority

The enactment of Statutory Instrument (SI) 34 of 2022 was the major achievement of 2022. The revision of fees allowed BAHA to avoid financial bankruptcy and regain stability that is projected to continue for the next five years.

All surveillance programs were completed, and no introduction of new pests or diseases were detected. The animal health department successfully addressed a suspect case of avian influenza and maintained free status.

The Food Safety Services department completed the Taiwan FDA questionnaire for equivalency for fish and fishery products to support expansion of the industry.

Administratively, both the Plant Health and Quarantine departments have a full complement of staff. BAHA is approximately 95% complete in negotiating a collective bargaining agreement with the Public Service Union.

Over 50% of staff benefited from some form of training. This training ranged from short online seminars to extended international courses to build technical competencies.

3.11 Pesticides Control Board

The PCB achievements include the following:

1. Conclusion of the PCB's Five-Year Strategic Plan for modernization of the institution and development of a second Strategic Plan, in consultation with partners and stakeholders. The 2023 to 2028 Strategic Plan is to be launched in April 2023.

2. Continued development of the PCB's data management and information system.
    a. The PCB's online portal allows permit clients to submit their applications online, resulting in greater process efficiency.
    b. The online database of registered pesticides provides pesticide users and registration clients with updated information on usage recommendations and registration status of pesticides registered for use in Belize.
    c. Enhanced effectiveness and efficiency of process management and service delivery as well as timely and accurate reporting
        i. Registration and Permits
        ii. Importation
        iii. Licensing – Pesticide Handling Facilities (PHFs) and Certified Pesticide Applicators(CPAs).

3. Enhanced collaboration with partners and stakeholders, i.e.:
    a. Resilient Rural Belize
    b. Rotterdam Convention/University of Belize
    c. Sustainable Harvest International
    d. OIRSA
    e. Belize Agricultural Health Authority
    f. Department of the Environment
    g. Forestry Department

4. Enhanced governance.
    a. Strategic Governance Retreat held in July 2022 hosted a Roundtable Discussion on trade, environmental and health issues associated with global pesticide trends.
    b. Successful convening of the quarterly meetings of the Board and its sub-committees.

3.12 Corozal Free Zone

Revenue:

Despite the Covid pandemic, the Corozal Free Zone continued to see growth in various sectors.

Importations were valued at USD 190,030,341, an increase of 34.3% compared to 2021 (USD 133,784,978.). As a result, social fees paid to the Government of Belize summed up to USD 12,377,715, an increase of 66.4% compared to 2021 (USD 7,436,855.).

Sales in 2021 amounted to USD 268,774,006. while in 2022 they were USD 266,042,753.64.

15 new companies were also under the Commercial Free Zone Regime as the total amount of companies at the time of this report is at 299 active companies.

Direct employment increased by 44.7% compared to 2021, due to an increase of 464 employees, and indirect employment also increased with the many service workers that are required for the day-to-day operations of the Corozal Free Zone. All in all, the Corozal Free Zone represents approximately 3,000 job opportunities for Belizeans.

The increase in revenues is attributed to a rise in footfall and an increase in average transaction value.

Footfall:

The Corozal Free Zone received approximately 1.1 million visitors in 2022. This represents a 20% increase in footfall compared to the previous year. The increase in footfall is attributed to the opening of new stores and an increase in promotional activities.

We also saw an increase in the number of vehicles from 242,481 in 2021 to 296,635 in 2022 which represents a 22% increase and contributed to the growth of the zone.

Infrastructure and assets:

During the year 2022, our organization invested in upgrading its fire station, accessory road restorations, IT infrastructure, and initiated a contract to expand the office area. We have acquired network equipment, biometric scanners at both gates, invested in POS systems at both entry points and updated software to support the growing business needs. The new infrastructure will allow us to house our fire department, process and store data more efficiently and effectively, and digitalize our day-to-day operation which ultimately improves our overall performance.

We also initiated a proposal to the Central American Bank for Economic Integration (CABEI) to fund the restoration of the access road from the Santa Elena Bridge to the Corozal Free Zone main entrance. This project includes drainage and a complete paving of the 4-lane boulevard. The proposal has been submitted and we await confirmation of its approval, an investment of approximately USD 1.9 million.

Assets Obtained:

In addition to upgrading our infrastructure, the organization has also acquired new assets during the year. We have invested in new office equipment and spaces, including chairs, desks, filing cabinets, and signage. We have also acquired 4 new vehicles, including 1 Isuzu MU-X, 1 Isuzu DMAX, 1 Ford Ranger and 1 Isuzu NPR Cargo Truck to support our transportation needs.

3.13 Sugar Industry Control Board

Research of the Sugar Industry Research and Development Institute (SIRDI)

a. Variety Development Program

Sugar cane variety selection is one of the most important decisions in establishing a productive cane field. Therefore, varieties with commercial potential in Belize must be evaluated under local agroecological conditions and farming practices in a statistically designed multi-location trial to determine their suitability for commercial production in Belize.

As part of the evaluation process, a plot was established with a total of 16 varieties (10 BBZ and 6 Cuban varieties) in vertisol soil. Data collected were plant height, diameter, number of internodes, number of active leaves, and yield at 12 months old; while cane quality was at 10, 11 and 12.

Results: Data indicated that Variety C323-68 and JA 64-19 rank top for purity, pol, and tons cane/tons sugar (TC/TS) in the month of May. B79474 can be harvested from December up to June, JA6419 variety from February to the end of the crop, and C090317 variety from March to May. The evaluation is still ongoing to be able to determine the exact harvesting period for the different varieties. Data has indicated that the weather plays an important role in sugarcane quality. In May 2022, it was a dry period; however, in June and July, the rains started, hence, there was a reduction in quality.

b. Plant Nutrition

Optimal nutrient application is critical for- profit maximization and the prevention of adverse environmental effects. However, fertilizer application is not optimized in Belize because local trials have not been carried out for fertilizer applications, resulting in fitting inaccurate biased estimations of the nutritional requirements of the crop. According to the results for agriculture yield for the first ratoon cycle, harvested in April 2022, the optimal dose is 50 kg, which produces the second most important relative increment (17.19%) after 100 kg/ ha with a nitrogen rate of 21.72%. The linear model shows low correlation between nitrogen application and relative yields of r2=0.16, which means low response to nitrogen application in the ratoon cycle.

c. Irrigation Trial

The severe drought of 2019 impacted the sugar industry with a decrease of approximately 32%. It is predicted for the upcoming years that rainfall will be below the historical average, because of climate change. The Sugar Industry Research and Development Institute (SIRDI) continues with its evaluation of the irrigation experiment using the water balance method. Results of the first ratoon corresponding to B 79474 variety in a vertisol soil type indicated that precipitation recorded 1,236.8 mm year 2021. February to May was the driest. The critical period for irrigation is between the months of January to April. A total of 1,552.8 litres or 1.55 cubic meters of water per square meter were applied, for the period March 2021 to December 2021, which calculated by acre equals 6286 cubic meters. There were increases in yield by 39.8% when compared to the rain-fed condition, a difference of 13.08 tons more per acre.

d. Pest Monitoring

Froghopper and stem borer pest outbreaks pose an ongoing challenge to farmers and have caused economic losses to the sugar industry. Integrated Pest Management (IPM) involves the integration of various pest control techniques to discourage pest population development and maintain pesticide use at economically justifiable and environmentally responsible levels.

A study financed by the Caribbean Community Climate Change Centre (5C's) was conducted is to understand the distribution and intensity and to estimate the loss in production based on the species identified. Results of the 2021-2022 study indicated that the economic damages attributed to the sugarcane stem borer were BZD 1,137,055, based on the damage intensity index obtained in the monitored area. The entomological identification of sugarcane stem borer in the northern sugar industry confirmed the presence of *Diatraea magnifactella* (Dyar), *Diatraea saccharalis* (Fabricius), and *Eoreuma loftini* (Dyar) which will assist in the development of an integrated pest management program, which will include the use of biological control as its backbone.

Froghopper monitoring sites were in the different agroecological zones which served as a guide to determine the status of the pest. For the monitoring site located in San Jomal, Corozal, results indicated that the accumulated precipitation of (50 mm) May trigger the diapause eggs to hatch, Adult frog hoppers were identified 20 days after receiving accumulated rainfall. The accumulated rainfall + the relative humidity and temperature of 90^0 F triggered the eggs to hatch.

The industry needs to implement an integrated pest management strategy for the frog hopper pest. If nothing is done an outbreak is expected in 2023 with the first rains. Field affected by frog hopper require the pass of the light harrow not exceeding 10 days after harvest and use of preventative measures.

e. Herbicide Trial

This is the second year of evaluating three pre-emergent herbicides: Merlin Total (Ixosafluotole), Plateau (Imazapic), and Alion (Indaziflam). The herbicides were applied during the dry period and were compared with the no-weed control, to determine the efficiency in suppressing weed germination. The three pre-emergent herbicides performed much better in comparison to the previous year by increasing weed control efficiency. Merlin Total had better efficiency controlling 97% of weeds in comparison with the control. The product Merlin Total was able to keep the field free of weeds for a period of 116.5 days of the total 120 days evaluated. The results will assist in reducing the irrational use of pesticides which ends in our water bodies, affecting the different ecosystems. The product price per acre is less when compared to post-emergent herbicides. The volume of water used for pre-emergent mixture is less when compared to post-emergent use, thereby minimizing application cost.

Services

a. Integrated Pest Management Laboratory

One of the major pests that has negatively affected the sugar cane industry is the frog hopper; thus, an Integrated Pest and Disease Management (IPDM) lab financed by the European Union producing the biological control agent Metarhizium was established. The biological agents were introduced to minimize the use of chemical pesticides used by farmers, which are detrimental to the environment and human health. Part of the marketing strategy was to conduct a series of presentations to the sugar industry stakeholders and the agriculture sectors to promote the biological agent.

Trials in cabbage, sweet pepper, coconut, and livestock (ticks and pastures) have been conducted, having excellent results. The IPDM laboratory has an effective quality control system to maximize product performance. One of the measures conducted on the Metarhizium is the viability test to ensure product efficacy. The environmentally friendly bio-pesticide is sold in liquid and powder formulations.

b. Agricultural Services

This service increased the adoption of mechanized technology for land preparation and Ratoon Maintenance. The Support Services Program provided tractor services on over 1,576 acres. The increase in the acreages is primarily due to MAFSE relief vouchers for Sugarcane Farmers affected by the drought program. One hundred fifty-six (156) SIF/World Bank vouchers were received from farmers for tractor services.

One of the different implements is the hay rake (trash liner) used for alignment of the sugar cane residue which assists in reducing the second burning by neatly aligning harvest residue within the field (sugarcane rows). There are many benefits to the soil in leaving

the harvest residues within the field, for example, soil restoration, and reducing the emission of carbon dioxide and other gases into the atmosphere.

c. Capacity building of industry stakeholders

A series of training for the industry stakeholders and cane farmers was conducted to provide technical know-how in the area of integrated pest management strategies for sugar cane stem borer and froghopper, sugarcane varieties, irrigation, and soil nutrition.

Collaboration

SIRDI has built strong collaborations which may provide the industry with opportunities to develop innovative approaches to face current and future challenges. Therefore, it adopted the following programs:

d. Sugar Cane Replanting Program

SIRDI's role is to provide technical guidance to the farmers to adopt the best management practices through field inspection of the participating farmers. The funds available form part of the Revolving Credit Facility (RCF). This fiscal year for replanting a total of 663.2 acres: 337.2 acres are for farmers in the Corozal District and 326 acres for farmers in to the Orange Walk District. A total of 183 farmers qualified for the program of which 83% are males and 17% females. For ratoon maintenance a total of 474.3 acres was inspected and recommended for 33 farmers of which 67% are male farmers and 33% female farmers.

b. Weather Data

Collaborating with the Belize Meteorological Department has resulted in the installation of automated weather stations within the northern sugar belt of Belize. Last year the accumulated precipitation varied depending on the agroecological zone. The graph below shows that the total rainfall in San Estevan was 1,749 mm compared to Tower Hill with 1,274.20 mm. The data helped the industry with decisions when it comes to monitoring any pest outbreak, coordinating the harvesting and delivery of sugarcane, and the optimal planting season, just to mention a few.

c. Soybean and Coconut Program

In collaboration with MAFSE, the Caribbean Agriculture Research and Development Institute (CARDI) established a coconut nursery for the strengthening of planting material availability for the diversification program. The nuts procured, i.e. Brazilian Green Dwarf variety, have been set within the pre-nursery, from which proper selection will be undertaken to place them within the nursery. A total of 8524 seeds were developed within the pre-nursery.

Soybean is being promoted as an alternative crop to aid in the process of diversifying the crops the sugarcane farmers can adopt for an additional revenue source. SIRDI established an experimental plot with eight (8) soybean varieties, which unfortunately did not grow as planned due to excess moisture. The experiment will be repeated next year during the optimum period for soybean production. This collaboration also involved participating in capacity-building activities for the production management of soybeans.

d. Wild Cane Biomass Project

Belize Electricity Limited financed the research component to test the feasibility of cultivating wild cane. Collaboration with CARDI and SIRDI was responsible for the design, establishment, and analysis results of agronomic (research) trials with the wild cane. Preliminary data after one year of growth shows that each species' behavior under cultivation is different. *A. donax* is a much faster colonizer, but on average the stalk diameters of *A. donax* are generally smaller than that of the *G. sagittatum*. Biomass coverage of at least 12 months was best on planting distance at 1 foot. Preliminary results indicated that the treatment with 2 nodes per stalk at 1 ft. between plants and 5 ft. between rows, , and with fertilization, *A. donax* is performing better in all parameters under evaluation.

The viability of cultivating wild cane as biomass fuel for energy generation would offer a significant potential opportunity for Belize to realize its goals of becoming less dependent on fossil fuel imports, an energy exporter, reducing its greenhouse gas emissions, achieving its Nationally Determined Contribution targets, and enable upgrading the existing infrastructure to provide immediate and direct benefits toward resolving our national energy challenges.

4. Lessons Learnt

2022 was a year of recovery. The economic impacts of COVID 19, the war in Europe and Hurricane Lisa have highlighted the need for efficiency in operations and the prioritization of work as we continue to build resiliency to external shocks.

The MAFSE has had to work in close collaboration with private sector producers, exporters and producer and export organisations and with affiliated Ministries and statutory bodies such as BAHA, and the PCB to secure production for food security and exports to earn foreign exchange. By networking and exchanging reliable information MAFSE can expedite crucial services to the private sector.

MAFSE should advocate to improve the legislative framework in certain industries to enhance productivity, competitiveness, and equitable sharing of benefits in traditional exports. Robust consultations are required to get inputs form stakeholders; however, stakeholders should not hold back the reform process. The traditional three exports including sugarcane, citrus and banana require legislative reforms to address their present and future constraints.

Last year MAFSE indicated the need for a disaster response mechanism for the agriculture sector. Work continued with FAO and the World Bank) to define a suitable mechanism for Belize. MAFSE has been contemplating a co-contributary scheme as a solution for Belize's needs.

MAFSE must demonstrate its commitment to the agriculture sector by responding and solving challenges that impact the sector. This helps to build trust between MAFSE and the stakeholders. Presently the sector believes that MAFSE is assisting and providing solutions promptly. MAFSE's ability to respond is based on the accuracy of information available to make decisions. Therefore, it is important to continue maintaining good communication with representatives from the sector and to update the Belize Agriculture and Information Management System.

The agriculture sector is dependent on key imported inputs such as pesticides and fertilisers, hence the importance of adopting technologies which can rely on local inputs to remain resilient, sustainable and competitive. CRESAP funded by the World Bank is one of those projects which will assist Belize with climate-smart agriculture.

Legume and grain producers are collaborating with a more proactive MAFSE which responds to their needs. MAFSE should ensure an enabling environment for additional investments in climate-smart agriculture production and in processing.

Monitoring of food availability with producers and processors should be continued and encouraged. With additional personnel monitoring and verification of food availability, stocks can be improved.

The Agro-processing Unit can collaborate more effectively with the Youth Services Department to increase its ability to build the capacity of the women and youth to contribute positively to the economic development of the country through value addition such as processing of seasonal locally grown fruits and vegetables. Regular servicing of the machines at the facility is needed to ensure the preservation of the life of the machine. Closer collaboration among the Unit, extension, cooperative, BBS, BAHA, public health, and BMDC, is needed to improve and increase the number of processors who access the services of the Unit as well as capacity- building needs.

As a result of the Covid pandemic, the importance of food safety was heightened; wearing protective gears, face mask, etc. allowed for processors to examine their processing techniques to ensure that food safety protocols were adhered to.

It is very important to collect data on processors as institutions who assist processors can have a central database from which they can contact processors when markets are identified. Very few persons know of the existence of the Agro-processing Unit; increased awareness of the Unit is

important as it will allow for entrepreneurs and processors to know that there is a facility that can assist them in product development and enhancement.

Working together with other units by providing support during critical periods, e.g. land preparation and harvesting seasons, is imperative for all units as this allows for members of other units to build their capacity in another area of the agriculture field. For example, the processing unit assists the tilapia hatchery when harvesting, gutting, and filleting of fish. The staff of the processing facility are training in filleting of tilapia increasing their knowledge and value to Central Farm. Similarly, the unit assists the horticulture unit when planting, which enables the processing staff to gain appreciation on how various crops are grown and the management techniques required to maintain crops. This increases the value of the staff member to Central Farm as these same officers can now perform the task of the other staff members when the need arises to ensure continuity.

Ensuring that officers are evaluated in a timely and regular manner will translate to a happier, healthier working environment that farmers can appreciate. Information sharing is key to the success of the agriculture industry. The activities being executed across the ministry need to be streamlined and recorded to avoid duplicating the work and efforts of the units.

The main constraint of the Policy Unit currently is the shortage of technical staff. There is currently the need to update the BAIMS modules, core registry survey forms, creation of sampling designs and analysis of current data. Another constraint identified is the need for transportation to conduct field visits, validation of industry data, conduct sampling surveys and overall logistical operation of the Policy Unit. These constraints have led the unit to do online training but limitations exist with internet and hardware connectivity at some of the district agriculture stations. One-on-one training has been identified as critically important for capacity building among the Extension Department. The Policy Unit has also identified the need for its officers to be trained in statistics, data analysis and economics.

The Policy Unit has been working in close collaboration with the Statistical Institute of Belize (SIB), Central Bank of Belize, Mennonite communities, Sugar Industry, Banana Industry, Citrus Industry, Shrimp Industry and farmers. Other key partners include CARICOM, Min. Foreign Trade (Regional Trade), World Food Program, NEMO, UNDP, World Bank, IDB and other regional partners. Future collaboration with key partners is very important to facilitate and formalization of the partial scope agreements of Belize with Guatemala, Mexico, and El Salvador. The Unit also has close collaboration with the CARICOM Secretariat in facilitating data for regional trade and for the 25% by 2025 special ministerial task force.

The suspect case of avian influenza emphasized the importance of following established emergency action plans for the effective control and eradication of diseases. Further, there is a need for BAHA to develop standard operating procedures for technical processes.

Transition in leadership of technical departments identified the need for BAHA to implement strategic and succession planning. Additionally, the need to secure information and establish quality management for record keeping was highlighted as an area to strengthen.

Hiring competent staff, with integrity and positive work attitude is important when human resources are limited. Additionally, cross-training of technical staff is a benefit for staff and the Authority.

2022 saw an increase in national and regional collaboration and international partnerships. The value of this level of engagement in advancing food safety at the national level is important.

Engaging all levels of staff and having technical directors in championing the major activities at the departmental level is vital to the success of programs and projects.

There are two critical lessons BMDC intends to improve on for its short to medium term of operations. Firstly, BMDC sees it necessary to strengthen its farmer relations. Immediate work needs to be done regarding its communications with farmers as it relates to standards and post harvest management. In addition, the Corporation recognizes gaps in the diversity of income generation. Income flows such as project-based, and specialized products can offer the Corporation long term sustainability and should be incorporated into its short-term to medium term goals.

Research projects on- and off-station require a significant allocation of both human and financial resources. Although planning for research projects is consulted and are agreed upon based on priority, work is disrupted due to commitments that arise during the year. Therefore, the research plan needs to be flexible as best as possible.

The research program is in high demand to support other objectives of the MAFSE, and this requires greater emphasis in collaboration with support partners such as CARDI, IICA and OIRSA.

With more effective communication between senior managers and program coordinators, technicians, and Station Manager, better planning and sharing of resources can occur.

The program has a very heavy workload on station at the RDIC and as such review of priorities have had to be done due to limited human and financial resources.

The benefits of cooperation with partners such as INIFAP and FAO are significant, but this can only be impactful if MAFSE departments are fully involved. The experts travelling to Belize in the past year have a wealth of knowledge and experience, and they take great pride in sharing their knowledge.

The Department of Agriculture in the district hosting World Food Day should take the lead in identifying and implementing the projects. Follow up from the Agriculture Department in the form of technical assistance is vital to ensure that there is continuity with all activities left at the school.

With regards to the NATS, persons should be hired for the period leading up to the show to decrease the reliance on the program's staff. Fuel allocations should be adjusted as well since there is daily commuting to the grounds in the months/weeks prior to the show.

Projects require reliable transportation to execute the activities in a timely manner. If the MAFSE is unable to provide adequate transportation, then these should be written into the project. Furthermore, fuel is another important aspect that needs to be addressed since it is very difficult to deliver a project without a fuel allocation.

Proper allocation should be made for payment of subsistence and overtime of workers. Several of them make very little money, which makes it difficult for them to have to leave money at home and set aside extra to take out district. All of them depend on the subsistence and overtime and having to wait three months to get paid is not a good incentive.

The Agronomy Program carries out a wide range of field activities on-station. Timely management of all the fields is hindered due to the following: limited human and financial resources, unavailability of laborers due to uncertified, sick and vacation leave and due to outreach projects, lack of working machinery, and unavailability of tractor services and transportation upon request. At the Centre for Research, Development and Innovation, support services sometimes depend on station priorities.

To be able to build climate resiliency, synergies must be promoted between research and extension services. There is an urgency in enhancing the technical capacity of farmers in reducing pest incidence by adopting preventative measures rather than relying on synthetic compounds that are detrimental to the environment.

SIRDI, a Centre of Excellence, has the potential to fulfil its vision and mission, but external funding is needed for projects.

The rotation of herbicides is important to prevent the appearance of new weeds in the field and to avoid weed resistance.

Weather plays an important role in sugarcane quality. May was a dry period; however, in June and July the rains started, hence there is a reduction in quality.

The variety extension program must continue with its evaluation at 16 up to 18 months to capture quality and yield data. The information obtained will provide guidance for a harvesting plan for the industry to maximize the potential of each variety.

5. Future Priorities and Plans

MAFSE will continue to ensure farmers are the focus of the work it does, through the execution of projects in their benefit and through continuance of existing programs such as its Buy Belize initiatives.

Ministry's wide priorities include ensuring a National Agriculture Policy is formulated, based on the #planBelize MTDS. These actions will be carried out in collaboration and consultation with our partners such as IICA, the FAO, and OIRSA. The Ministry also has internal goals with project execution that remain high priority. Equally important is the execution of its #planBelize MTDS goals, several of which will be in more focus for this year, such as ensuring educational institutions adopt teaching of or practices related to agriculture, and the enhanced marketing of Belize's agricultural products to our neighbouring countries.

MAFSE will continue supporting the traditional exports to achieve competitiveness in an environment of rising agricultural inputs, competition, environmental challenges, and consumer demand for safe food. The review of the Sugar Industry Act (SIA) will continue and should be completed in 2023. A Commission of Inquiry will be conducted and is expected to be completed by mid-2023. Recommendations from the Commission will feed into the revision of the SIA. MAFSE has no option but to create an environment for the BSCFA and BSI/ASR to negotiate a commercial agreement by the commencement of the 2023/2024 sugar cane crop.

MAFSE will work along with the citrus industry stakeholders for the rehabilitation of the citrus industry. The Ministry must ensure that the most important factors constraining the industry are addressed. Rehabilitation using HLB tolerant varieties along with proven best management practices should be used to establish new groves and increase productivity. The legislative framework of the industry will be reviewed. Diversification in coconut, pineapple and soursop will be encouraged. The Citrus Products of Belize Limited (CPBL) is investing in additional processing equipment to process the fruits and intends to convert its business from a citrus juice company to a tropical fruit juice company.

In bananas, both the Ministry of Economic Development and MAFSE will continue exploring the option of obtaining assistance for the industry through the Green Climate Fund to make it more resilient to climate change.

MAFSE should address the availability and rising cost of fertilizers and other agricultural products. The Central Farm Centre for Research, Development and Innovation is researching the use organic products, with a view to developing a plan to commercialise the production of these products.

The grain and legume subsector experienced growth in 2022. The rising cost and availability of inputs, domestic market saturation, and export market access are challenges which MAFSE along with stakeholders in the sector need to jointly address. Market access to Central America, particularly Guatemala, and Mexico, should be pursued. Likewise alternative sources of fertilizers and pesticides should be explored as well as reintroducing the farming systems approach to maintain soil nutrition. Research and Development should continue to select drought resistant and better yielding varieties, and value adding to substitute imported products should be encouraged.

Collaboration is needed between our partners for development to be able to access a wider portion of the population; BBS to build capacity in labelling and labelling standards, BMDC to build capacity in marketing and market information, BAHA to build capacity in food safety within processing facilities, Public Health to certify processors with a food handlers permit that will allow them to perform product development activities.

More women and youth will be included in capacity building and training such as product development, and product enhancement. This can be achieved by working along with the Women's Department to engage more women in value addition of locally grown produce; further engaging the Youth Department and technical schools as it pertains to development of machines, increasing efficiency of certain processing steps, e.g developing coconut grinders, coconut de-huskers, coconut shredders. These ideas will be shared with vocational schools to get the students to create and develop tools to improve the efficiency of processing activities.

Increasing the sales of Baking Pot Foods will be pursued by supplying consistent and affordable products in the shop located in Central Farm. With the installation of a small building in front the Cayo extension service office in Central Farm, the unit will be able to better market their product and obtain market feedback directly from purchasers. This feedback will allow for improvement of the product and will serve as a guide that the unit will use to assist the processors.

MAFSE will improve the facility to accommodate bulk processing such as dehydration. Infrastructure improvement to allow for dehydration to occur in large quantities without hampering the use of the facility for training or tours when dehydration is ongoing.

The following areas are identified as areas of priority for the Belize Agricultural Health Authority:

- Improve budget process and budget performance management systems;
- Complete the collective bargaining agreement;
- Advance continuous professional development for staff in areas of management to include supervision, customer service, monitoring and evaluation, and communication skills;
- Introduce technology to create a smarter working environment;
- Document and approve standard operating procedures for technical processes in all departments;
- Apply for accreditation for the Aquatic Animal Health PCR Lab to support shrimp industry (awaiting report of the Shrimp Industry Taskforce);
- Advance plans for centralization of services and improve building maintenance to meet basic working conditions (especially at CIL, Belize City);
- Advance legislative review of the BAHA Act (Chapter 211, revised edition 2011).

The Belize Marketing and Development Corporation intends to prioritize the following activities going forward:

- Strengthen its relationship with the tourism sector to be a part of the fast-tracking of an Agri-tourism model.
- Increase Big Falls Rice Mill performance to reach 2 million lbs of rice paddy by partnering with farmers by 2024.
- Increase the Corporation's output in label printing and packaging to producers (max potential output is 45,000 labels weekly).
- Increase sales for its Belize Jewel Honey;
- Develop its human resources to be more involved in project funding opportunities.

There is optimism about the future of the Corozal Free Zone. There are plans to continue investing in the development of the infrastructure and assets to provide a better experience for customers and businesses. The CFZ also plans to expand human resources and increase marketing efforts to attract more customers.

The following are plans for future action the Centre for Research, Development and Innovation:

- Continued collaboration with national and international agencies to strengthen research and development.
- Capacity building and institutional strengthening for increased effectiveness and impact of the Agronomy Program
- Dissemination of research and development results Infrastructural improvement of on station facilities
- Validation of the adaptability of climate resilient technologies at the CRDI
- Production of quality vegetable seedlings for farmers, schools projects etc
- Production of quality seeds and planting material
- Management of germplasm banks
- Management of coconut hybridization program
- Support and participation in MAFSE public engagement and visibility activities.

6. Staffing and Budgeting Considerations

As is the case for many government ministries, MAFSE suffers from several considerations that affect its performance as it relates to staffing. Staff need to be replaced in some instances, after retirement or resigning. The staff on hand multi-task, resulting in diminished performance sometimes due to the prioritization issues associated with due-date periods. Several posts have become vacant and need to be filled, keeping in mind the connection between hiring and

increases in recurrent revenue in the Ministry's budget. The Ministry's undertaking of projects also leads to strain on staffing and resources, particularly extension officers and vehicles. Many projects require prioritization periods that clash at times, resulting in projects being held back or taking longer to complete than usual. The clashes also mean more meetings to ensure coordination are held, which also takes away from hands-on time or field execution targets for extension officers.

Resource allocation, especially with vehicles and fuel, is an issue with this Ministry. The vehicle fleet is aging, with few, if any, new vehicles added to the existing fleet since 2020. Many vehicles are already more than five years old, and the resulting additional wear and tear, maintenance and risks associated with aging vehicles tell on the delivery of projects for the Ministry, apart from the higher associated costs. As if the vehicle fleet's age were not enough, the allocation of fuel seems to always be an issue, as limited fuel allocations affect the performance of officers, especially those engaged in project execution or support. Access to parts and repairs given the age of the Ministry's vehicle fleet follows closely on the heels of the issue of vehicle availability and condition. Repairs on vehicles may end being costly, especially if the ocean freight costs of parts for some brands the Ministry has invested in in the past are examined closely. Mahindra Pikups, for example, seem not to have long lifespans, but have been easier to obtain due to their lower acquisition costs. However, given the country of origin, India, and the disposition of these vehicles to have parts such as axles, differentials, and transmissions to fail, repairing them can end up being a huge expense. Great Wall vehicles follow closely behind; they are cheaper to acquire but the maintenance is costly in the longer run with vehicle parts failing at inordinate times.

Considerations by the Ministry allocating funds for Ministries should be made keeping in mind the MAFSE's position as a key player as it relates to international commerce and trade. As has been reported in previous Technical Reports, links, networking and cooperation programs have been in execution. This means support must be given in budget for the resulting programs, if at least to support the increased international travel required for officers of MAFSE. Officers of MAFSE need to now make constant visits for training, capacity building and representation in Mexico and Guatemala as both governments are working with MAFSE in cooperation programs and technical exchange programs. Our country's position as a leader in international program initiation and the ability of the MAFSE to assist farmers are enhanced through these links and networking, so the ability of MAFSE to support them is critical.

The ideal position of the Ministry in terms of realizing adequate needs and wants is one where, as a Ministry in custodianship of primary industries which together are a key pillar of the economy, it can realise its activities without having to worry about resource availability and allocation from line ministries. More collaboration with partners is called for as well to ensure the best of all worlds for the Ministry and execution of its tasks. Agricultural activities many times cannot be held up- plants and animals need timely, if not constant and urgent attention, and the Ministry's needs should be likewise attended to.

7. Conclusions and Recommendations

For 2022, MAFSE was proud to be able to deliver on its goal of keeping the local farmer as the focus of its activities. More than 15 projects in their benefit were or are in execution; more visits than ever before have been carried out by extension officers in support of projects. The Ministry is in a very healthy position as it relates to the Ministry's public image, and general awareness of the Ministry's activities is at an all-time high. The National Agriculture and Trade Show 2022 was a huge success and the Ministry's efforts to create international linkages and networking are also successful, as our Guatemalan and Mexican neighbours continue their successful collaborative efforts with us.

MAFSE relevance to the agriculture sector should be strengthened. Despite challenges, the private sector views the Ministry with respect and as a results-oriented capable partner. This can be measured by increased volumes of production in the grain and legume sector and investments in processing infrastructure for value adding.

In relation to the traditional exports, MAFSE should ensure that they remain viable since they account for substantial foreign exchange earnings, employment, food security and maintaining the socioeconomic fabric. A clear strategy to diversify the agriculture base should be implemented.

MAFSE should continue lobbying for a tax exemption regime for agriculture inputs. Taxes can subsequently be levied on finished products.

With the assistance of international partners, a disaster response mechanism should be identified and implemented.

Legume and grain producers are collaborating with a more proactive MAFSE which responds to their needs. MAFSE should ensure an enabling environment for additional investments in climate-smart agriculture production and in processing.

Monitoring of food availability with producers and processors should be continued and encouraged. With additional personnel monitoring and verification of food availability stocks can be improved.

As BAHA management aims to streamline technical and administrative process and to maximize efficiency, all departments are asked to identify key performance indicators to evaluate accomplishments. Further, the need to develop written procedures for all technical processes, utilizing a quality management system, must be prioritized and resourced. Simultaneously, BAHA is long overdue for a legislative review to ensure that the Authority complies with international best practices that allows for modernization and use of advanced technologies.

It is concluded that with proper resources, empowered staff, formalized procedures and an educated public, BAHA can continue to manage biosecurity risks to Belize and provide an appropriate level of protection for human health, animal health and welfare, plant health and the environment and ensure safe and wholesome food for the Belizean populace.

However, while SI 34 of 2022 allowed financial relief, it did not permanently address the type of financial sustainability that is required to ensure stability and independence from the Government of Belize. For this reason, BAHA must continue to pursue the implementation of a passenger fee like those established regionally.

Agricultural health is everyone's business, however not everyone is aware of its importance. It is imperative that training continues in this area not only within the Authority, but also of our partners and stakeholders and including our parent Ministry.

BMDC was able to deliver high level outputs in 2022. For the first time, contract farming for honey is being done and the results will guide other opportunities. The Corporation has made significant steps in forging new market access for farmers. Institutionally, it is noted that BMDC has developed a more adaptive structure that meets its current mandate. On the horizon is the opportunity for the Corporation to advance its effectiveness and efficiency by connecting further with other agencies with linked goals and plans, investing in technology and new business opportunities, and human resource development.

Finally, the Ministry held its Annual General Meeting on May 18 and 19 at Hopkins Village. Stakeholders and Ministry officials met, presented and discussed during the meeting, which produced several key concerns and suggestions as noted below:

1. MAFSE should make training for young people readily available in school settings.

2. Concern expressed for regulations for aerial spraying of crops- communities with sensitive crops are right next door to areas being sprayed.

3. Suggestion to stimulate establishment of silvo-pastoral systems.

4. Suggestion for promotion of organic farming and certification for organic products.

5. Development of policy on Genetically Modified Organisms.

6. Cabinet paper on lowering taxes for packaging materials and taxing dairy imports.

7. Concern on balancing imports of special cuts of beef with use of local special cuts.

8. Suggestion for fast- tracking permit systems at BAHA.

9. Suggestion to negotiate conditions for importation of limes, avocadoes and mangoes from Mexico.

10. Suggestion to negotiate sanitary and phyto-sanitary conditions for soybean and coconut for export to Mexico.

11. Suggestion to conduct varietal trials for carrots and onions.

12. Concern for need for attention to Tilapia farming within MAFSE.

13. Suggestion to fast- track permits at the airport for very low risk items.

14. Suggestion for a hotline at BAHA to answer questions or seek advice.

15. Concern for vampire bat control, including concern for safety of technicians and equipment acquisition.

16. Suggestion for change in butane regulations to address lower price limit for price control.

17. Suggestion for BMDC to sign Pitahaya purchase contracts with volume and price set.

18. Suggestion to pursue cardamom production and marketing information.

19. Suggestion to set specific window for importation of vegetables for the protection of farmers.

20. Suggestion for food processing facility in north and south of Belize to be located at the BMDC facilities.

21. Suggestion for the BLPA and MAFSE to work on appropriate training and regional exposure for meat processors.

22. Suggestion for Ministry to investigate best way forward with Integrated Pest Management.

23. Suggestion for BMDC to get banana flour from Central Farm and market.

24. Suggestion for promotion of production system/hydroponics for quality tomatoes, bell peppers, etc.

25. Suggestion for visit by MAFSE personnel to Running W meat processing facility.

26. Suggestion for visit by MAFSE to Silk Grass Farms Processing plant.

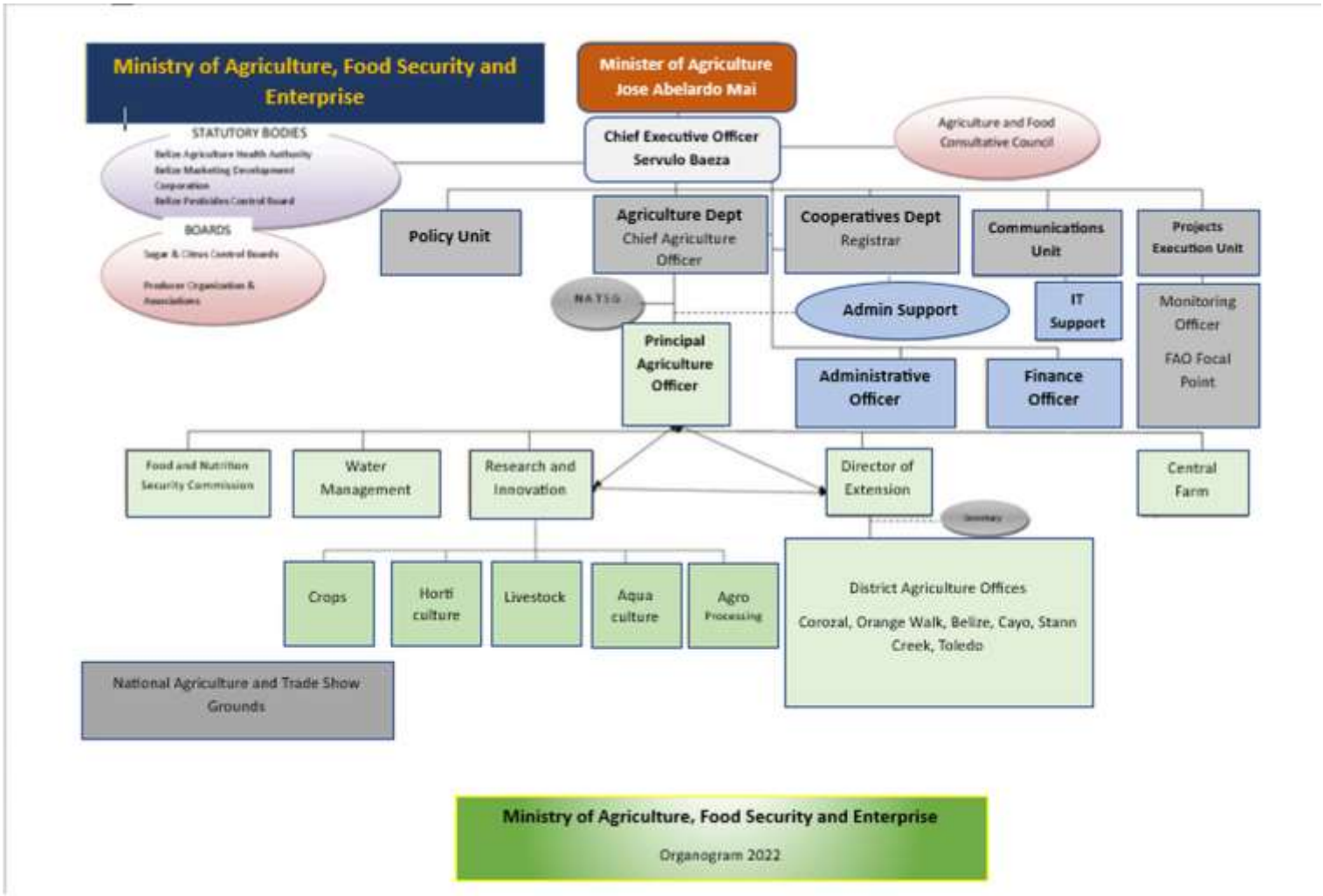
27. Suggestion to produce our own snacks and drinks for primary schools.

The Ministry will sit down to evaluate these suggestions and concerns and address them within and with its stakeholders.

Annexes

Annex 1:

MAFSE Organogram



Annex 2:

Legume Production Data for 2020, 2021 and 2022

TABLE 1.	Legume Production Data – 2020, 2021 and 2022			
Description	2020	2021	2022	% Change 2021 to 2022
Legumes				
RK Beans (million lbs.)	11.34	14.07	13.45	(4)
Acreage	11,769	16,679	14,270	(14)
Black Beans (million lbs.)	4.12	4.87	6.28	29
Acreage	4,369	5,234	7,590	45
Soybeans (million lbs.)	30.13	38.15	59.82	57
Acreage	26,342	28,851	36,115	25
Cowpeas (million lbs.)	5.77	3.85	3.76	(2)
Acreage	6,136	7,915	4,512	(43)

Annex 3:

Grain Production Data for 2020, 2021 and 2022

TABLE 2.	Grain Production Data 2020, 2021 and 2022			
Description	2020	2021	2022	% Change 2021 to 2022
Grains				
Yellow Corn (million lbs.)	152.91	215.29	224.30	4
Acreage	42,014	52,377	52,170	(1)
White Corn (million lbs.)	30.81	24.43	19.20	(21)
Acreage	15,446	12,428	8,961	(28)
Rice Paddy (million lbs.)	30.7	33.04	33.87	2
Acreage	7,609	6,531	7,178	10
Sorghum (million lbs.)	32.5	28.39	45.63	61
Acreage	13,385	12,614	15,200	21

Annex 4.

Publications by MAFSE, 2022.

Ministry of Agriculture, Food Security and Enterprise. (2022). *Annual General Meeting Reports*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Agronomy Unit. (2022) *Reports on Varietal Trials*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Extension Unit. (2022). *Monthly Extension Reports.* Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *Agriculture Sector Report.* Government of Belize

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *Belize Agriculture Price Information System Updates*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *Industry Performance Report*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *Food Stock Availability Report*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *Hurricanes Lisa and Julia Damage and Needs Assessment Report*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit (2022). *Market Analysis*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *National Economic Output*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Policy Unit. (2022). *Post COVID Market Analysis*. Government of Belize.

Ministry of Agriculture, Food Security and Enterprise Project Execution Unit. (2022). *Project Execution Unit Report*. Government of Belize.

Sugar Industry Research and Development Institute. (2022) *Reports on Varietal Trials*. Sugar Industry Research and Development Institute.