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Belize National Agroforestry Policy

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Belize National Agroforestry Policy

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Prepared by:

CATIE Team:

Dr. Marcelino Avila, Agroforestry Expert
MSc. Helen Choco-Galindo, Project National Coordinator
MSc. Guillermo Detlefsen, Project Leader

The National Agroforestry Policy Development Team:

Mr. Colin Mattis (Chair), Deputy Chief Climate Change Officer, National Climate Change Office, Ministry of Sustainable Development, Climate Change and Disaster Risk Management (MSDCCDRM)
Mr. Belarmino Esquivel, Principal Agricultural Officer, Ministry of Agriculture, Food Security and Enterprise
Mr. Wilber Sabido, Chief Forest Officer, Forest Department, MSDCCDRM
Mr. Martin Alegria, Chief Environmental Officer, Department of Environment, MSDCCDRM
Ms. Keiyari Romero, Policy & Planning Director, Ministry of Natural Resources, Petroleum and Mining
Mrs. Johanna Noble, Climate Change Officer, National Climate Change Office
Mr. Max Ortega, Project Coordinator, Belize Livestock Producers' Association
Dr. Elma Kay, Science Director (Terrestrial), Environmental Research Institute, University of Belize
Ms. Zoe Zetina, Campus Director, Department of Agriculture, University of Belize
Ms. Cristina Garcia, Executive Director, Ya'axché Conservation Trust
Mr. Edilberto Romero, Executive Director, Programme for Belize
Mr. Dale Young, Manager, Belize Agro-Productive Sector

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Abbreviations and Acronyms

AF	Agroforestry
BZ$	Belize dollar, equivalent to US$ 0.50
BFREE	Belize Foundation for Research, Environment and Education
BLPA	Belize Livestock Producers Association
CATIE	Tropical Agricultural Research and Higher Education Center (acronym in Spanish)
CC	Climate change
CFO	Chief Forest Officer
CTCN	Climate Technology Centre and Network
DE	Department of Environment
ERI	Environmental Research Institute, University of Belize
FAO	United Nations Food and Agriculture Organization
FCD	Friends for Conservation and Development
FD	Forest Department
GDP	Gross Domestic Product
GoB	Government of Belize
GHG	Greenhouse gas
GEF	Global Environment Facility
Ha	hectares
IWG	Interim Working Group
MAFSE	Ministry of Agriculture, Food Security and Enterprise
MFFESD	Ministry of Fisheries, Forestry, Environment and Sustainable Development
MSDCCDRM	Ministry of Sustainable Development, Climate Change and Disaster Risk Management
MMRF	Maya Mountain Research Farm
MMNFR	Maya Mountain Northern Forest Reserve
NAFP	National Agroforestry Policy
NCCO	Belize National Climate Change Office
NDC	Nationally Determined Contributions
NGO	Non-governmental organization
NWC	National Women's Council
PACT	Protected Areas Conservation Trust
PFB	Programme for Belize
R&D	Research and Development
RBCMA	Rio Bravo Conservation and Management Area
REDD+	Reducing Emissions from Deforestation and Degradation plus Policy and Advocacy
SDG	Sustainable Development Goal
SFM	Sustainable forest management
SIB	Statistical Institute of Belize
SIRDI	Sugar Industry Research and Development Institute
SMART	Specific, measurable, appropriate, reliable and time-bound
TA	Technical assistance
TCGA	Toledo Cacao Growers Association
TFCGA	Trio Farm Cacao Growers Association

TIDE	Toledo Institute for Development and Environment
UB	University of Belize
UNFCCC	United Nations Framework Convention on Climate Change
YCT	Ya'axché Conservation Trust

"The best time to plant a tree was 20 years ago. The second-best time is now."
Chinese proverb

"Until you dig a hole, you plant a tree, you water it and you make it survive, you haven't done a thing. You are just talking."
Wangari Maathai, Kenya

Chapter 1: Introduction

Belize became independent from the United Kingdom in 1981, and today it is a thriving democracy with a population of some 397.6 thousand of diverse cultural heritage comprising Mestizos (or Latinos), Creoles, the Maya, Garifuna, Mennonites, East Indians, Europeans, and many others, as well as mixtures of all the above.

Belize is an active member of the United Nations, Organization of American States, Caribbean Community, Central American System of Integration, and therefore is a signatory and abides by their multi-lateral conventions, agreements and programs. Belize also has bilateral relations with numerous friendly governments such as those of the European Union, United States of America, United Kingdom, Republic of China on Taiwan, Cuba, and Mexico, which provide technical cooperation and financial assistance.

Like many developing countries, Belize has made significant progress, doubling its per capita income, in the last 20 years and raising the socio-economic standards of living of its people. However, the country is hampered by the persistent socio-economic problems caused by declining productivity in the primary and secondary sectors, rural poverty and food and nutrition insecurity, and insufficient jobs and income generation. There are bio-physical problems related to natural resource conservation, deforestation and forest degradation, and environmental concerns. Belize is highly exposed to the hazards and risks of climate change impact with respect to devastating droughts, excessive rains/flooding, rising sea levels, and hurricanes with increasing frequency.

Based on the experience in other countries with similar characteristics of Belize, agroforestry (AF) has demonstrated excellent results in addressing some of the above-mentioned social-economic, bio-physical and climate change challenges confronting Belize today. AF is an old practice but a new science, which is defined as land-use systems or practices involving the management of trees on the same land with agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence (Steppler and Lundgren, 1988; Somarriba, 1992). AF can increase agricultural production, food security, nutritious feed for animals, construction materials, medicinal plants for rural communities, as well as other products of great value to society, such as bio-energy, conservation of natural resources, and ecosystem services, sustainability and resilience (Nair and Garrity, 2012).

Although some local institutions in Belize have been experimenting with AF systems and components, AF development today continues to face various challenges such as inadequate dissemination of knowledge, legal constraints, lack of incentives, and poor coordination among sectors that is needed and to which it contributes (CATIE, 2020c). From preliminary assessments and dialogue with international experts on the topic, AF has great potential for Belize at this stage of development. However, such potentials cannot be realized without a clearly convincing and effective policy at the national level, a policy that would lay out a solid justification, succinctly explain how AF can contribute to the economy and sustainable development, and above all, delineate what exactly is needed to make that potential a reality for Belize.

With that purpose, the then Ministry of Fisheries, Forestry, the Environment and Sustainable Development(MFFESD) through the National Climate Change Office (NCCO)along with technical assistance of the Climate Technology Centre and Network(CTCN), requested the Tropical Agricultural and Higher Education Center (CATIE), an expert institution in AF, to assist Belize in developing an integrative and comprehensive Belize national AF policy (NAFP).The overall objective of the NAFP development is to mainstream agroforestry development in Belize.

This NAFP was developed in a stepwise process. This process was carried out under the supervision and with the support of a National AF Policy Development Team integrated by the relevant institutions with experience and/or interest in the field of AF, which are:

- National Climate Change Office; Ministry of Sustainable Development, Climate Change and Disaster Risk Management (MSDCCDRM)
- Department of Agriculture; Ministry of Agriculture, Food Security and Enterprise (MAFSE)
- Forest Department; MSDCCDRM
- Department of Environment; MSDCCDRM
- Policy and Planning; Ministry of Natural Resources, Petroleum and Mining
- Belize Livestock Producers' Association (BLPA)
- Environmental Research Institute; University of Belize (UB)
- Department of Agriculture; University of Belize, UB
- Ya'axché Conservation Trust (YCT)
- Programme for Belize PFB)
- Belize Agro-Productive Sector (BAPS)

The process followed in the work plan included:

- Review of relevant literature and legislation
- Consultations with key stakeholder representatives across the country
- Drafting the national policy outline and sections
- Consultations and feedback inputs in each district
- Redrafting and improving the original draft, and
- National stakeholder validation meeting to agree on the final draft.

The proposed NAFP was also reviewed and supported by international partners (i.e. CATIE, CTCN) who have invested in its development as a basis for mobilizing technical and financial resources for AF development in Belize.

Chapter 2: Justification for a National AF Policy

There is convincing and compelling evidence to justify the need for this AF policy in terms of the strategic needs, opportunities and contributions that AF can make at this stage of development in Belize. As is evident in other countries' experiences (Buttoud et al, 2013, Government of India, 2014), a national AF policy is timely and relevant, and will be found to be attractive to the national policy makers, farmers, producers, environmentalists, investors, and citizens interested in the sustainable development of the country.

The External Context

The Sustainable Development Goals (SDGs)

As a member of the UN, Belize is a signatory to 17 sustainable development goals (SDGs)approved on September, 2015. In 2018, a technical report was published based on an extensive literature review of 1,000 scientific publications about practical AF projects and the impact on environmental, social and economic benefits (Andersson, 2018). The report presents evidence of how AF can contribute to 9 out of the 17 SDGs. It has the strongest impact potential on:

SDG 1: poverty reduction
SDG 2: hunger alleviation
SDG 5: gender equality
SDG 13:climate action, and
SDG 15: biodiversity conservation and sustainable land management.

AF can contribute to other SDGs by improving human health (SDG 3), increasing access to clean water (SDG 6), sustainable energy solutions (SDG 7), and responsible agricultural production (SDG 12).

Climate change mitigation and adaptation

Today greenhouse gas (GHG) emissions in the world are more than 50% higher compared to the level in 1990. Global warming causes long-lasting changes to out climate system. Climate change severely impacts livelihoods around the world, and in particular those of most disadvantaged groups, i.e. small farmers, women, youth, indigenous people and ethnic minorities. They must cope with extreme natural disasters and degradation of natural resources. If Belize does not take action, climate change will cause serious, irreversible damage.

Due to climate change, various environmental protocols have been developed for countries to reach their environmental goals. The UN Framework Convention on Climate Change (UNFCCC) is an international

environmental treaty adopted on 9 May, 1992. The Conferences of the Parties (COP) to the UNFCCC meet annually to assess progress in dealing with climate change. Under the UNFCCC, environmental agreements have been signed, such as the Kyoto Protocol, Doha Amendment of the Kyoto Protocol, and the Paris Agreement. The latter aims to reduce emissions from 2020 onwards through country commitments for the provision of Nationally Determined Contributions (NDCs) which aims to keep global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

Belize is a signatory of the UNFCCC which mandates the country to develop and implement policies, strategies and plans for climate change mitigate and adaptation nationally. Belize signed the Paris Agreement on 22 April, 2016, and submitted its NDC on 20 April, 2016. REDD+ is considered to be one of main initiatives that form part of Belize's NDC, and is geared towards improving Belize's ability to adapt to the adverse impact of climate change, foster climate resilience, and lower GHG emissions. One of the ways to achieve this is through AF, which is recognized by REDD+ as a strategy with great potential. Agriculture and forestry are both identified as priorities, emphasizing sustainable forestry management (SFM) and increasing resilience against climate change without threatening food production. REDD+ includes policy reforms and advocacy actions that address the drivers of deforestation and forest degradation, land tenure issues, forest governance issues, gender considerations, and environmental and social safeguards.

Belize recognizes the need for action on the ground and recognition of the multiple benefits of REDD+ as it relates to enhancement of ecosystem services and the potential delivery of wider social objectives (Simmons & Associates, 2014). Although emission reductions and CC mitigation will remain at the core of REDD+ in Belize, there are many other ecosystem services flowing from forests and trees that contribute to human well-being and can be enhanced through REDD+. These services are largely underpinned by biodiversity which also supports ecosystem resilience, which in turn could contribute to human adaptation to climate change.

AF can contribute to REDD+ in many ways, such as improving forest governance and land tenure/access issues, building capacity among local farmers and land users, assisting in lowering carbon emissions, helping Belize to participate in the current voluntary carbon market and earn USD40 million per year with a reduction of carbon emission (10%), contribute to enabling SFM in Belize, and contribute to capacity building and training with key line ministries relevant to the agriculture, forestry and land use management issues (Forest Department, 2020).

CATIE and FAO assistance

AF has been defined as a land-use system in which trees and shrubs interact, ecologically and economically, in a significant manner with crops and/or animals. Trees in AF are multi-purpose, they have been evaluated for producing over a 100 products and services, for example, those related to food, timber, feed, fuel, soil fertility, water, shade, medicines, carbon sequestration, and aesthetic value. AF has attracted considerable attention from the scientific and development community as a very promising technology because:

- Farmers are already accustomed to practicing some forms of it.
- AF can address a rather wide range of household needs, and

- AF has a definite potential for smallholder farming systems from the perspective of sustainable resource management and environmental services.

Starting in the 1970s, CATIE, ICRAF and the UN Food and Agriculture Organization(FAO) have been conducting research and development (R&D) in AF and now are renowned scientific centers of excellence and leadership in the field of AF (Budowski, 1981; CATIE, 2020).They could potentially provide scientific and technical assistance upon request from Belize. The NAFP will create the effective demand and tangible benefits in Belize from such organizations which otherwise would go un- or under-utilized.

The National Context

Socio-economic development challenges

According to the Table 1 below, Belize is a small country in terms of population and land area (22,806 km^2) with a low but steadily increasing population density and with a high proportion of its land area under natural forests. In the first half of the 20th century, the logging industry used to contribute over 70% of the GDP, but at around 1983, agriculture replaced logging as the most important income and employment generator in the primary and secondary sectors. At present, the service sector, in particular tourism, has overtaken agriculture, contributing an estimated 43% of the GDP in 2019.

Belize is classified as a middle-income country because of its per capita income, which has almost doubled in the last 20 years from BZ$5,746 to $9,205. However, during the last 10 years, the real growth rate of the gross domestic product (GDP) has declined significantly, from 13% to less than 1%, to a level that threatens the basic standards of living, particularly for those at the bottom of the ladder. Deforestation is increasing due to population growth and the expansion of the agriculture frontier (Cherrington et al, 2012). As a result, inequality has increased; poverty incidence has doubled, from 23% in 2000 to an estimated 50% in 2019. In Belize, a family of 5 requires at least an income B$678 per month (US$2.23/person/day) to stay above the poverty line, and for comparison, one adult member working full time earns BZ$612 per month based on the official minimum wage.

Table 1. Trends of selected demographic and socio-economic characteristics of Belize

Criteria	2000	2010	2019
Population	247,315	322,464	397,628
Persons/km	10.8	14.1	17.4
Per capita income, BZ$	5,746	8,650	9,205
Real GDP growth, %	13.0	2.4	0.3
Forest lands, %	65	61	58(estimated)
Poverty rate, %	23	41	50(estimated)
International trade deficit, US$ M	170.1	133.8	595.8
GoB debt/GDP, %	79	81	95

Sources: Worldometers.info/world-population/Belize; Wikipedia.org/wiki/Economy of Belize; Statistical

The public sector debt/GDP ratio is at 95% in 2019, a level way above the 60% considered financially sustainable by international financial institutions. The international trade deficit has been constantly growing. The value of imports has increased to approximately 50% of the GDP, and the value of food, feed stuffs and beverages accounted for BZ$220 million per annum in 2019. The international trade deficit has been increasing rapidly. Now with the Covid-19 pandemic, the trade deficit will decrease substantially as foreign exchange is being limited to importing essential products mainly, but also because domestic exports, though already decreasing in recent years, are expected to decline further due to technical and economic constraints in domestic production and due to declining international market prices.

A Renewed and revitalized focus on agriculture

In 2010, the Government of Belize (GoB) invested in a major effort to articulate a long-term strategy and plan for the sustainable development of Belize, i.e. Horizon 2030 (Barnett & Co, 2011), which even now offers relevant guidance and support for all sector policies (GoB, 2015a and 2015b) and the SDGS (GoB , 2016) which aims to guide overall development plans both medium-term economic development and longer-term sustainable development issues. However, since March 2020, Covid-19 has significantly disrupted the economy and caused a heavy financial burden on the GoB. Tourism, the leading economic sector, has suffered the greatest hit, and its recovery will be slow and will depend on containing the virus, not only in Belize but in the tourist-supplying countries, mainly the USA. Without a vaccine or modern therapeutic treatments, the Covid-19 pandemic will be around for an extended period.

The agriculture sector is holding up. Food security is not an issue yet, but some people are going hungry due to the lack of jobs and income. Hence there are urgent needs that must be addressed in the short term for farming families. There are also medium- and long-term measures that must be taken to strengthen and ensure the viability, sustainability and resilience of the agriculture and food chains.

Now there is urgency to prioritize income generation and the domestic productive sectors by introducing new products and foods, value-adding and recycling resources at home and community, and to create employment opportunities for women and youth, especially in the vulnerable sectors. There are development plans in gestation to strengthen micro, small and medium-size enterprises in production, processing and service sectors, with low interest (3%) loans, to expand the domestic economy to replace and substitute for the bulk of imported products and to increase exports to generate much needed foreign exchange. In this respect, there is great interest in the production of local foods, beverages, feed, energy, timber and construction materials, leather products, and other goods and services. In addition to the basic staples, there is increased interest in investing more on coconuts, pineapples, cocoa, indigenous fruits, non-timer forest products, beekeeping, and even domestication of wildlife species (e.g. deer, paca and crocodiles). This focus augurs well for agriculture, and AF development could make a valuable contribution in this regard.

Agroforestry for tourism

Pristine natural landscapes with flora and fauna biodiversity attract vast numbers of people to travel around the globe. No doubt, Belize is very popular tourist destination because of its rich tropical forest areas and reserves which are home to a magnificent array of wildlife, including jaguars, ocelots, pumas, tapirs, monkeys, snakes, toucans and other birds. Local communities are major beneficiaries of forest environmental services such as watershed protection, biodiversity conservation, atmospheric regulation, and scenic beauty; however, these services are also extremely valuable for ecotourism, recreation and for socio-cultural development, and most tourists are willing to spend large sums of money to enjoy them. In the absence of these services, ecotourism and the economic sectors would generate significantly less income (Groot, 2011).AF systems can create, protect and expand these environmental services. For example, the forest/cacao AF system in southern Belize is already being used as a tourism product, i.e. visitor tours and chocolate-making exhibitions, thereby diversifying its goods and services (Beltraide, 2018).

Deforestation or intensification

Agriculture can grow through intensification to meet the increased demand for food, jobs and income, since growth by expansion into the natural forest is no longer a desirable option. Although Mennonite large-scale agriculture (farming/processing/marketing) is a success story, it was based on expanding the agricultural frontier into the natural forests. However, the forest-elimination strategy cannot go on indefinitely. Forests need to be managed as productive ecosystems, pursuing options of sustainable logging, harvesting non-timber forest products, and generating environmental services (i.e. water protection and carbon dioxide sequestration). These options have been demonstrated to be more productive, profitable, and sustainable than the traditional milpa and mono-cropping systems.

Deforestation and forest degradation in southern and western Belize are also caused by the milpa system, also known as the shifting cultivation, which is practiced by Belizean and illegal Guatemalan farmers in the west and south, and in the north and central regions of the country. Wildfires during very dry spells also destroy the rich quality of the forest-based resources. Although the milpa is an old AF practice, it is a minimum-input, low-productivity, and unsustainable system, and since the farmers have no alternatives to secure their food needs, they will continue with the milpa. If left unchecked and un-improved, with high population growth, all forest areas will soon disappear or be degraded. Alternatives to the milpa system, like improved AF fallow management, rotation with legumes, and others, must receive a high priority in order to control deforestation and forest degradation in Belize.

Ensuring the protection and conservation of forests is highly important in a country like Belize, which relies heavily on its natural resources and services. Illegal logging, illicit wildlife trade, land grabbing, drug trafficking and cross-border encroachment are just some of the culprits that lead to critical deforestation, degradation and other destructive practices. By practicing AF in natural forests, local communities can develop effective approaches against the climate crisis and assist in enhancing environmental services and achieving agreed-upon carbon neutrality goals. Violations of environmental regulations are among the most profitable in the cross-border areas with Guatemala and Mexico.

Land management and land degradation

A national land use policy, drafted in 2019, aims to comprehensively address the use, management, distribution, enhancement and conservation of Belize's land-based resources, in order to achieve a well-ordered, effective and sustainable management of its land resources, including national lands, while developing the means to respond to the needs of the growing population and contributing to its resilience to the impacts of climate change in Belize (GoB, 2019).

In 2020, the MNR also defined national targets for achieving land degradation neutrality (LDN) as follows: achieving SDGs, contributing to low emissions and climate-resilient development, creating social impact, scaling up what works as it relates to proceeding from pilots to wide-scale adoption, building on good practices and enabling innovation, enhancing national capacities through strengthening national institutions, using participatory approaches, and leveraging innovative financing (MNR, 2020). Accordingly, the MNR identified several on-going projects whose actions are related to LDN and several transformative projects for LDN. Many of these LDN targets and projects scoped are directly related and can be complemented with AF development.

Forests and tree planting traditions

Due to our cultural background in the rural and urban areas, many Belizeans enjoy gardening and farming. The cultural heritage and the logging industry, which accounted for 70% of the economy in the early 20th century, exposed the people to the valuable timber species and the wide range of indigenous fruits that grow naturally in the forests. Local fruit trees are ubiquitous and very much appreciated, delicious and nutritious: i.e. cacao, mamey, custard apple, sapodilla, guinep, cohune nut, guava, soursop, avocado, mango, plums, ramon (breadnut), and coconut. Trees are also used for animal feed, well known are the ramon, pixoy, and others. People also have an old tradition of using medicinal trees. Local people have valuable experience on how to plant, take care of and use these trees. Many communities already use various tree species for multiple purposes; however, their processing and marketing are limited and need to be developed.

Participation of women and youth

Beyond the compelling evidence for gender representation at all levels of agricultural development, the arguments are even stronger in AF because women, compared to men, prioritize the wellbeing of the children and family (i.e. food, nutrition, health, house construction, and conservation of natural resources), above short-term productivity and cash income gains (CATIE, 2020b). The unconscious bias towards the male heads can distort critical decision making in terms of who makes decisions, what incentives are needed, who does the work, and who harvests the benefits. AF can be used to inspire women, train them, and offer opportunities to them to lead in AF work, to contribute in the field, school, or office.

It has been noted that young generations are more concerned than other age groups about the environment, climate change and sustainable development because these will be their inheritance and patrimony. Hence AF development can offer the youth an opportunity to act today in the interest of a better future for themselves. Their participation is also most desired in the rural productive sector, because due to the self-

perceived gloomy outlook in agriculture, they are migrating to the urban areas in the pursuit of a better future.

Uncoordinated AF project efforts

Several government departments or units (Agriculture, Forestry, and Environment), the University of Belize and non-government organizations (e.g. Programme for Belize, BFREE, and Ya'axché Conservation Trust [YCT]) are engaged individually in AF initiatives, because they can appreciate the valuable contributions AF can make to their own missions and mandates (CATIE, 2020c). However, there is not enough inter-ministerial coordination and collaboration among these AF initiatives. The usual strategy of each ministry is to work independently, and therefore in the absence of a national AF policy, there is no reason and no motivation or effort to do otherwise. Furthermore, because of the small size of each ministry or organization, there is limited capacity to mount the minimum interdisciplinary team in each institution. A minimum "critical mass" is absolutely necessary in AF to have competent programs to produce the scope and quality of work required to make a credible impact on the productive sector and, more so, on the national economy.

Investment stimulation and mobilization

AF cannot grow and be mainstreamed without investment, hence the highest priority of any NAFP is precisely to stimulate and secure investments from those who have resources. The argument to be made is about income, profits, and better return on the limited resources of land and capital in Belize. AF can offer good economic returns for all, even for low-income families if adequate financial support or incentives are provided to them.

Chapter 3: Agroforestry Practices and Potentials in Belize

The Rise of Agroforestry

The John Bene team's report in 1977 on trees, food and people noted the existence of AF and recommended the establishment of the International Council on AFto study its practices (Bene et al, 1977). AF is an old practice of farmers who were planting trees on cropland and pastures, contrary to the conventional recommendations of the experts in agriculture. Today, AF is also an area of science that studies, improves, tests and evaluates, for example, different spatial and temporal arrangements, below- and above-ground interactions, and the yield and services provided by the components of crops, livestock and trees, over time, albeit tangible and intangible.

There are three general types of AF based on the presence of the main components: agrosilvo (crops and trees), silvopastoral (trees, pastures and livestock), and agrosilvopastoral (crops, trees and pastures and livestock). The predominance of any AF type is a function of the cultural, ecological and socio-economic characteristics of each area or country. In Central America, for example, CATIE's work on understanding the potentials of AF had its origins in its research on multiple cropping systems with annual and perennial crops, farming systems (including livestock) of small farmers, and its work on watershed/forest management systems. By the 1980s, CATIE had already established an AF program in this region, recognized as a leader in

the world, similar to that of ICRAF in Sub-Saharan Africa, followed and complemented by other efforts in United States, Europe, Brazil, and India (Nair & Garrity, 2012).

Starting in the 1990s, ICRAF and other collaborators started a global research program to develop an alternative to slash-and-burn agriculture (SBA) in Africa, Latin America and Asia (Bandy et al, 1993). The program focused on: a) selection and improvement of tree species, b) understanding the physical and economic interactions among components, c) design of new systems to improve productivity and sustainability of the SBA cycle, and d) the identification of socio-economic constraints for adoption recommended alternatives, i.e. land tenure, institutional policy, household decision making and gender issues. Improving the cropping and fallow phases of the SBA systems as well as the natural forest ecosystem were important to reduce demographic pressure for forest conversion.

In East Africa, the farmers are experimenting with a diversity of approaches and projects for what they call restoration ecology. One example is reforestation conducted with local communities who are not only planting trees but doing so in a way that can secure access to carbon markets. This is implemented by following a quality standard for monitoring, training and employment of the farmers who participate, to ensure a high rate of success on long-term conservation. These are incredible initiatives designed for improved socio-economic and environmental impact.

In Costa Rica, the payment for environmental services program is executed through the National Fund for Forest Financing and the National System for Conservation Areas (Ortiz & Kellenberg, undated). The payment program aims to protect primary forest, allow secondary forest to flourish, and promote forest plantations to meet industrial demands for lumber and other wood products. The program makes direct payments to landowners for ecological services which their lands produce when they adopt land uses and forest management techniques that do not have negative impacts on the environment and which maintain the people's quality of life. The program recognizes forest ecosystems for four ecological services, i.e.: mitigation of GHG emissions; hydrological services, including provision of water for human consumption, irrigation, and energy production; biodiversity conservation; and provision of scenic beauty for recreation and ecotourism. Financing comes from taxes on fossil fuels and from national and international payments for environmental services. The program has also negotiated payments with three hydroelectric companies, a private beer company, sale of Certified Tradable Offsets derived from forest ecosystems, and donations from the Global Environment Facility.

Payment for environmental services in Belize could be an option to increase added value of AF systems, to be derived simply by planting more trees in all landscapes to compensate for carbon emissions into the atmosphere. AFSs can be promoted as a dual-performance system for carbon and water footprint and as a high value system for ecological compensation or restoration (Hannachi et. al 2017).

Agroforestry in Belize

AF began to receive some attention in Belize in the late 1990s (CATIE, 2020c). The Programme for Belize (PFB) promotes the conservation of biodiversity and sustainable development of Belize through proper management of the Rio Bravo Conservation and Management Area (RBCMA) to conserve forested land and

other natural ecosystems in north-western Belize threatened with deforestation and fragmentation. The PFB started some work on tree nurseries to produce seedlings of valuable timber species for AF with village farmers' groups. However, that work ended soon due to farmer group conflicts, money issues and lack of funding to continue.

Key government departments have also been promoting this type of sustainable agriculture. The Ministry of Agriculture started its AF work with tree nurseries, selling seedlings to farmers at subsidized prices, which continued for some time but at a slow pace. Today, the Ministry's interest has increased since it is promoting various AF-related practices, such as:

Mixed farming systems: these include integrated farming systems, intercropping, alley cropping, organic production and sustainable agriculture; each system promotes "diversity". For example, the Farmer of the Year national competition puts considerable emphasis on farms that have tree/crop/livestock components.

Regenerative agriculture: the objective is to improve and conserve soil quality (soil amendments, cover crops, bokashi, compost), water management (irrigation, draining, water harvesting), and more recently, educating and promoting principles and practices that increase biodiversity, and carbon sequestration (above and below ground).

Protein and energy banks: the objective is to produce forage with high protein and energy content, to discourage the producers from expanding grazing areas and teaching them better practices to improve the animal nutrition through intensification.

Silvo-pastoral systems: this includes rotational grazing of animals, live fences with *madre cacao*, improved pasture species, scattered trees in pasture, and riparian buffers.

Agro-silvo-pastoral systems: this is focused on crop production with livestock and tree components.

Beekeeping: this program addresses forest preservation, creates adequate micro-climates for bee populations, and uses trees to protect hives from extreme weather events and to provide buffers for community safety and pollination.

AF nursery: Tree seedlings are made available to farmers, even though there is not any campaign or strategy to encourage tree planting on farms at present.

A natural characteristic of trees is that many species can serve various functions simultaneously or at different stages of growth. Depending upon location, management, needs of a household, or usable parts of a tree, the same tree species can be used for food, feed, fuelwood, timber, medicines, soil improvement, shade, barrier, and medicines, hence the use of the term "multipurpose trees" in the AF literature.

Although the Forest Department does not have an AF program per se, they recently adopted National Forest Policy which, inter alia, seeks to promote AF (GoB, 2015a). Thus, the Department works with forestry partners such as YCT in the Maya Mountain North Forest Reserve (MMNFR) and the Friends of Vaca group in the Vaca Forest Reserve along with the support of Friends for Conservation and Development (FCD) in integrated farming systems.

YCT empowers and builds climate-resilient communities located in the Mayan Golden Landscape i.e several Mayan Communities and communities in the buffer zone, protects wildlife, soils, forests, rivers, and the reef for a sustainable future in Belize. Their Community Outreach & Livelihoods program has successfully

implemented climate-smart farming practices, such as the first cacao AF concession in Belize, beekeeping, *Inga* alley cropping, and works with fruit trees, i.e. avocado, cocoa, mango, coconut, breadfruit, and oranges. The YCT is collaborating with the Toledo Cacao Growers Association (TCGA) to improve the socio-economic standard of living of its members through a competitive, diversified system of production that incorporates sound ecological practices through AF practices. This is the rationale for producing cacao under shaded trees (timber trees), along with intercropping leguminous trees, plantains, and other staples. YCT is also working with local farmers to manage bees for organic honey production in the MMNFR.

In June 18, 2014, the Forest Department granted a permit to YCT to cultivate on 379 ha of land situated within the MMNFR for a period of 15 years. This said permit, which may be considered as a Co-management Agreement, was later amended on October 14, 2015. Certain conditions were imposed on the permit holder to abide by: i) clearly demarcate the area of cultivation, ii) assist Forest Officers in prevention and extinction of fires and other forest offences within the MMNFR, iii) if the conditions are breached, the permit may be cancelled within three months' notice and all property may be forfeited to GoB, and iv) the permit holder must abide to supplementary conditions of describing demarcated area, administering, sticking to the purpose and scope of the permit, allowable and prohibited activities, forest inventory and topographic survey, and providing the forest/AF management plan, royalties and fees, ecological consideration and requirements.

The Trio Farmers Cacao Growers Association (TFCGA) is a private, for-profit community-based organization in the community of Trio. Members organized themselves in 2010 to seek access to land in the Maya Mountain North Forest Reserve (MMNFR) to support their livelihood by implementing cacao AF practices through aconcession. The YCT and TFCGA are pioneering a community AF concession model in a forest reserve, since there are other organizations interested in participating in these AF practices depending on the results of the YCT projects.

Another organization that is important to mention is the Belize Livestock Producers Association (BLPA). The goal of the BLPA is to provide the livestock industry and all its stakeholders with oversight at the national and governmental levels andprovide access to both new local and international markets. They also provide and disseminate new technologies and information via extension officers, training, education initiatives and projects such as "Improving Productivity and Resilience to Climate Change in Livestock Systems". This program seeks to improve productivity, to increase resilience to climate change, and at the same time to reduce GHG emissions on small and medium-scale farms by promoting silvo-pastoral innovations.

The University of Belize (UB), Department of Agriculture (Central Farm Campus) is in the process of reviewing its Associates Degree in Applied Agriculture (Z. Zetina, pers. comm.). The review is being undertaken as part of the Skills to Access the Green Economy Project funded by Global Affairs-Canada. With the assistance of three Canadian universities, UB aims to develop a curriculum that focuses on AF and climate smart agriculture. For this reason, the Department of Agriculture has much interest in the NAFP currently under development.

In fact, the news media recognizes the value of forests as being worth more than gold or oil for multiple reasons: they make invaluable contribution to financial and physical health of our people and country; protect our water supply, our soil, and our air quality; provide medicine, prevent desertification, and enhance

tourism; and provides a home for the other creatures of the earth that we were meant to share the planet with (Editor-Amandala, 2020). For example, BFREE is located in the Toledo District and they are an organization which strives to successfully integrate scientific research, environmental education, conservation and create sustainable development opportunities for alternative livelihoods for Belizeans. They founded the Belize Cacao-based AF Restoration Project in 2012. Whereby, the program encouraged farmers (indigenous farmers and other farmers of ethnic race) to implement shaded AF as an opportunity by providing tools which facilitate these farmers to explore AF as an option for production. The Mayan Mountain Research Farm (MMRF) is an organization in the Toledo District which works with the intersection of agriculture and ecology. The organization works along with the communities in the foothills of the Mayan Mountains hoping to build an evolving economy based on AF and permaculture systems. AF systems have been implemented using fruit trees, timber, tree legumes, herbaceous perennials and medicinal crops, as well as home gardens which in return helps in rebuilding soils structure and fertility. Meanwhile, the YCT and TFCGA are the first entities working together and they are pioneering a community AF concession model in a natural reserve. As mentioned before there are few other organizations that are actively participating in implementing AF practices, meanwhile there are other organizations which are interested and play some roles and support this practice.

Relevant AF Systems

From consultations in all districts of Belize, many farmers and producers do believe that incorporating trees into their farming systems can protect natural resources, the environment, wildlife, and mitigate climate change (CATIE, 2020d). They also believe AF is good for farmers, children and grandchildren, and can improve crop yields. For some, AF is an old practice that needs attention, and as a result they would be interested and motivated to plant the trees.

From a CATIE study, a number of AF systems were identified as having high potential for Belize, some because they were already being practiced and others because they could address a very critical constraint or offer an excellent opportunity for farmers (Ibrahim & Beer, 1998). These systems are as follow:

- Home-garden, or backyard farming, is a dense mixture of multipurpose trees, crops, vegetables, condiments, medicinal, small animals, and others. Traditionally the area is about an acre and had the highest total yield/acre of any agricultural system in Belize.
- Live fencing is trees planted on the borders and used as a fence or barrier with or without wire; the trees can produce fruits, fodder, or firewood.
- Pasture with trees scattered in grazing areas can provide shade, fodder, food, or fuel.
- Cocoa managed under trees that provide the needed shade, and in addition the trees can be pruned periodically to improve soil structure and fertility.
- Farm or community forestry is tree planting in woodlots or planting trees in any open spaces on the farm or community.
- Border tree planting is planting valuable timber trees in row on farm boundaries; the trees can serve as protection and windbreaks too.

- Taungya involves short-period cropping (e.g. vegetables, grains, pumpkins, watermelons) during the first 2-5 years of establishing tree plantation. Some shade-tolerant crops like ginger can continue to produce even after the tree canopy closes.
- Fodder bank is the intensive production of nutrient-rich biomass from trees or shrubs to supplement animal feed, especially in the dry season. Tree or shrub biomass has between 20 to 30% crude protein content which is as good or a better option than a commercial concentrate with 18% CP content.
- Improved fallows are enriching cropland with nitrogen fixing trees to reduce the length of the fallow periods and also for generating valuable products of use to farmers.
- Riparian tree planting is using valuable timber trees or fruit trees to stabilize riverbanks, thereby reducing erosion and producing desirable outputs.
- Multi-strata combinations: forests and plantations are enriched with shade-tolerant shrubs, fruit trees, spices, and small animals. NB: the cocoa/tree system is already noted above.

This wide range of these AF alternatives and others (e.g. alley cropping, agro-forests, and forest-based AF systems), and the adaptation co-benefits that can be made thereof, offer particular attractions for the small, medium and large scale producers, because of the specific resources required and the tangible benefits and services generated in each AF system.

The rapidly growing eco-tourism sector in Belize has created an effective demand for beautiful natural landscapes of high ecological quality, which AF with multi-strata arrangements can offer, including the provision of environmental services to enrich the experience of visiting tourists. For this reason, Belize is now rated highly as an international tourist destination.

AF can also offer significant economic benefits for the rural poor. At present the timber industry accounts for less than 2% of the economy, and Belize even imports cured pine lumber from Canada, retailed at about $\$3/ft^2$ dressed. Farm forestry, a common practice, is planting valuable trees in unused niches around the homestead, small lots, boundaries, and subdivisions within the farm or in village spaces. Belize has excellent tree species for farm forestry, such as mahogany, Spanish cedar and teak. If a small farmer could plant at least 20 trees per year, in five years they would have 100 trees in development, worth about $4,000 per tree when mature. After 20 years of growth for each batch, that asset could be worth as much as $400,000 when harvested and sold in bulk. What if the small farmer could produce furniture, that asset could increase at least three-fold, a handsome return for their land and labour. Farm forestry can be an excellent investment for the future heirs or for a rainy day in the future. If 2,000 farmers did the same, then this conversation would be about a multi-million business operation, borne from micro beginnings.

Another effective mechanism that must be exploited for AF is public-private partnerships through social and environmental responsibilities and commitments for private companies because introducing and cultivating trees are a medium to long-term investment in training, inputs, support services and incentives for farmers. This partnership is a win-win strategy for the public institutions which can provide training and extension, technical information and support, and networking and sharing experiences, whereas the private sector could assist with financing and subsidizing the investment and operational costs, and will benefit from downstream processing and marketing services. This partnership can be complemented with international or regional organizations engaging in research and development (R&D), infrastructure development and

financial assistance or incentives for farmers and producers. This type of partnership arrangements can be a formula for successful AF development in Belize.

Chapter 4: Constraints to Agroforestry Development in Belize

After interviewing the current practitioners of AF in Belize, the main challenges presented to its development and adoption can be summarized under seven topics, as follow (CATIE, 2020c).

Farmers and Producers

Farmers and producers are genuinely interested in AF, especially in planting timber and fruit tree species on their farms (CATIE, 2020d). There is inadequate knowledge and awareness of the benefits of trees in their farming systems, there is insufficient persuasion to encourage farmers to incorporate trees into their farms, and there are few if any institutions they can turn to for technical assistance or training. Farmers admitted to mainly needing training, quality seedlings, inputs and water, finance, fast returns, and land for AF adoption.

Limitations of time, financing and other resources prevent them from adopting AF in their farming systems. The present prices are low for agricultural products, such as cattle, grains, other food staples and even timber, at the producer level. The royalties paid on harvested timber from commercial plots appear to be higher than for timber harvested from the forest. Then there are general sales tax, land taxes and export taxes, that together significantly increase cash costs for them. The scarce resources for investment force them to invest in short term options instead of investing in trees with longer term benefits. There are significant costs they have to make in procuring seedlings, establishing the plants, protecting and taking care of them, yet financing for such operations are not available, and when available, the costs of accessing them are too high or have a high opportunity costs for rural households. Some cited that to work on the desired AF, they would need more land, which is increasingly difficult to access.

There are also people issues, customary practices and beliefs that present challenges for AF, i.e. working in groups, poor business practices, engaging the women, and motivating the youth, for participation. These social issues need to be analyzed and addressed, hence the critical importance of engaging the socio-economic professionals in AF development.

Knowledge and Data on Agroforestry

The level of expertise in AF and their land use management system is very low. There is need for sound empirical data, which are derived from formal R&D programs, albeit generated here or abroad under similar agro-ecological conditions. Some specific areas highlighted include: good nursery practices to produce sufficient quality seedlings of trees in demand, competition of crops with trees, utilization of tree biomass produced, cost-effective methods to protect established trees, yields of combination of trees/crops and livestock over time, and performance AF prototypes relevant for specific objectives, farmers and regions.

Institutional and Technical Capacities

There is need to build the capacities in education, R&D and extension and training for AF among the relevant organizations. Mixing trees, crops and livestock requires a higher level of expertise, and based on experience there is minimum level of expertise that is required from the agronomy, livestock, forest and socio-economic sciences to forge a "critical mass" to guide, plan and evaluate AF development (Avila & Scott, 1989). Due to the complexity and high level of interactions among the components, AF requires an interdisciplinary, systems approach that can integrate different structural components, can analyze different functional relationships over time, and assess the productivity of multiple components with criteria relevant to the technical staff and, equally important, relevant to the potential beneficiaries (Avila 1992). Implementation, although important and challenging, can be done by competent institutions or actors once the policy and game plan are well understood.

Legal and Regulatory Directives

Laws, regulations and measures define forest-related access, tenure and user rights of land and trees, taxes and duties, benefit-sharing and decision-making responsibilities (CATIE, 2020a). Legal and regulatory controls are put on forests because of over-harvesting and wanton destruction of some valuable species that would rapidly lead to their commercial extinction. This led to the list of endangered species in the CITES Convention, which justifies the legal controls in Belize. According to the Forest Act (Chap. 213 Rev. Edition 2003, under Forest Regulations, First Schedule), Section 5 states that no person shall convert primary or secondary hardwood and softwood into lumber without a license. Primary hard woods are mahogany, cedar and teak. Secondary hardwoods include any other tree not defined as primary hardwood and softwood are trees of any indigenous species and tree of coniferous class that have been introduced into Belize. Harvesting requires an application and granting of a permit/license if approved by the Chief Forest Officer (CFO). According to Part III of the Forest Rules, no person shall clear, cultivate, or break up land for cultivation except by the issuance of a license issued by the CFO to camp, reside and cultivate in a nature reserve. This type of permit was granted to YCT along with the TFCGA. While the Act itself is not considered a constraint, it can often times be difficult for farmers or interested persons to obtain the necessary permit, and thus discourage them from practicing agroforestry.

The land tax regime of the country needs to be reviewed with the aim of offering incentives to producers and farmers to support new development and conservation priorities. A good example at present is the Government's higher tax on undeveloped land, i.e. forested lands, than on developed land, i.e. land under crops and pastures, which leads land users to the conversion of large tracts of forests to crop cultivation and cattle ranching. A lower tax on forested land should increase forest conservation and reforestation.

Land and Tree Tenure

When introducing trees on rural spaces, there are a number of land and tree tenure issues that could potentially drive or impede the adoption of AF, hence the need to understand the legal regulations and customary practices in Maya community lands, unused village areas, and boundaries between freehold properties. An AF policy should also enable the formulation and implementation of land and tree tenure policies that can promote AF. This could be achieved, for example, by providing a clear legal basis for AF, understanding local resource use and tenure practices (i.e. rights of whom, for whom and for what),

formalizing land values with specific species of established trees, and creating incentives that can lead to greater participation and equity in rural communities through the adoption and sustainable management of AF.

Consumer-ready Products and Market Development

In the agriculture sector, farmers complain about low product prices, unstable markets, low levels of processing and much waste at harvest season, particularly for perishable commodities. Since AF can generate a wide range of products and services, and perishables too (e.g. fruits), it is very important to develop each product so the presentation and quality, for wood products too, will fetch the best price in the domestic and export markets. Hence there is need to invest in processing to add value to all the main products, by-products and residues, and in packaging and marketing plants. In this context, the current Covid-19 pandemic has taught us some valuable lessons. Belizean leaders and people now realize that the local production and value chains in the food and agricultural sector must be given high priority and receive more attention to avoid high-level dependence on food and feed imports.

Financing and Financial Incentives

There is limited financing and the costs of borrowing is prohibitive for agriculture since policy makers have maintained that agriculture must compete with the industrial and service sectors. This has not worked for farmers and producers; hence the levels of investment are low, profits are low and investment risks are high due to uncontrollable climatic, biological, and economic factors. So, even if farmers can appreciate the potential pay-off and all positive impacts of AF, there is not much they can do if new investments, low interest loans, or in-kind incentives are not made available to them, and in the case of AF, though the risks would be lower, most of the benefit streams would be in the medium and long terms (CATIE, 2020d).

Chapter 5: National Policy Goals, Objectives and Principles

Vision and Goals

The vision of the NAFP is to mainstream the use of AF systems that are productive, competitive, and adoptable by small, medium and large farmers, producers and land users, in order to enhance food and nutrition security, conserve natural resources (i.e. lands, forests, biodiversity and water), improve the environment, decrease greenhouse gas emissions and strengthen the resilience of the agricultural sector to climate change.

In order to mainstream AF in Belize, the goals of the national AF policy (NAFP) goals are two-fold:

1. To propose and advocate for enabling legislation, legislative reforms, and complementary policies, and to coordinate and build synergies among the relevant sectors, institutions, and programs for its widespread adoption and development as a viable and sustainable option for Belize.

2. To improve the total productivity, resilience and sustainability of agriculture and forestry through the adoption of AF systems in Belize, in order to improve the livelihood and wellbeing of present and future generations, with particular attention to the participation of the youth, women, the impoverished and the Mayan people across the country.

Policy Objectives

These are as follows:

1. Resolve the legislative and regulatory impediments and to mainstream AF in the policies of relevant sectors that will enable the widespread adoption and management of AF systems, such as laws, regulations pertaining to the tenure, access and use of land, trees and services and pertaining to monetary and fiscal measures.

2. Strengthen institutional capacities for research, training and education, extension, public awareness and promotion, to provide science-based data to professionals in public and private institutions, farmers, producers, processors, merchants, in the fields of AF.

3. Advocate for widespread adoption of agroforestry and promote tree planting in farming systems, villages and urban areas, to meet the ever-increasing demand of timber, food, fuel, fodder, fertilizer, fiber, and other products.

4. Develop AF alternatives to the shifting cultivation (milpa), cropping, livestock, and currently unsustainable farming systems, recover degraded lands, as well as improve the resilience/risk management of agriculture and forest ecosystems due to climatic change, climate disasters, biological attacks, or socio-economic shocks.

5. Develop AF as a way of reducing the pressure on existing forests, reducing deforestation and degradation, thereby complementing the REDD+ target of increasing forest/tree cover for ecological stability and environmental services especially in the vulnerable regions.

6. Apply market-driven approaches and develop value adding, processing and packaging of a range of AF products and by-products, to penetrate domestic and international markets, including niche markets at home and abroad.

7. Mobilize investment and resources for AF programs and projects and to provide the appropriate incentives for AF beneficiaries, from local, national and international donors to complement the resources of GoB, local institutions, the private sector and farmers/ producers, in order to achieve the goals and objectives of the NAFP.

8. Organize a review, planning and learning conference, at least every 2 years, with representatives of the main AF stakeholders, i.e. producers, educators, researchers, developers in the public, private and non-governmental sectors, and the interested international partners like CTCN, CATIE and FAO.

The first conference, ideally planned right after the enactment of the NAFP, should be carried out as a national stocktaking review on current and past achievements with the purpose of identifying future AF development priorities and a way forward.

Guiding Principles

The guiding principles and concepts implementing the NAFP are as follows (CATIE, 2020b and 2020c):

People-centered and inclusive development: the focus is on sustainable livelihoods and on Mayan people, the rural poor and those with disabilities. The private sector (i.e. those motivated by profit), civil society (i.e. those groups, organizations and citizens interested in advancing community or common goals and agendas), and other stakeholders (those directly or indirectly affected by, or interested in, a given resource) will be courted to participate with government in the AF programs.

Gender and youth participation: this policy will empower men, women, and youth from all cultures through their participation in the leadership and implementation of the AF policy, R&D, access to training and education opportunities, creation of economic opportunities, and their access to and ownership of land and tree resources. Special measures will be used to ensure that women and youth, boys and girls are safe, productive and secure in the mainstreaming of AF.

Systems and inter-disciplinary approach: because of its multiple components in space and time, AF is a complex, dynamic system, with below-ground and above-ground interacting processes. Hence AF development requires teamwork involving the experts and practitioners in forestry, agronomy, livestock, soil/water management, and socioeconomics.

Communication and transparency: the free flow of reliable information enables all collaborators and stakeholders to access, monitor, understand, and share in a timely manner the results and views on the progress of AF programs.

Compensation and incentives: motivation for action or provision for a service (environmental) or sacrifice (work or benefit foregone) requires payment or compensation, as part of the NAFP. In the case of AF, there are multiple options to mobilize funds to provide incentives for AF adopters, for example, because of the combination of commercial purpose, conservation of natural resources, environmental benefits (e.g. green market or payments for environmental services and carbon sequestration), and community support programs (e.g. poverty reduction, food and nutrition enhancement, and other SDGs.)

Chapter 6. The Pillars and Expected Impacts of the Agroforestry Policy

Pillars and Building Blocks

The level of success in achieving the goals and objectives of the NAFP will depend on the following pillars.

Leadership and coordination

Leaders are key in terms of building consensus on the mission, setting priorities and planning the strategies and managing the programs to achieve objectives with limited resources. Leaders must know how to manage interdisciplinary teams who can work together and effectively achieve common goals. The leader needs to coordinate different institutions to get their commitment and support, and to mobilize and motivate a range of stakeholders with diverse interests and skills. Such leadership skills can be learnt, and every effort must be made to do so from the start.

Knowledge of the science and traditional practices

This is reflected in the state of the art, Mayan traditional knowledge, data bases or library (physical and virtual), and previous and on-going experience on R&D and education programs. For AF to be promoted, basic knowledge especially the traditional knowledge of the Mayan people is required on all components involved (crops, livestock and /or trees), with respect to establishment techniques, adapted and quality germplasm or genetic resources (including use of seeds, cuttings, scions and pollen), input and management regimes, pest and insect control, harvesting techniques calendars, product processing/development, etc. In addition, empirical socio-economic data is required for the ex-ante or ex-post analysis of the AF systems or their components. Empirical data may be required on gender and policy issues, land use and tenure, etc, or wherever data gaps exist.

Institutional capacities

Policy implementation will require having a basic capacity to conduct applied and adaptive R&D, education and extension or technology transfer to farmers and producers. A “critical mass” of professionals is needed, at least one or two from each of the basic disciplines of agronomy, livestock, forestry and socioeconomics, who can function as an interdisciplinary team for the national AF programs and projects. They could be drafted from the different institutions and AF projects, and would agree to work as a team for the critical phases, e.g. planning projects, evaluating results, and reviewing reports and publications.

Value chain and market development

In the short to medium terms, the market-driven approach must receive increased attention to ensure that AF can be profitable for all stakeholders, with special regard to vulnerable, marginalized groups, including women and youth. The consumer demand/market conditions (e.g. prices, product quality, sanitary and phytosanitary standards) must be understood, processing and value adding operations must be developed and integrated into AF projects, and farmers and producers, especially the small farmers and producers, must

be organized, through business arrangements, associations or cooperatives, to access the markets, domestic and abroad, and to strengthen their market penetration and positioning.

Human resource strengthening

There is need to strengthen all the human resources with current or potential interest in AF development, i.e. policymakers, researchers, educators, extension staff, farmers, producers, and entrepreneurs. There is need to expose them to the latest information on AF approaches, good practices, and production possibility curves or services that can be generated for the well-being of people. This could be achieved through communication and networking, training, targeted support to project teams, creation of virtual platforms, and tools and methods for gender analysis and designing appropriate responses.

Investment and financing

Without investment and financing for short term and long-term AF development, there is no way Belize can mainstream AF. Although not all components of the AFS are long term in nature, the main benefits do require a longer time horizon, compared to traditional agricultural systems. In fact, agriculture in Belize is undergoing a very difficult period at present due the inadequate levels of investment in the public and private sectors, high interest rate, inadequate repayment schedules, and high administrative cost of financing for the sector. Hence, investment and financing will require some policy changes and innovations that would favor AF development. Looking toward the future, both the DFC, Atlantic Bank and the credit union, which were consulted, expressed support for investing in AF, provided potential borrowers would meet the conditions and the supporting infrastructure and services would be available to ensure the success of the AF projects (CATIE, 2020d).

Outcome and Impact Areas

AF is capable of generating multiple cultural, social (and health), economic (and financial), and environmental (and conservation) benefits, tangible and intangible, at household, community and national levels. Therefore, depending on the priority needs of the beneficiaries, donors or investors, evaluations of AF systems reflect inherent biases, thus giving more weight to the preferred benefits of interest. Hence, at micro and macro levels, benefits need to be prioritized, and their rankings may differ, but decisions must be made as to what is more important and relevant.

It is well known that AF can make a significant contribution to several SDGs on poverty, hunger, gender equality, enhancement of climate resilience, and others as listed previously, and especially for the vulnerable and marginalized populations of our country. Depending on the overall priorities of the Government, these should be monitored and evaluated.

Over the short and long terms, the successful implementation of the NAFP will complement the national plans and strategies developed in the country for the agriculture, forestry, and environmental sectors, as well as for mitigation and adaptation of climate change. Accordingly, after consultations with the relevant stakeholders, specific targets and their ranking need to be clear in terms of being specific, measurable, appropriate, reliable and time-bound (SMART), such as these:

- Bring about innovative, diversified enterprises, hence improving food security, nutrition and health of the people, affecting at least 10,000 households after five years.

- Improve interactions and recycling processes (e.g. bring up water and nutrients from deep in the ground and build soil organic matter and thus soil carbon) in the productive components which will enable higher productivity and higher income and profits from the sale of crops, fruits, livestock, tree products, and non-timber forest products, valued at least B$100 million in income every year.

- Increase the asset base with planted trees reaching maturity stages, creating better micro climates and rendering agricultural landscapes more attractive and resilient, thereby improving the value of some 20,000 acres in 10 years.

- Increase forest cover, conservation of flora and fauna species, and protect the biodiversity and water resources at the national level, affecting 50,000 acres in 10 years.

- Sequester carbon from the atmosphere, and estimated captured CO_2at 40 million tons of carbon every year.

- Fortify our ecosystems and environmental services, such as providing wind barriers, restoring degraded lands (with established targets), improving water conservation, preventing soil erosion, and adapting to and building resilience to climate change, affecting another 50,000 acres in 10 years.

- Develop supply value chains and value adding capacities (plant capacity) for efficient input supply, processing, and marketing by the private sector, affecting some 5,000 enterprises over the next 10 years.

- Improve the trade balance in terms of increasing exports of agricultural, food and timber products and reducing the import of the same products, valued at some B$300 million over 10 years.

- Train farmers and producers, at least 5,000 in all 6 districts of whom at least 30% are female, in 5 years.

- Train staff in public institutions and civil society, at least 50 with at least 20 professionals with MSc and 5 with PhDs; approximately 50% female, in 5 years.

- Mobilize international (80%) resources and local resources (20%) for investment and financing of AF programs and projects, targeting at least $5 million per annum during the first 5 years.

The successful implementation of this policy requires systematic, interdisciplinary and farmer- or producer-driven approaches. Future priorities for analysis must be based on:

- Understanding and quantifying farmers' dynamic management and exploitation of AF systems.
- Determining short- and long-term impacts and implications of differing AF potentials, and

- Defining relevant indicators and refining cost-effective methods to describe, explain and predict AF impacts, adoption potential, and sustainability.

In brief, this type of analysis requires a strong input from the socio-economic disciplines from the start in analyzing the target farmers in order to identify appropriate indicators, types of analysis, and hence data requirements for AF development and adoption.

Chapter 7: Organizational Strategy and Institutional Mechanisms for Sustainability

The NAFP, like any public policy, is an authoritative prescription for a specific course of action. Hence, once the policy is enacted or legalized, there must be a legal authority charged with the implementation and monitoring of the policy.

The main organizational authority for implementing the NAFP is a proposed National AF Council (NAFC) to be established with representation of the key organizations with interest and capacity to participate. The NAFC should be based in the ministry responsible for Agriculture (with support from the ministry responsible for Forestry) for several reasons such as:

- Having institutional capacities in crop production, livestock production, and farmer extension services in all districts
- Demonstrating strong interest, developing expertise and ongoing initiatives in AF development
- Expressing willingness to host and accept the NAFP and NAFC responsibilities
- MFA having the support of other partners to be the lead Ministry.

To ensure real partnership, the chair of the NAFC should be selected by the membership and rotated every three years.

The NAFC will have an executive secretariat, comprised of a full-time head and four full-time members who are actively involved in AF development programs in the public or non-governmental sectors. The members of the Secretariat will represent the disciplines of forestry, agronomy, livestock and social sciences.

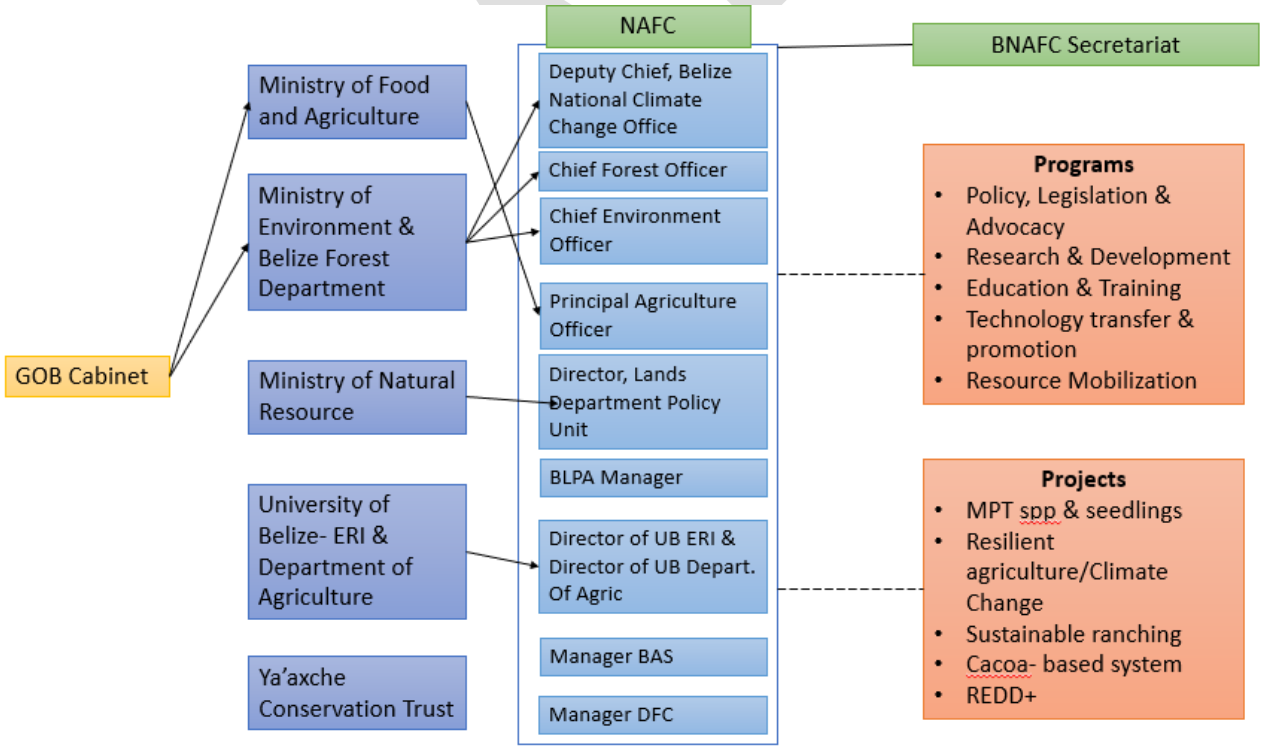
The NAFC Secretariat will carry out the substantive and administrative work as directed by the NAFC. The main functions of the Secretariat, in support of the NAFC, are to:

- Gather and prepare background information on various programs, projects and priorities of the stakeholders so that the Council can study the facts and make decisions as need be
- Implement the decisions made by the Council, track and facilitate activities and processes
- Organize periodic national planning and review meetings of the NAFP
- Keep the key stakeholders and general public updated about the work and achievements
- Monitor and evaluate organisational performance in terms of results, outcomes and outputs.

- Assist in preparing scientific and technical publications and communications
- Develop plans for the financial sustainability of the NAFP and support resource mobilization for AF development.
- Formulate and/or promote projects with national and/or international financing institutions that strengthen the AF sector (i.e. silvoagricultural, silvopastoral and agrosilvopastoral) at all levels.

The organizational structure for implementing the policy is presented in Figure 1. The main ministries are the ones responsible for forestry and agriculture, plus the University of Belize, YCT, the Belize Agro-Productive Sector (BAPS) and the Development Finance Corporation (DFC) are to be represented in the NAFC, who will appoint the NAFC Secretariat, which in turn will oversee and lead the AF programs and projects.

Figure 1. Organigram for implementation of the National Agroforestry Policy



Programs in this context are defined as strategic units mainly focused on developing technical capacities in key areas, each possessing an essential body of knowledge, differing and unique skills, all deemed necessary in a balanced way, to implement the NAFP. These programmatic areas need a medium to long-term strategic plan with clear, logical frameworks including objectives, actions and expected outputs and outcomes. The

success in mainstreaming AF through the NAFP will depend on these programs, tentatively proposed as follows:

- **Policy, legislation and advocacy**: Identify and understand polices and legislation that can promote or discourage AF, and to bring about policy and legal changes that will enable the success of the NAFP.

- **Research and development**: Generate knowledge, appreciate indigenous knowledge, conduct evaluations and solve problems identified on AF components, resources, management, performance, and adoption of AF systems.

- **Education and training**: Build capacity in AF at all levels, through formal and informal methods, for those in the school system, the public sector, private and productive sectors, NGOs and the youth and children. In the short term, curriculum development/adaptation should be a high priority.

- **Technology transfer and promotion**: Transmit AF recommendations and information to all stakeholders, especially famers and producers, using traditional and innovative technology transfer methods, virtual platforms, empirical databases, and specific communication products which are targeted to specific audiences and forums across Belize.

- **Resource mobilization**: Work with stakeholders (i.e. beneficiaries, partners and donors) to develop proposals to access human, technical and financial resources to implement the NAFP, its programs and its projects.

Projects are defined as fixed term units with specific objectives, outputs and time-frames, confined mainly to its funding source. Depending on the investors and donors, projects entail a logical framework with combined elements of policy initiatives, research, education, and extension and/or outreach activities, all necessary to achieve the project's overall objectives. To plan and deliver on projects effectively and efficiently, programs should serve simultaneously as contributors and beneficiaries to projects.

Although this organizational strategy is arguably ambitious for a small country like Belize, it is what is basically essential for the policy vision and goals of AF development to be realized. Hence the proposed organizational structure cannot be established immediately, but it is achievable in the medium term with steady and concerted efforts on the part of all key stakeholders.

Chapter 8: Agroforestry Planning, Monitoring, Evaluation and Learning

The life blood of the mainstreaming process of AF in Belize is the planning, monitoring, evaluation and learning process which will permeate all the operations of the NAFP, and specifically it will contribute effectively to the generation of outcomes and impacts for all intended target beneficiaries.

Project Cycle Management

The project cycle management refers to the process followed for planning, executing and evaluating a project or program, while maintaining alignment with the strategy and objectives agreed upon with stakeholders at the onset. ICRAF developed and applied a practical framework for AF development which involved 4 iterative steps (Franzel & Avila, 1991):

a. Characterization and diagnosis of existing land use systems and indigenous knowledge on AF practices, in a particular area or region. The objective is to understand the community and household context, their production systems, their constraints, and in particular, identifying the potentials and opportunities for improvement with AF interventions. The role of the potential beneficiaries is paramount in this phase.

b. Design of AF interventions, components and management regimes that could address such constraints in that particular area or region: this step includes a socioeconomic feasibility analysis to make estimations of the productivity, profitability and adoptability of improved and proposed AF systems. This step requires an analysis of household decision-making, resources, food and income, and an analysis of markets and prices for inputs, products and services. The range of AF permutations, subject to the selection of desired species, arrangements, levels of management, harvesting regimes, etc, enables the designers to customize AF interventions to the particular circumstances and abilities of the small, medium or large farmers.

c. Testing of the AF recommendations either on stations, farms, or forests: This step involves R&D on the relevant AF components of trees, crops and/or livestock that provide empirical data and experience on whether AF interventions and components can resolve problems identified and deliver on expected performance, in terms of technical, social, economic or other criteria.

d. Up-scaling of successful AF alternatives for wide-scale adoption in the target area and extrapolation to other areas. This step involves the assessment of AF adoption impediments in the context of institutional capacities and services that are ready, or lacking, for providing and sustaining the demand for training, extension, financing, marketing, etc. to the intended adopters and beneficiaries.

In consideration of the short and long-term horizon of AFSs, the design phase of cycle management does require greater attention to economic analysis (ex-ante or ex-post[1]) to determine the profitability and rates of return for critical factors such as labor and capital. In particular, for bankable projects, the internal rate of return would need to exceed the going interest rate, a necessary condition for financing to be availed.

Monitoring, Evaluation and Learning System

[1] *Ex ante* analysis uses hypothetical or best estimate data, while *ex post* analysis is based on empirical data on real-time observations.

The NAFP will require a well-functioning monitoring, evaluation and learning system (MELS), to be implemented or adopted based on the following six steps (Franzel& Avila, 1991). Based on the expected outcome and impact areas, indicated above, consensus is necessary among target beneficiaries or stakeholders on a hierarchy of criteria and indicators to evaluate the performance of the AF interventions or components. The steps are:

1. Agree on the SMART indicators for each AF system or component under evaluation, based on the expected results and outputs (or hypothesis in the case of an experiment).
2. Select the right tools and methods to measure each indicator, such as cases studies, field surveys, data recording or periodic measurements.
3. Assign responsibilities as to who will collect data, who will analyze and write up the results, and who will allocate resources, so these tasks are carried out.
4. Analyze results together among the team, and share the results also with all the stakeholders, in particular the farmers and producers.
5. Based on the analysis, improve the AF interventions for follow-up actions.
6. Use all the above to learn and design better AF programs, projects and above all, improve the NAFP, as well as the agriculture and forest sectors of our country.

The planning and MELS will be extremely vital to the success of the NAFP in that the most strategic output of the MELS will be the identification of new AF initiatives and proposals for projects that can attract financial and in-kind contributions from local, national and international donors.

Financial Sustainability

The NAFP requires financial sustainability which can be defined as the ability to mobilize resources to fund the AF programs and projects now and into the future to achieve the goals and objectives of the NAFP. The ability to do so will depend on a range of competences needed for planning and prioritization, execution and generation of outputs, communication and advocacy, and building alliances and cooperation (Yamron, 2020).

On planning and prioritization, project cycle management and the MELs provide a sound background for elaborating a strategic business plan which can clearly defines the management structure, a strategic action plan with appropriate justification, skill sets and resources needed, as well as capacity development to address those gaps. The business plan can articulate the evidence-based demand or market for outputs and services of the program, involvement of stakeholders as drivers, and sources of funding including current and potential donors or co-operators.

On funding options, the best programs and projects in terms of mobilizing resources are those in which the Government and other national institutions are investing (about 20% of the total cost), farmers and producers are investing another 20% with in-kind contributions, and the external donors are investing the remaining 60%, usually providing those resources that are beyond the reach of the national stakeholders. If

national stakeholders or beneficiaries are investing with their contributions, external donors will be quite convinced that such projects are of high value to national stakeholders, who would in turn be more committed to making the projects work for themselves. However, if the domestic contribution is very low or non-existent, the chances of receiving external support would be quite low. Forging alliances with different types of donors and partners (e.g. those interested in policy work, R&D, extension and production, training and education, or financing) always pays off in terms of diversifying funding sources and enabling the AF program to respond to and serve a wide spectrum of national stakeholders.

Based on consultations with the DFC and La Inmaculada Credit Union, their interest in investing in AF was very positive. Financing is available, depending on the borrower, facilities and infrastructure that would ensure project success (CATIE, 2020d). There is need to demonstrate AF benefits. DFC has lines of credit with international financial institutions like CDB, EIB and CDF. With the support of GoB departments, the NAFP will attract financing, due to its environmental appeal, but concerted actions are needed on the campaign to inform the people, legislation and regulations, trademark and patents, the implementation plan, and a clear policy statement from GoB. The policy would need champions and executives with will power and passion.

To ensure efficiency and effectiveness of projects and operations, the AF programs must apply good practices on using human, logistic and financial resources, in order to generate good value for money. This involves understanding of logical framework analysis, timely implementation, M&E systems, and timely and transparent financial management. Donors will invest in programs that are well managed, that produce results and can account for every cent invested. It is logical - every donor must account to its own taxpayers or investors. This requirement is non-negotiable.

With respect to communication and visibility, the AF programs need to define their audience, products to be delivered and best media of communication with each stakeholder. Being attractive is very important in order to appeal to and motivate potential beneficiaries to invest in the AF programs and projects. Potential beneficiaries and investors could include, e.g. government, farmers and producers, the private sector, NGOs, financing institutions, etc. There are also international development and financing organizations which may want to collaborate with Belize and therefore would be interested in investing in the programs and projects of the NAFP. Everyone loves success stories in terms of achievements, i.e. results, outcomes and impact. Hence, there is need to collect and analyze data, and report using the SMART performance relevant to each type of audience, which is an essential tool for self-advocacy.

The NAFP must have a well-designed strategic plan for financial sustainability. A complementary mechanism, proposed by the NAFP development team for financial sustainability, is the establishment of an AF fund or trust, similar to that of the Protected Areas Conservation Trust (PACT). Revenues for PACT are primarily derived from a conservation fee of US$ 3.75 paid by overnight visitors, a 15% commission from cruise ship passenger head tax, fiduciary services, and interest earned on its term deposits. PACT redistributes the revenue by providing funding for projects that support conservation and promote environmentally sound management of Belize's natural and cultural resources. Today PACT is an accredited national implementing entity for the Adaptation Fund and was granted a fiduciary role for the World Bank, the Meso-American Reef Fund, Global Environment Facility (GEF) and the Belize Nature Conservation Fund (BNCF).

An AF fund could offer benefits for non-profit property tax exemption and the ability to apply for public or private sector grants, request tax-deductible contributions, and seek financial support from international organizations or funds, friendly governments and others.

The main purpose of the fund would be to mobilize financial resources to provide much needed assistance to small producers, processors and exporters, build technical capacity, strengthen professional and technical services, and provide incentives to these stakeholders, towards the wide-scale adoption of AF practices in Belize.

The fund could be registered like PACT or inserted under the PACT Act and governed by a Board of Directors constituted by interested representatives of the public, private and NGO sectors of the country.

Chapter 9: A Start-Up Strategy - the Next Steps

Risk Management

As with any new national policy, there is need to anticipate the problems or threats that are likely to be faced, and in advance, try to neutralize them before they have any chance of sabotaging the NAFP initiatives. In Table 2, the major risk factors are identified as well as the probability of occurrence, actions to manage each risk, and who should act. Accordingly, the startup phase must take these risks factors into account to start off on a firm foundation.

Table 2. Identification of major risk factors and strategy to manage each risk

Major risk factor	Probability of occurrence	Actions to manage the risk	Who has to take action?
Support of political leaders (i.e. Cabinet)	Medium	• Circulation of final NAFP draft • Personal meetings to inform, consult&lobby at least 5 Cabinet ministers in preparation for Cabinet decision • Finetune draft policy based on feedback received before presentation to Cabinet	Ministers/ CEOs responsible for Forestry, Climate Change, and Agriculture
Commitment of essential ministries, NGOs, farmer and other organizations	Medium	• Focus on at least 2 ministries or departments, SIRDI, UB, BAPS, etc. • Strengthen capacity in relevant topics for start-up program	Professionals and technicians of these organizations
Financial resources not availableto invest in policy implementation	High	• Prioritize resource mobilization for policy implementation • Develop a financial sustainability plan	Technical team comprising of interested departments, NGOs, UB and others

For the immediate, initial stage of implementation, the draft NAFP would need to be disseminated and socialized among government entities, at the high levels of Government (i.e. Cabinet, National Assembly and Caucus of CEOs), NGOs, private sector, and farmer organizations. The draft policy would be appropriately analyzed, advocated for its adoption and approval, and decisions made on how to proceed with the legalization process. At this juncture, the NAFP will arrive at an opportune time to be inserted into the national dialogue on the policy directions and strategic priorities of the new Government.

An Interim Working Group

For this initial stage, it is recommended to form an interim, Inter-Sectoral Working Group (IWG)comprising of one representative of the NCCO, MFA, FD, UB, private sector and NGOs. The WG could be chaired alternatively every 2 years by the MFA and the FD. The nature of its work would demand substantive "political" muscle, technical resources, and absorptive capacity, which can be provided ably by both departments working as a team. The work of the WG would focus on:

1) Analysis of convergence, synergies and dovetailing among current and new policies, programs and projects of the new Government taking office in December 2020. If and where conflicts may arise with other public policies and programs, they must be addressed by revisiting national priorities and trade-offs.
2) Dissemination of and advocacy for enactment of the draft NAFP to receive the active support from potentially affected parties, including legislators, courts, interest groups, other units of government, etc. There may be a lack of interest or even active opposition from organized groups with the resources to combat the policy.
3) Capacity building for key institutions and stakeholders on the NAFP and AFSs, as a practical, short-term means for enabling cooperation, extension and networking, even if the legalization of the NAFP is delayed due to administrative issues.
4) Mobilization of resources by exploring and building alliances with regional and international partners, such as CATIE, CTCN, FAO and others.
5) Development of a five-year AF development strategy and action plan, depending on the results of the above actions.

Resource Mobilization

The IWG, as a matter of priority, must mobilize financial and technical resources to implement the NAFP, followed by a preliminary indication of external donors which could be tapped for support. The IWG can explore various options for external support to implement the NAFP (CATIE, pers. comm.), such as:

1) GoB has an option of using part of its funds under the GCF Readiness. CTCN is a delivery partner of the GCF, and its role is to collaborate with country governments in proposal formulation. Belize could explore how to tap the resources of Readiness 2021. Also, every country has US$1 M for projects related to institutional capacity strengthening, coordination, policy and planning, and programming of investment by designing bankable projects.

2) With GEF, Belize can access some of its STAR Allocation which each country receives, specifically for climate change, biodiversity and soil degradation, with flexible allocations for each area. In this case, CTCN also provides support for project formulation.

3) The Adaptation Fund is another option with which CTCN also collaborates. This Fund finances projects with vulnerable communities in developing countries, to adapt to climate change, based on country needs and priorities. Helping the most vulnerable countries and communities is an increasing challenge and imperative, especially because climate adaptation requires significant resources beyond what is already needed to achieve international development objectives. The Fund is financed in part by government and private donors, and also from a 2% share of proceeds of the Certified Emission Reductions (CERs) issued under the Clean Development Mechanism projects.

4) CAF is a development bank created in 1970 and owned by 19 countries (17 of Latin America and the Caribbean, Spain and Portugal) as well as 13 private banks in the region. The CAF promotes a sustainable development model through credit operations, non-reimbursable resources, and support in the technical and financial structuring of projects in the public and private sectors of Latin America.

5) "One Tree Planted" in the USA is a 501(c)(3) non-profit organization. As an environmental charity, its mission is to make it simple for anyone to help the environment by planting trees! The principle is "one us dollar for one tree planted". Planting trees is justified on the basis of SDG 8 (Decent work and economic growth), SDG 13 (Climate action), and SDG 15 (Life on land). The specific objectives of projects could be to stabilize climate, to protect biodiversity, and to empower local communities, by planting valuable hardwoods and other trees of importance to them.

6) CATIE is in a position to work with local organisations of Belize to secure funding. CATIE can assist in tapping potential support from well-known donors to countries like Belize, i.e. the Climate Change Fund in Germany, Green Climate Fund, GEF, Inter-American Development Bank's Invest Fund, and the European Union (e.g. for capacity building).

These are but a few suggestions for resource mobilization which should be pursued with a comprehensive and concerted strategy (Di Biase & Ellis, 2012). Resources to be mobilized include financial, human services, goods (i.e. vehicles, computers, scientific equipment and others), and services (i.e. land clearing and preparation, maintenance, repairs, printing and others). Donors no longer want to be perceived as cash providers, but rather prefer to be treated as partners in decision-making, and there are many to be approached today with interest in AF, such as the UN system organizations, international development and cooperation agencies, international foundations, private sector companies, international NGOs, etc. These external partner resources can be well complemented with various local options such as community-based schemes, payment for public goods or services, and others. The NGOs in Belize have good expertise in resource mobilization because of necessity and survival, hence their involvement in the NAFC should bring tangible benefits in the short term.

The suggested options to mobilize resources, and others to be explored, should provide an ambitious, fruitful start for mobilizing resources towards the full implementation of the NAFP of Belize.

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Common and scientific names of speciesmentioned in the text

Common name	Scientific name
avocado	*Persea americana*
cedar	*Cedrela odorata*
cacao	*Theobroma cacao*
coconut	*Cocos nucifera*
cohunenut	*Attalea cohune*
custardapple	*Anona reticulata*
guava	*Psidium guajava*
guinep	*Melicoccus bijugatus*
Inga or ice creambean	*Inga edulis*
lime	*Citrus aurantifolia*
logwood	*Haematoxylon campechianum*
madre de cacao	*Gliricidia sepium*
mango	*Mangifera indica*
mahogany	*Swietenia macrophylla*
mamey	*Pouteriasapota*
orange (sweet)	*Citrus sinensis*
pine	*Pinus caribaea*
pixoy or bay cedar	*Guazumaulmifolia*
plum	*Prunus domestica*
ramon or breadnut **tree**	*Brosimum alicastrum*
Santa Maria	*Calophyllum antillanum*
sapodilla	*Achras sapota*
soursop	*Annona muricata*
teak	*Tectonagrandis*
Animals	
deer	*Odocoileus virginianus*
gibnut	*Cuniculus paca*
crocodile	*Crocodylusmoreletii*