



THE STATE OF **PALAU'S**  
BIODIVERSITY FOR FOOD AND  
AGRICULTURE

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# STATE OF THE WORLD'S BIODIVERSITY FOR FOOD AND AGRICULTURE PALAU COUNTRY REPORT

## 1. Assessment and monitoring of biodiversity for food and agriculture

### 1.1 General context

The islands of Palau, part of the Western Caroline Islands, are in the western part of the Pacific Ocean. Palau stretches from about 2 to 8 degrees north latitude and 131 to 135 degrees east longitude. It is about 500 miles equidistant from the Philippines to the west and from Papua New Guinea to the south. It lies within a reef system that is about 80 kilometers long and about 27 kilometers wide at its widest point. Most of the reefs are barrier reefs, but some are fringing. All of the islands in the area are inside of the reef system except the island of Angaur, which lies across a deep channel off the southern tip of Babeldaob.

Palau covers 189 square miles of land area including Rock Islands. The surrounding sea area is very large, including an exclusive economic zone extending over 237,850 square miles. The capital of Palau is located in Koror with a land area of 7.1 square miles where two thirds of the population resides. Koror lies just south of Micronesia's second largest island, Babeldaob, which contains 153 square miles of undulating forests, grasslands, rivers, waterfalls, wetlands, mangroves and some of the most beautiful beaches

Palau consists of more than 340 islands, of which 9 are inhabited. These are, from Northeast to Southwest: Kayangel, Babeldaob, Koror, Peleliu, Angaur, Sonsorol, Pulo Anna, Hatohobei, and Helen Reef. Most of the islands are volcanic in origin, and others are of raised limestone. Babeldaob is the largest island, making up 80 per cent of the total land area. Babeldaob Island consists of ten states, namely, Airai, Aimeliik, Ngaremlengui, Ngarchelong, Ngchesar, Melekeok, Ngiwal, Ngaraard, Ngardmau, and Ngatpang States. Including the states in Babeldaob, there are altogether 16 states in Palau.

Palau has a maritime tropical climate. Temperature ranges from 24-32°C and a total of 423cms of rainfall per year.

The Republic of Palau became an independent nation on October 1, 1994 in part with the implementation of the Compact of Free Association between Palau and the United States of America.

Total population in 1995 was 17,225 which increased to 19,907 in 2005. Over a 20 year period, average population growth rate varies from 2.1 to 2.6. Urban population increased from 71.4% in 1995 to 77.35% in 2005; while rural population decreased from 28.59% in 1995 to 22.65% in 2005. As of January 2016 the population was estimated to be 21,305.

In addition, current tourist arrivals in Palau stand at 5,000 to 10,000 per month. The increase in urban population means a significant increase in demand for agricultural production, which has significantly affected food security and rural development. Because of this, there was an observed

increase in rural poverty primarily due to urban migration which resulted in less farming manpower and therefore less food production.

The crop sector in Palau is composed primarily of private farmers who grow various root crops at a subsistence level for their own consumption. Average farm size of private farms in Palau is 0.25 acre or less. Recently, the Palau Farmer's Association has been organized through the initiative and assistance of the Bureau of Agriculture and the Taiwan Technical Mission, primarily so that farmers can help each other especially in the procurement and sharing of planting materials as well as marketing of their produce. Since the crops grown are mostly vegetatively propagated, planting materials, are shared or sold among and between farmers. For vegetable seeds, they are mostly imported by local retailers from the US, Taiwan or the Philippines.

Traditional agriculture in Palau has included agroforestry systems and multistory plantings of trees and root crops. Importantly, the Bureau of Agriculture has been promoting agroforestry systems (which are estimated to cover 2 741 acres or 2.7 per cent of the total land areas of Palau). Cultivated land without tree cover, or interspersed with some secondary vegetation is estimated to cover 1 006 acres, or one per cent of the nation's land area, which includes urban cropland. Traditional crops in Palau have included species such as true taro, giant swamp taro, cassava, sweet potato, yam, banana, papaya, coconut, betel nut, and breadfruit. More recently beans, eggplant, cucumber, squash, cabbage and watermelon have been introduced to Palauan agriculture.

At present, agriculture does not constitute a large portion of the commercial market economy. While the value of agricultural production has increased modestly over the past decade, it has declined significantly relative to the overall economy. The contribution of agriculture to gross domestic product (GDP) declined from 2.0 percent in 1992 to 1.3 percent in 2005. Agriculture in Palau is mainly for subsistence and customary purposes, although sales of products such as vegetables, root crops, fruits and betel nuts are common. Farm labour is provided by women with the most commonly produced commodities being taro, sweet potato, cassava and some fruits. There is an element of extended dualism with some women employing foreign labour from the Philippines, Bangladesh to assist in the production of taro, which is an important crop culturally and economically, as well as for subsistence purposes. Some foreign labourers are employed also by Palauan owners of commercial farming operations.

Fish is an important element of food security in Palau. Although Palau has a high GDP per capita relative to other countries in the region (USD 7,812), implying considerable ability to purchase food, much of the national prosperity is based on payments from the USA – income that will not continue in perpetuity. This fact, in conjunction with a high per capita consumption of fish, attests to the large importance of fish in national food security. The main trends in the fisheries sector include:

- Increasing exploitation of the coastal resources, especially those close to urban markets.
- Continuing substantial involvement of local and international NGOs in the management of coastal marine resources
- Growing realization of the inability of Palau's coastal resources to feed local residents and tourists, and support commercial exports.
- Increasing interaction between fishing activities and Palau's thriving tourist trade

The inshore fishery industry in Palau is a dynamic, multi-species industry involving individual fishers feeding their families, providing food for traditional customs and selling to commercial markets, restaurants and selective buyers for export. Between 1989 and 1998, 81% of Palau's inshore fishery production was consumed locally. Based on the data available yields are declining.

There is a conflict of interest between commercial fishing and the tourism sector<sup>1</sup>. Even though the bulk of commercial fishing in the region focuses on tuna, sharks are frequently hauled in as bycatch. Removing sharks out of the sea directly hits Palau's biggest moneymaker: the \$85M dive tourism industry. An Australian study calculated that shark divers bring Palau \$18M per year, with each swimming shark worth \$1.9M in diving and tourism. Through this lens, sharks contribute 8% of Palau's GDP. With the passage of the Palau National Marine Sanctuary Act, about 80% of the nation's maritime territory is fully protected, a higher percentage than in any other country. Full protection means that no extractive activities such as fishing or mining can take place.

Palau has been at the forefront of aquaculture development. It was at the Palau Mariculture Center where the technology for farming giant clams was first developed in the 1970s and 1980s. Clam farming is a rapidly expanding small industry in Palau. Other aquaculture products now in production include crabs, milkfish, groupers, and rabbit fish.

### **(a) Role of biodiversity for food and agriculture in Palau**

Palau depends on imports for virtually all of its food requirements, but as previously mentioned there is subsistence agriculture, as such the contribution of terrestrial biodiversity to food and agriculture is difficult to assess. There is significant agricultural biodiversity in Palau – Palauans cultivate over 100 varieties of taro, 17 varieties of sweet potato and many varieties of cassava, as well as bananas and other fruits for food. Over 44 species of trees are used for timber and firewood, and over 82 plants have medicinal healing powers. The fruits and flowers of over 100 plants are food for bats and wildlife. Taro varieties from Palau with tolerance/resistance to the taro leaf blight disease were vital in getting taro back into the fields in Samoa after taro leaf blight wiped out all the local Samoan varieties.

Palau's marine biodiversity and its associated ecosystems is the main tourism product for Palau. -  
“Tourism contributes considerably to the economy of Palau, one of the world's top diving destinations. Travel receipts amount to about 50 percent of GDP, more than twice the Pacific island average and among the highest in the world. Tourism is also a main source of growth in Palau, through employment generation and spillover to broader economic activity. A one percentage point increase in the growth rate of tourist arrivals is estimated to raise real GDP growth by 0.2 percentage points on average.” (IMF 2012 Republic of Palau Report)

Strategic Area 5 of Palau's National Biodiversity Strategies and Action Plan (NBSAP 2015) focuses on reducing direct pressure on biodiversity through sustainable use. Actions under this strategic area include development of guidelines and establishing standards for sustainable practices for important business and food production activities in Palau. Sustainable use of biodiversity will be achieved by establishing industry-specific guidelines for Best sustainability practices, with particular attention paid to the tourism industry, cultivated biological resources (aquaculture, agriculture, agroforestry), and wild—caught biological resources (fisheries, gleaning, hunting, harvesting, marketing).

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<sup>1</sup> <http://www.theguardian.com/sustainable-business/palau-sharks-ban-commercial-fishing-tuna-industry>

Palau's traditional agriculture landscapes provide important habitats for waterbirds (native and migratory species) Palauans have converted fresh water marshes into taro fields that have been farmed for hundreds of years and as such have become part of Palau's wetland ecosystems. These taro fields are utilized by both humans and many bird species. Because taro fields or patches are part of a production landscape that includes both wetland crop and agro-forestry cultivation many native and migratory bird species can be found in these fields. Wetland birds utilize the irrigation ditches in the taro fields for feed purposes and native forest birds feed in the foliage provided by the agro-forest around the taro fields. The Palau islands are in the East Asian/Australasian flyway, and many species using this flyway have been recorded in Palau during the migratory season. Migratory birds that routinely utilize taro patches for feeding include the Glossy ibis, ducks and black wing stilts.

**(b) Table 1. Production systems present in Palau**

| <b>Production system</b>          | <b>Indicate if present in the country</b> | <b>Description<sup>13</sup></b>   |
|-----------------------------------|---|---|
| Livestock grassland-based         | N   |   |
| Livestock landless systems        | Y   | Livestock production in Palau is focused in backyard swine production mainly for local customs, household consumption and local market. Poultry for egg production are also raised on the island.                           |
| Naturally regenerated forests     | Y   | These are forests of native species, where there are no clearly visible indications of human activities and the ecological processes are not directly disturbed by humans   |
| Planted forests                   | Y   | These are forests and regenerated forest of introduced and/or native species established through planting or seeding mainly for production of wood or non-wood goods;   |
| Self-recruiting capture fisheries | Y   | These are the reef fish, migratory fish, clams and shell fish, sea cucumbers, lobsters, land crab, mangrove crab, collected and caught in the open sea waters covering the exclusive economic zone surrounding the country. |
| Culture-based fisheries           | N   |   |
| Fed aquaculture                   | Y   | These consist of milkfish aquaculture farms in Palau.   |
| Non-fed aquaculture               |   | These consist of clam farms and sea cucumbers farmed in Palau.  |
| Irrigated crops (rice)            | N   |   |
| Irrigated crops (other)           | N   |   |

|   |   |   |
|---|---|---|
| Rain fed crops                          | Y | These consist of the root crops, fruits and vegetables vital to the market and daily subsistence of the population that are grown in the upland and wetland areas in Palau. |
| Mixed systems (livestock, crop, forest) | N |   |
| Others (please specify)                 |   |   |

| Production system                 | Area            |        | Production - quantity                     |      | Contribution to the agricultural sector economy | Reference Year |
|-----------------------------------|-----------------|--------|---|------|---|----------------|
|                                   | Value           | Unit   | Value                                     | Unit |   |                |
| Livestock landless systems        | Poultry – 1.0   | Has    | \$2.3 M                                   | USD  | 5.44 %  | 2015           |
|                                   | Piggery – 2.3   | Has    | \$ 300,000                                |      | 0.70 %  |                |
| Naturally regenerated forests     | 445             | Sq. km |   |      |   | 2010           |
| Planted forests                   | 100             | Acres  | Mahogany - \$ 2.9M                        | USD  | 6.85 %  | 2010           |
| Self recruiting capture fisheries | 250,416         | Has    | Tuna - \$28M<br>Domestic fish - \$637,292 | USD  | 66.23 %<br>1.50 %                               |                |
| Fed aquaculture                   | Milkfish – 36.5 | Has    | \$ 792,000                                | USD  | 1.87 %  | 2013           |
| Non-fed aquaculture               | Clam – 6.0      | Has    | \$ 45,000                                 | USD  | 0.1 %   | 2013           |
| Rain fed Crops                    | 179             | Has    | \$ 7.4 M                                  | USD  | 17.5 %  | 2015           |

## 1.2 State trends and drivers of change of biodiversity for food and agriculture

Agriculture and fisheries (including aquaculture) are considered as priority sectors for driving future economic growth. For climate security, economic security, and better health, Palau needs to increase agricultural productivity while simultaneously conserving forest, soil, and water resources. Revitalizing agriculture while balancing agriculture expansion with the need for forest conservation, watershed management, and tourism development, is a major development challenge.

## **(a) State and trends information**

Palau contains some of the most diverse and pristine ecosystems in the world. These diverse habitats are home to an extraordinarily high number of marine and terrestrial species that are essential to the culture, economy and livelihoods of the Palauan people. Many species and ecosystems are endemic or rare and conserving Palau's resources is important globally. Palau is home to the greatest area of continuous native forest in Micronesia. There are over 303.51 km<sup>2</sup> of forest cover throughout the islands. With more than 1200 species of plants, of which over 860 are native, Palau's forests are the most species-diverse in Micronesia. In addition to their direct biodiversity values the forests provide vital ecological services that help to maintain the health and ecological integrity of all of the terrestrial and marine ecosystems (e.g. sediment trapping, climate stability, nurseries for reef fish, soil production and conservation, Agro-forest covers 10.92 km<sup>2</sup> and is dominated by coconut stands. Palau's forests are highly valued as watershed areas, for preventing soil erosion, as sources of firewood, medicines, building materials, and as areas to forage and hunt for food.

Palau has the highest levels of marine and terrestrial biodiversity within Micronesia, and is on the northeastern margin of the area called "the Coral Triangle" which has the highest diversity of shallow-water marine species in the world (Green and Mous 2006). Although Palau has slightly fewer species than found in the coral triangle, the diversity of marine habitats found within the relatively small area of the Palauan archipelago is probably as great as would be found anywhere in the world. Palau supports more than 350 species of hard coral, 200 species of soft coral, over 300 species of sponges and more than 1,300 species of reef fish. In early 2012 Palau International Coral Reef Center (PICRC) analyzed existing data on fish and reported to traditional leaders that fish populations across Palau were continuing to decline. However, areas with effective management in place showed signs of minimizing the decline. In 2012 PICRC completed a pilot study to assess populations of Bumphead Parrotfish and Napoleon Wrasse. A national ban on their harvest was implemented in 2006. In the pilot study, researchers surveyed 27 sites for the fish. Findings from that survey showed the population of fish rebounding. Preliminary analysis shows the value of management measures such as closure of a fishery as a means to improve the status of said fishery.

### **Drivers of change:**

The following affect both terrestrial and marine biodiversity:

**Climate change and variability:** Climate change impacts affect both marine and terrestrial ecosystems and the organisms that depend on them. Climate change contributes to increased seawater temperature, increased air temperature, sea level rise, climate extremes, and changes in weather and precipitation patterns. These factors resulting from climate change lead to ecosystem level impacts that can directly affect biodiversity. The 1998 El Niño event contributed to massive coral bleaching and decline of sea life in near shore areas. Also at the peak of the event Palau received the lowest amount of rainfall in over 100 years of records. The resulting drought led to depletion of water supplies, crop failures, and uncontrolled wildfires on some islands. In recent years saltwater intrusion into the taro fields is impacting on taro agricultural diversity. Droughts and storms also increase susceptibility to invasive species.

**Economic development:** Current economic activities such as tourism and fishing also impact biodiversity. Tourists are drawn to Palau by extraordinary natural beauty and the abundance and diversity of wildlife. However, the number of visitors acts to effectively increase the demands on infrastructure, ecosystem services, and natural resources, including biological resources. Anecdotal

observations suggest that overfishing and the taking of undersized fish have led to a general decline in the quality and quantity of catch size throughout Palau.

**Population Growth and Urbanization:** Population growth contributes to increased pressure on ecological systems by raising the demand for natural resources and by driving development of land and water areas. Urbanization represents a shift from traditional fishing and agricultural values toward greater reliance on new technology and imported materials in order to meet the needs of a growing population. The Ngerikiil Watershed is the primary source of drinking water for approximately 75 per cent of the population, and includes areas that have undergone major development. The Ngerikiil River empties into Airai Bay. As a result of increased sediment loads and decreased capacity for natural features such as mangrove forests to filter suspended particles, the reefs in Airai bay have been smothered, and the once productive fishery has collapsed.

**Invasive species:** A good example of this is the plant known in Palau as kebeas (*Merremia peltata*). Kebeas is a very vigorous and fast-growing vine that naturally grows in forest clearings. As little as twenty years ago, kebeas was common, but not generally a problem in Palau. Now, land clearing, road construction, and other human activities have created more opportunities for kebeas to thrive. At the same time, there are fewer human activities to control its growth, which is now threatening forests and communities on the islands of Koror and Babeldaob. Agriculture on Angaur is no longer possible because of the invasive macaque monkeys – these monkeys prefer to eat betel nut and taro that the people depend on. As there are more monkeys than people on the island, subsistence farming is nearly impossible for the residents of Angaur who have to compete with the monkeys to survive.

**Specific to the inshore marine biodiversity:**

- Conflicts between user groups (conservation versus exploitation, commercial versus subsistence; fisheries versus tourism, etc);
- Overfishing and tourism overuse. People are now collecting resources, especially in the marine environment, with new and more effective gear. Traditional methods that tended to limit the harvest are rarely employed as methods for hunting and fishing. In addition people are increasingly collecting or harvesting resources for monetary income rather than solely for local subsistence uses.
- Degradation of foreshores and reef areas by poor land use practices and habitat destruction;
- Weak compliance with and enforcement of conservation laws and regulations;
- Management of data;
- Lack of alternative livelihoods for fishers in the tourism sector (thereby giving fishers a greater economic incentive to support and comply with conservation measures) or in offshore fisheries.

According to the SOW PGRFA:

The main drivers of change are: urbanization and negative attitude towards agriculture and farming. Other factors include environmental effects such as recurrent drought, and climate change and pests and diseases.

**National Information System .** Palau is currently developing a biodiversity clearing house mechanism which will be a website dedicated to biodiversity information on Palau. It is anticipated that this clearing house mechanism will be online by the latter quarter of 2016.

**Table 2 - List of associated biodiversity species that are actively managed in production systems for the provision of ecosystem services**

| <b>Ecosystem service provided</b><br>(Place pointer on the ecosystem service name for a detailed description) | <b>Actively managed species (name) and sub- species (where available)</b> | <b>Production systems (code or name)</b> | <b>Availability of diversity information (Y/N)</b> | <b>Source of information</b> |
|---|---|--|--|------------------------------|
| Pollination   |   |  |  |                              |
| Pest and disease regulation   | <i>Merremia, Praxelis, Imperata, Mikania</i>                              | Forestry, Rainfed crops                  | N  | BOA                          |
| Water purification and waste treatment  |   |  |  |                              |
| Natural hazard regulation   |   |  |  |                              |
| Nutrient cycling  | Legumes   | Rainfed crops                            | N  | BOA                          |
| Soil formation and protection   | Soil organisms introduced and nurtured through Composting and mulching    | Rainfed crops                            | N  | BOA                          |
| Water cycling   |   |  |  |                              |
| Habitat provisioning  |   |  |  |                              |
| Production of oxygen/ Gas regulation  |   |  |  |                              |
| Other [ <i>please specify</i> ]:  |   |  |  |                              |

**Table 3 - List of wild food species gathered for food in your country**

| Species (local name) | Species (scientific name)                                | Production systems or other environments in which present and harvested | Change in state (2,1,0,-1,-2, NK) | Differences within species identified and characterized (Y/N) | Source of information |
|----------------------|--|---|-----------------------------------|---|-----------------------|
| Grouper              | <i>Plectropomus</i> sp.                                  | Self recruiting capture fisheries ; Fed                                 | -2                                | Y   |                       |
| Rabbit fish          | <i>Siganus canaliculatus</i>                             | Self recruiting capture fisheries ; Fed                                 | -2                                | Y   |                       |
| Humphead Parrot fish | <i>Bolbometopon muricatum</i>                            | Self recruiting capture fisheries                                       | -2                                | Y   |                       |
| Snappers             |  | Self recruiting capture fisheries                                       |                                   |   |                       |
| Turtles              | <i>Chelonia mydas</i> ,<br><i>Eretmochelys imbricata</i> | Self recruiting capture fisheries                                       | -2                                | Y   |                       |
| Tuna                 | <i>Thunnus albacares</i>                                 | Self recruiting capture fisheries                                       |                                   |   |                       |
| Wahoo                | <i>Acanthocybium solandri</i>                            | Self recruiting capture fisheries                                       |                                   |   |                       |
| Napoleon Wrasse      | <i>Cheilinus undulates</i>                               | Self recruiting capture fisheries                                       | -2                                | N   |                       |
| Goat fish            |  | Self recruiting capture fisheries                                       |                                   |   |                       |
| Unicorn fish         |  | Self recruiting capture fisheries                                       |                                   |   |                       |
| Surgeon fish         | <i>Paracanthus hepatus</i>                               | Self recruiting capture fisheries                                       |                                   |   |                       |
| Mangrove Crab        | <i>Scylla serrata</i>                                    | Self recruiting capture fisheries ; Fed                                 | -2                                | Y   |                       |
| Coconut Crab         | <i>Birgus latro</i>                                      | Self recruiting capture fisheries                                       | -2                                | N   |                       |
| Rock Lobster         | <i>Panulirus</i> sp.                                     | Self recruiting capture fisheries                                       | -2                                | Y   |                       |
| Giant Clam           | <i>Tridacna</i> sp.                                      | Self recruiting capture fisheries; Non-fed aquaculture                  | -2                                | Y   |                       |
| Trochus              | <i>Trochus niloticus</i>                                 | Self recruiting capture fisheries                                       | -2                                | N   |                       |
| Sea Cucumber         | <i>Holothuria</i> sp.<br><i>Actinopyga</i> sp.           | Self recruiting capture fisheries                                       | -2                                | Y   |                       |
| Sand Clam            |  | Self recruiting capture fisheries                                       |                                   |   |                       |

(e) It is estimated that 80% of the population eat wild food.

(f) The status and trends of associated biodiversity of relevance to food and agriculture are far less systematically monitored than of animal, aquatic, forest and plant genetic resources. Considering the lack of quantitative data and monitoring capacity for many environmental processes and species in Palau, effort has been made to identify qualitative indicators of ecosystem health. It is hoped that using qualitative indicators can be used to improve environmental until local capacity for qualitative data collection and management improves. Some progress has been made in improving understanding of possible indicators of ecosystem health. The Belau National Museum, in cooperation with the Palau Conservation Society and the Palau International Coral Reef Center, has completed preliminary studies to identify bird species that can be used to indicate near shore environmental quality. More research and analysis is needed to improve understanding of the conservation needs facing Palau as well as to improve the ability to monitor and analyze the outcomes of conservation initiatives. Across all sectors, the lack of quantitative data and analysis is a major hindrance to developing effective policies and monitoring any effects that management programs may produce.

The drivers of change affecting associated biodiversity, ecosystem services and wild food resources are:

- Climate change
- Economic development – land use

**BOX 1:**

BUL ((moratorium on harvesting and other activities)is implemented in Palau. This is a traditional way of conserving certain species during times of low availability. There is a total ban on harvesting certain marine food species for conservation and to allow for reproduction and multiplication. In addition certain areas in each state is designated as Marine Protected Area where fishing is banned to protect fish stocks and reefs so future generations can profit from these efforts.

**The Palau Protected Areas Network (PAN)** is a nationwide network of terrestrial and marine protected areas that aims to protect areas of significant biodiversity, important habitats, and other valuable resources that are essential to the future social, cultural, economic and environmental stability and health of Palau. To date there are 15 PAN sites that consist of single sites and networked sites. These 15 sites have a management plan that guides conservation and natural resource management efforts within their borders and are implemented by site conservation officers employed at the state in which these sites are located. All of these managed sites have goals and objectives that speak to biodiversity conservation.

**Belau Watershed Alliance:** This community-based organization strives to protect water resources and watersheds in Babeldaob and Palau. By protecting watersheds, the alliance plays a vital role in biodiversity protection. Because BWA represents communities and resource owners, it is sometimes able to achieve conservation objectives that become stalled at the national level due to political reasons. Establishing buffer zones alongside rivers is an example of a conservation measure that the OEK failed to approve but has been approved by BWA and is being enforced by state governments.

- Invasive species
- Overharvesting and exploitation linked to economic development

### **1.3 Needs and Priorities**

(a) Country's main needs and priorities in terms of BFA

There are no monitoring activities on associated biodiversity.

In order to outline any changes in components of associated biodiversity within production systems baseline data of associated biodiversity for each production system is required and from this baseline continuous or systematic monitoring of the levels of associated biodiversity for each production system, as coded, is necessary in order to detect changes. At present, the existence of such data is virtually non-existent and can only be assumed in terms of 'healthy or not' on the basis of the general ecosystem health, assuming that is subject to some assessment.

Better understanding of pollinators – species and roles, and possible impact of climate change on their behavior.

Watershed management and water systems management must go hand-in-hand and be supported by Sustainable Land Management. While there is growing awareness about watershed issues and important work is underway to protect watersheds, development pressures threaten to outpace water management regimes.

The large number of treaties and conventions pertaining to biodiversity provide important financial, technical and political support for domestic work. The number of agreements, however, is a constraint in that each has its own reporting and administrative obligations. These obligations place stress on a small country like Palau with limited human and institutional resources. This situation is likely to be the same for all PICs therefore some harmonization of reporting and administrative obligations are required. Along the same lines, an active coordinating mechanism (such as the National Environment Protection Council -NEPC) that brings stakeholders together is required.

Human resources are a major constraint. There is more work to be done than qualified Palauans which means that many officials wear multiple hats and ultimately, some important work does not get done. Since biodiversity and environmental protection cross cut many sectors, a stronger domestic arrangement for human resource development is vitally needed at the same time that country-to-country arrangements are strengthened at the sub-regional and regional levels.

A lot of resources are allocated to marine research; similar commitment is needed for terrestrial research.

Clear policy direction for agriculture – the sector is under-resourced and needs to have a clear focus well supported by the whole-of-government and the whole-of-society. Priorities should include - develop sustainable forest-based sources of livelihood including ecotourism, agroforestry, and sustainable harvest.

Increased support for fishers including assistance in diversifying their incomes through tourism and offshore fishing - promoting aquaculture to promote food security while reducing pressure on wild fish stocks

Improved monitoring of the health of coastal resources

## II Sustainable use and conservation of BFA

### 2.1 Sustainable use -

#### (a) Management and diversity based practices

Table 4a: Management and diversity-based practices that support the maintenance and use of biodiversity for food and agriculture in production systems.

| Production System                          | Management/diversity based practice   | Trends in the application of the practice over the past 10 years |
|--|---|--|
| Livestock landless systems:                | Landscape management; Sustainable soil management practices; Water management practices, water harvesting; Organic agriculture  | 1  |
| Naturally regenerated forests: Tropics     | Landscape management; Sustainable soil management practices; Water management practices, water harvesting; Agroforestry; Reduced-impact logging   | 1  |
| Planted forests: Tropics                   | Landscape management; Sustainable soil management practices; Water management practices, water harvesting; Agroforestry; Reduced-impact logging   | 1  |
| Self-recruiting capture fisheries: Tropics | Ecosystem approach to capture fisheries; Conservation hatcheries  | 2  |
| Fed aquaculture: Tropics                   | Conservation hatcheries   | 2  |
| Non-fed aquaculture: Tropics               | Conservation hatcheries   | 2  |
| Rainfed crops - tropics                    | Integrated Plant Nutrient Management (IPNM); Integrated Pest Management (IPM); Landscape management; Sustainable soil management practices; Conservation agriculture; Water management practices, water harvesting; Agroforestry; Organic agriculture; Low external input agriculture; Home | 2  |

|  |                           |  |
|--|---------------------------|--|
|  | gardens; seedling gardens |  |
|--|---------------------------|--|

**Box 2:****Palau Conservation Society (PCS)**

Since 1994, PCS has worked with Palauan communities to protect natural resources by establishing locally managed conservation areas, developing watershed management strategies and increasing awareness about all aspects of conservation and protection of natural resources. PCS has worked with several states to create, monitor and manage protected areas. In 2002, PCS began to focus more effort on working with communities and partner agencies on conservation and awareness projects on Babeldaob, where much of the new development in Palau is occurring. Working with Airai state government and EQPB, in 2013 PCS completed the 5-Year Airai State Watershed Management Plan, the first state-level watershed management plan in Palau.

**The Northern Reef Management Plan**

In March 2014, The Nature Conservancy and WildAid partnered to design an enforcement system for Palau's Northern Reefs that is practical, affordable, and feasible to implement over a four-year time frame. The system provides strategic sensor coverage to key fishing areas, MPAs, and access ways. The strategy combines high-power video cameras and a robust VHF marine radio network with the strategic placement of buoys, patrol vessels, and a floating barge to provide a constant presence and fast response capacity throughout both Marine Managed Areas (MMAs).

**Aquaculture**

Palau has been involved in aquaculture for more than 35 years beginning in 1973 when the Micronesia (now Palau) Mariculture Demonstration Center was established. Pioneering work conducted there developed the technology for farming the giant clam. The Mariculture Center continues operation with a focus mainly on giant clams. A new center for aquaculture research has been established in Ngaremlengui (at laboratories located on the extension campus of PCC) and a new center of production established in Ngatpang. With increasing population and tourism and declining production of inshore fisheries, aquaculture is the key to sustainably meeting the demand for aquatic food in the next decade. The Bureau of Marine Resources is responsible for creating an enabling environment supportive of aquaculture.

**Best management practices:** taking into consideration the economic needs of managed areas, their ongoing importance to tourism, agriculture and other industries, and the intrinsic value of biological resources, management plans have been designed to promote implementation of best management practices (BMPs) as a method for achieving sustainability. BMPs include both generally accepted management solutions as well as Palau-specific practices based on traditional knowledge of the local environment.

**Agricultural Biodiversity:** There are more than a hundred varieties of taro grown in Palau. Palauans traditionally grow a wide range of taro varieties in any given taro patch, thus making it less vulnerable to being wiped out by a pests and diseases. This significantly contributes to food security and nutrition to the communities as well as stable livelihoods. It also increases the resilience of the production system.

Examples whereby the biodiversity per se, or its lack, had a direct effect on productivity; food security and nutrition; rural livelihoods; ecosystem services; sustainability; resilience; or sustainable intensification.

**Table 4b - Effect of the lack of biodiversity for food and agriculture on production, food security and nutrition and livelihood.**

| Production system | Biodiversity component for which diversity is lacking | Extent of problem (2,1) | Effect on food security and nutrition | Effect on livelihood | Reference                     |
|-------------------|---|-------------------------|---------------------------------------|----------------------|-------------------------------|
| Rainfed crops     | 1   | 2                       | 2                                     | 2                    | Local knowledge, PGRFA Report |
| Livestock         | 1   | 2                       | 2                                     | 2                    | Local knowledge               |
| Aquaculture       | 1   | 2                       | 2                                     | 2                    | Local knowledge               |

**Table 5 Examples whereby the use of biodiversity for food and agriculture (BFA) contributed to cope with climate change, invasive alien species, and natural or human-made disasters**

| Objective  | Description   |
|--|---|
| Use of BFA to adapt to and mitigate climate change <sup>2</sup>  | Taro varieties have been found to be salt tolerant and capable of survival and growth in salt water intruded taro patches affected by sea level rise.   |
| Use of BFA to manage the spread of/control invasive alien species <sup>3</sup>   | Biological control of <i>Chromolaena odorata</i> (Siam weed) using the gallfly <i>Cecidochares connexa</i> and <i>Mimosa diplotricha</i> (giant sensitive plant) using the psyllid insect <i>Heteropsylla spinulosa</i> |
| Use of BFA to prevent natural or human-made disasters and/or reduce their effects on livelihoods, food security and nutrition <sup>4</sup> | Coastal planting of mangroves   |

**d) List and briefly describe ecosystem/landscape/seascape approaches that have improved the management and use of biodiversity for food and agriculture in the country.**

<sup>2</sup> Reference: question 69 of country report guidelines.

<sup>3</sup> Reference: question 46 of country report guidelines.

<sup>4</sup> Reference: question 43 of country report guidelines.

**Table 6.** Adoption of and importance assigned to ecosystem approaches in production systems in the Country.

| Production system    | Ecosystem approach adopted (name)                                   | Extent of adoption (2,1,0,NA) | Importance assigned to the ecosystem approach (2,1,0,NA) |
|----------------------|---|-------------------------------|--|
| Rainfed Crops        | Best Agricultural Practices   | 1                             | 1  |
| Forestry (F1 and F5) | Integrated Water Resource Management; Sustainable Forest Management | 1                             | 2  |

PCS’s Ridge to Reef Road Show, an ecosystem-based curriculum on watersheds, has been included in the fifth grade curriculum and is part of the annual schedule. PCS is working to expand environmental curriculum beyond the fifth grade. In 2011 PCS and the University of Guam Sea Grant launched a new project called “Biib’s Kids.” The Biib’s Kids project partners with teachers in grades 5 through 8 to expand the Ridge to Reef Road Show to grades beyond the fifth grade. As a kick-off to the project, PCS and UOG Sea Grant offered five competitive incentive grants to teachers to design projects on any of the Ridge to Reef Road Show themes (watersheds, forests, marine ecosystems, biodiversity, and climate change)<sup>5</sup>.

GEF funded Ridge-to-Reef project: Palau plans to focus on managing the full range of its Protected Area Network in association with many areas not captured by the PAN. (areas targeted for sustainable land and forest management). It will focus on an integrated approach with regards to land-use management, forest management and water and coastal management to enhance their ecosystem services.

**Table 7. Landscape based initiatives to protect or recognize areas of land and water in the country with particular significance for biodiversity for food and agriculture.**

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<sup>5</sup> <http://www.palauconservation.org/cms/index.php/conservation-programs/communication-and-outreach/environmental-outreach-and-schools>

| Landscape based initiatives | Description of sites and their characteristics of relevance to biodiversity for food and agriculture  | Extent (area)      |
|-----------------------------|---|--------------------|
| RAMSAR Wetland              | The Ngardok Nature reserve is the first designated Ramsar Wetland site of importance. Lake Ngardok is the largest natural lake in Micronesia. The traditional leaders of Melekeok established the Ngardok Nature Reserve to protect the watershed from degradation, the special qualities of the lake and integrity of the forests above the lake are critical to preserving the water quality. |                    |
| World Heritage Site         | The southern Lagoon of the Rock Islands have been designated as a World Heritage Site   |                    |
| Ngermeduu Conservation Area | Protection of marine habitat biodiversity. First UNESCO biosphere reserve in Pacific Islands region. Largest estuary in Micronesia, including mangroves, mudflats, sea grass beds, fringing reefs, reef channel, inner reef flats, reef slope   | 167km <sup>2</sup> |

**(e) Activities undertaken to maintain and use traditional knowledge of Associated biodiversity and wild foods**

In Lake Ngardok, Melekeok State, the plant Hanguana malayana (local name, euais) is believed to purify water and enrich the habitat for fresh water fish and shrimp. The plant is also a sign of water availability. One way of passing down the traditional knowledge is through wood carvings of ancient customs and traditional practices.

The women in Palau are responsible for the sustainable management, conservation and preservation of traditional knowledge and skills on taro and crop production, clams, sea cucumber, mud clams (ngduul). On the other hand, the men are responsible for the sustainable management, conservation and preservation of coastal marine species (fish, lobster, mangrove crabs, clams, turtle)

Bul is a traditional way of conserving certain marine species during times of low availability. There is a total ban on harvesting certain marine food species to allow for reproduction and multiplication.

**(f) Identify possible needs and priorities in terms of sustainable use of BFA and in particular of associated biodiversity and wild foods.**

- National policies and strategies in place to support sustainable use of BFA – especially for agriculture and fisheries, for example, land management policies that permit or limit production practices.

- Certification systems, such as organic certification, that encourage sustainable practices in production systems - market creation for products or services provided by ecological agriculture may be important in ensuring long-term adoption of sustainable practices, substituting public financial support after an initial phase.
- Increased awareness and education for all stakeholders including decision-makers, researchers, producers and consumers is needed to highlight the multi-functionality of agriculture and the interconnectedness of biodiversity, ecosystem functioning and human health.
- Identification of the associated biodiversity found within the different production system
- Knowledge on how management practices and diversity-based interventions influence BFA
- Knowledge (technical/field) on management practices and diversity-based interventions that support the sustainable use of BFA

**a. In situ conservation of associated biodiversity and wild food species.**

Caring for the environment has long been an important part of Palau's culture. For centuries, traditional leaders on these Pacific Ocean islands have worked to protect local waters through enactment of a "bul" – a moratorium on catching key species or fishing on certain reefs to protect habitats that are critical to the community's food security. Palau has taken a leading role that creates a modern day "bul" which puts the marine environment first. The Palau National Marine Sanctuary Act establishes one of the world's largest protected areas of ocean. The sanctuary will fully protect about 80 per cent of the nation's maritime territory, a higher percentage than in any other country. Full protection means that no extractive activities such as fishing or mining can take place. The reserve covers 500,000 square kilometers (193,000 square miles).

Most Marine Protected Areas (MPAs) had larger biomass of 'resource fish' (commercially important species) than nearby unprotected areas. Total resource fish biomass was, on average, twice as large in MPAs as at nearby control areas. The most striking difference between MPAs and unprotected areas was the fivefold greater biomass of top predators in the MPAs, which shows that no-take marine reserves in Palau are effective at conserving top predators.

The Palau Protected Area Network is also an innovative mechanism designed to protect the nation's critical biodiversity and ensure the resources are effectively conserved.

Palau has also established the world's first Shark Sanctuary. Palau forbids any kind of shark fishing within its Exclusive Economic Zone, and the shark sanctuary covers roughly 600,000 square km, protecting species that are already endangered or vulnerable. By creating the sanctuary Palau is protecting over 135 Western Pacific shark species as well as rays – species that are vital to the balance of the ocean's ecosystems.

## ***Sub-regional/regional initiatives***

The Micronesia Challenge<sup>6</sup> is a commitment by the Federated States of Micronesia, the Republic of the Marshall Islands, the Republic of Palau, Guam, and the Commonwealth of the Northern Marianas Islands to preserve the natural resources that are crucial to the survival of Pacific traditions, cultures and livelihoods. The overall goal of the Challenge is to effectively conserve at least 30% of the near-shore marine resources and 20% of the terrestrial resources across Micronesia by 2020. The challenge covers:

6.7 million square kilometers of the Pacific ocean. The Challenge represents more than 20% of the Pacific Island region and 5% of the largest ocean in the world.

- 66 species in Micronesia recorded on the IUCN Red List
- 1,300 species of fish living in the waters of Micronesia
- 483 species of corals (60% of all known corals)
- 1400 species of plants (200 endemic)
- 85 species of birds (50% endemic)
- 104 of the 218 recognized Endemic Bird Areas confined entirely to islands around the world.

The BirdLife Pacific Partnership has started a new four-year European Union funded regional Invasive Species programme which seeks to reduce the spread and the environmental and socio-economic impact of invasive alien species by supporting the eradication and control of invasive alien species and also enhancing biosecurity. BirdLife Partners involved in the programme are Te Ipukerea Society (Cook Islands), Palau Conservation Society, NatureFiji-MareqetiViti, O Le Si'osi'omaga Society Inc. (Samoa), Société d'Ornithologie de Polynésie (French Polynesia) and Société Calédonienne d'Ornithologie (New Caledonia). In Palau the target is eradication of rodents<sup>7</sup>

The Framework for Nature Conservation and Protected Areas in the Pacific Islands region, 2014-2020 will provide guidance for the region on key priorities for biodiversity conservation and ecosystem management with clear linkages to NBSAPs and the Aichi Biodiversity targets. Strategic goal C is 'to improve the status of biodiversity by safeguarding ecosystems, species and diversity'<sup>8</sup>

### ***b) Describe the status of ex situ conservation of associated biodiversity and wild food species in your country:***

- **List and describe any existing national ex situ conservation initiative(s).**

There are no national ex situ conservations initiatives on associated biodiversity and wild food species

- **Indicate which species/groups of species are being conserved and with what objective(s).**

**There are no national ex situ conservations initiatives on associated biodiversity and wild food species but ex situ conservation of root crops such as taro, cassava and sweet potato is currently carried out at the Palau Community College Research and Development**

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<sup>6</sup> <http://themicronesiachallenge.blogspot.co.uk/p/about.html>

<sup>7</sup> <http://www.birdlife.org/pacific/news/birdlife-pacific-invasive-species-programme>

<sup>8</sup> <https://www.cbd.int/sp/targets/>

**Station primarily for conservation for food security of the nation and to support distribution.**

**Describe any existing sub-regional/regional ex situ conservation initiative(s) the country is involved in.**

Palau, as a SPC member country can participate in ex situ conservation through SPC and USP. In 2011, the Secretariat of the Pacific Community developed the Pacific Islands Tree Seed Centre (PITSC) to help research, conserve and disseminate seeds of socio-economically important tree species for its 22 member countries and territories, including Palau.

In April 2014 the RBG, Kew and SPC signed a 10-year agreement to work together in supporting and implementing plant conservation activities in the Pacific region, specifically with the PITSC.

The vision of the Regional Strategy and Action Plan on Forest Genetic Resources Conservation and Management is: by 2020, the Pacific Island Countries and Territories are enjoying improved livelihoods, greater food security and increased environmental protection, resulting from enhanced collaboration and coordination within and between them in the conservation, management and sustainable utilization of forest genetic resources, while maintaining their unique Pacific cultures

The SPC Centre for Pacific Crops and Trees can support SPC member countries in conserving agricultural biodiversity.

The Fiji Herbarium at the University of the South Pacific houses more than 50,000 vascular plant specimens in the main collection. It also has a wet collection of plant parts, bryophytes and algae from the Pacific region. The Herbarium serves as a very important resource in matters pertaining to the taxonomy, conservation and ecology of plants, forestry, land use planning, economic plants and weed problems in the region.

Constraints for ex situ conservation in the region include limitations in, or lack of, research, national policies and strategies, funding, facilities, public education and training for staff, as well as land tenure issues.

***c) Identify possible needs and priorities in terms of the conservation of biodiversity for food and agriculture, and in particular of associated biodiversity and wild food species.***

- Close coordination and collaboration with the Department of Agriculture is needed to ensure that any planned expansion in agriculture does not impact negatively on sensitive habitats – cross-sectoral collaboration
- Improved monitoring and data gathering is needed including mapping data to enable future assessment of the environmental impacts of agriculture on the environment.
- Increased awareness and education for all stakeholders including decision-makers, researchers, producers and consumers is needed to highlight the multi-functionality of agriculture and the interconnectedness of biodiversity, ecosystem functioning and human health.
- Capacity building and supplementing is needed either at the national, sub-regional or regional level to support both development of conservation strategies, including prioritization and development of technologies.

- Build capacity of communities to become informed partners in land use planning. More active participation by communities in land use planning will lay a foundation for states to develop and implement land use plans, which will set the stage for conservation of BFA.
- Increase in use of ridge-to-reef, landscape and ecosystem approaches
- More research and analysis is needed to improve understanding of the conservation needs facing Palau as well as to improve the ability to monitor and analyze the outcomes of conservation initiatives, including indicators of ecosystem health. For example, the 5<sup>th</sup> NBSAP report notes that recent survey work has increased the number of ant species known to occur in Palau from an original estimate of 16 species to 80 or more species with at least eight previously undescribed species and two undescribed Genera. The surveys established the presence of functional groups of ants that can be used as bio-indicators for monitoring the health of Palau's forest ecosystems

**2.3. Access and Exchange Describe in Table 6 the main measures in the country (i) regulating access to; and (ii) ensuring the fair and equitable sharing of benefits arising from the utilization of biodiversity for food and agriculture.**

- Palau is a signatory to the International Treaty for Plant Genetic Resources for Food and Agriculture. As such it has access to genetic resources from other countries, and also is subject to fair and equitable sharing of benefits arising from utilization of genetic resources. Palau is a beneficiary of the FAO Treaty Benefit Sharing Project.

| Components of BFA              | Description of measures governing access to BFA  | Description of measures regulating the fair and equitable sharing of benefits arising from the utilization of BFA |
|--------------------------------|--|---|
| <i>Genetic resources</i>       |  |   |
| PGRFA                          | Palau ratified the ITPGRFA so ABS is through the IT MLS  |   |
| AnGR                           | Palau signed the Nagoya Protocol in 2011 but has not ratified  |   |
| FGR                            | Palau signed the Nagoya Protocol in 2011 but has not ratified  |   |
| AqGR                           | Palau signed the Nagoya Protocol in 2011 but has not ratified  |   |
| <i>Associated biodiversity</i> |  |   |
| Micro-organisms                | Any research into marine organisms would likely be in collaboration with USP which is the regional agency with expertise in this area. |   |
| Invertebrates                  |  |   |
| Vertebrates                    |  |   |
| Plants                         |  |   |
| Wild foods                     |  |   |

Bioprospecting began in Palau in the early 1970s and continues today. Over 150 technical publications on marine natural product compounds have been produced from studies in Palau, and the Palau-based Coral Reef Research Foundation (CCRF) has held the prestigious US National Cancer Institute's (NCI) shallow water marine collections contract since 1992 making Palau one of the most thoroughly sampled regions in the world for potential anti-cancer drugs. CCRF works only for the US NCI, which has in place state of the art agreements to protect the rights of the countries in which it works. Commercial development of a

drug or other product cannot occur unless a royalty and licensing agreement is in place with the source country. If traditional knowledge is used to identify product for testing, that contribution is recognized. Palau needs to enact legislation to ensure all researchers follow similar procedures.

### ***III. Policies, Institutions and Capacity***

#### ***3.1 Policies, programmes, institutions and other stakeholders***

***a. Policies and programmes the country has adopted and is implementing to support the conservation and sustainable use of BFA: specify to which extent they address associated biodiversity and wild foods***

Policy directives for Strategic Area 6 are aimed at identifying and preserving locally important agricultural species and varieties. Traditional agricultural practices often included planting a variety of plants in the same plot, while modern imported practices favor monocultures, in which a single variety of a species is planted in a plot. Monocultures are particularly susceptible to environmental disturbances. Maintaining varied agricultural plant lines improves food security by preserving varieties that may be more resistant to drought, disease, pests, flooding or other factors that can result in crop failures. Protecting agricultural biodiversity reduces direct pressure on biodiversity, promotes sustainable use, protects genetic diversity and enhances benefit sharing, which supports Strategic Goals A, B, C and D of the Strategic Plan for Biodiversity 2011---2020 and the Aichi Targets. Policy directives will be achieved through creation of a comprehensive inventory of agricultural plants, including varieties within species; evaluation of the conservation status of agricultural species and varieties; and development of a sustainable management and conservation strategy for agro---biodiversity. (Palau NBSAP 2015)

Programmes with a BFA focus include:

- Marine Protected Areas have been observed to have a larger biomass of commercially important species than unprotected areas.
- Protected Areas Network is composed of terrestrial and marine protected areas of significant biodiversity, important habitats and other valuable resources that are essential to future social, cultural, economic and environmental stability and health of Palau. There are currently 15 PAN sites with management plans implemented by conservation officers.
- Northern Reef Marine Sanctuary is an enforcement system located in the reef areas of Ngarchelong and Kayangel State primarily for the conservation of marine resources for the future generations.
- Micronesia Challenge aims to effectively conserve at least 30% of near shore marine resources and 20% of terrestrial resources in Micronesia, which are essential to the survival of Pacific traditions, cultures and livelihoods.
- Palau Shark Sanctuary bans fishing of Western Pacific shark species within the Exclusive Economic Zone, which covers 600,000 square km.
- Melekeok State Land Use Plan, Airai State Master and Land Use Plan and Airai State Watershed Management Plan are strategies for the zoning and management of areas within their respective state for regulation and conservation purposes.

Palau won the 2012 Future Policy Gold Award for their Protected Areas Network Act 2003 and their Shark Haven Act, 2009. Palau was selected as the Gold Award winner out of 31 policies that were nominated from 22 countries. The island nation is recognized for their policies that engage local communities and traditional management systems of natural resources and for taking the global lead with others to counteract the dramatic decline in shark populations.

- b. Strengths and weaknesses of the policies and programmes and level of implementation
- A general weakness would be the lack of/limited capacity for monitoring and recording data on conservation
  - A general strength would be the increased awareness of the importance of those areas both nationally, regionally and as with the Shark Sanctuary internationally.

***Highlight how stakeholder groups have actively contributed to the improved sustainable use and/or conservation of BFA and maintenance of ecosystem services***

- Northern Reef Management was developed and implemented with the assistance of fisher folk in Ngarchelong and Kayangel States.
- Palau Community College - Collection, conservation and maintenance of the root crops germplasm collection of Palau is actively done at the PCC Research and Development Station was done with the participation of women farmers in Palau

***Provide up to three examples to highlight how stakeholder groups have actively contributed to the improved sustainable use and/or conservation of BFA and maintenance of ecosystem services***

***Belau Watershed Alliance (BWA)***

BWA is an organization comprised of representatives from government organizations, NGOs, and the private sector with the mission of improving watershed management throughout Palau. The BWA promotes cooperation between various stakeholders in order to make the best possible use of available knowledge and resources to protect water quality and quantity, ecosystem services and biodiversity within watersheds. In September 2013 the BWA hosted a regional watershed management summit in Koror, which included attendees from throughout Micronesia

**The Babeldaob Ecosystem-based Management (EBM) Initiative** is a response to the decline of Babeldaob's coastal resources brought about by increased urban and commercial development. It strives to mitigate the threats of increased urbanization to the ecosystems and communities on Babeldaob Island by improving natural resource management in these communities. Partners included PCS, the Palau International Coral Reef Center (PICRC), the Palau Environmental Quality Protection Board (EQPB), the Belau National Museum (BNM), the Office of the Palau Automated Land and Resource Information Systems (PALARIS) and the Bureau of Arts and Culture (BAC). A recent achievement of the Palau EBM Project was the adoption, by Presidential Executive Order, of a national monitoring project using birds as indicators. Additionally, the Palau Environmental Quality Protection Board (EQPB) adopted a standard set of bird indicators and a monitoring protocol as part of its permitting requirements and process. The Belau National Museum leads these bird monitoring and training programs.

However it had two outcomes, which are very important for conservation effort.

1. Conservation planning takes an ecosystem based management approach (holistic which is why in Palau the basic unit for conservation has to be the watershed) and
2. Palau's Conservation Consortium- Palau's environment agencies/orgs have to collaborate and coordinate with one another because there is not enough technical expertise, bodies to work independently.

c. Successful inter-ministerial cooperation in the area of conservation and sustainable use of BFA

Best management plans: Taking into consideration the economic needs of managed areas, their ongoing importance to tourism, agriculture and other industries, and the intrinsic value of biological resources, management plans have been designed to promote implementation of best management practices (BMPs) as a method for achieving sustainability. BMPs include both generally accepted management solutions as well as Palau-specific practices based on traditional knowledge of the local environment.

Most of the programs in conservation and sustainable use of biodiversity for food and agriculture are implemented by agencies under the Ministry of Natural Resources, Environment and Tourism such as the Bureau of Agriculture, Bureau of Marine Resources. However there are also conservations programs under each local state government such as the Protected Areas Network. Moreover, the enforcement of laws for the different conservation programs such as the Division of Fish and Wildlife and Division of Law Enforcement are under the Ministry of Justice.

d. Needs and priorities in terms of policies, programmes and institutions governing BFA and AB and wild food species

Across all sectors, the lack of quantitative data and analysis is a major hindrance to developing effective policies and monitoring any effects that management programs may produce. Without more and better data and data analysis, agencies are severely limited in their ability to design, implement, and monitor the effectiveness of environmental policies. Anecdotal observations made by fishermen and other individuals with regular interaction with the environment provide valuable information for shaping policy decisions, but systematic, quantitative data is necessary to improve the quality of environmental management. Some progress has been made in filling in some data gaps through research supported by partnerships between government, NGOs and the private sector. However, considerable capacity development is needed in order to establish and maintain ongoing data collection, monitoring, reporting and analysis systems.

### 3.2 Capacity

a. Training and education needs that target the conservation and sustainable use of AB

The following table was compiled as a result of a National Capacity Needs Self-Assessment for Environmental Management in Palau (2007)<sup>9</sup>

### Comprehensive Analysis of Capacity Constraints in Area of Biodiversity

| Obligations   | Capacity Constraints  |
|---|---|
| Effective National Biodiversity Planning                            | <p>Lack of understanding by decision makers that biodiversity protection should be a high-priority consideration for all legislation, not only environmental legislation.</p> <ul style="list-style-type: none"> <li>☐ Weak/no comprehensive biodiversity policy and legislation, particularly in areas of biotechnology and biosafety.</li> <li>☐ Weak framework for cooperation in matters related to biodiversity.</li> </ul>  |
| In-situ and ex-situ conservation of biological diversity            | <p>Lack of human resources capacity for biodiversity conservation and sustainable use.</p> <ul style="list-style-type: none"> <li>☐ Low institutional capacity of public, NGO, CBO, PVO agencies for the conservation and sustainable use of biodiversity.</li> </ul>   |
| Identification and Monitoring of components of biological diversity | <p>General lack of, or weak capacity for, assessment, identification and monitoring of components of biodiversity.</p> <ul style="list-style-type: none"> <li>☐ No comprehensive standardized baseline data, criteria and indicators so biodiversity can be measured and monitored.</li> <li>☐ Lack of a biodiversity assessment and monitoring program and systems.</li> <li>☐ General lack of taxonomic expertise at the national level for biodiversity characterization, conservation and sustainable use.</li> </ul> |
| Economically and socially sound incentive measures                  | <p>No explicit strategy, policy or program on incentive measures for biodiversity conservation and sustainable use.</p> <p>Some existing policies act as perverse incentives.</p> <p>Lack of a national incentive program to induce compliance.</p> <p>No capacity development / building in incentive measures</p>   |
| Scientific and technical research and training                      | <p>Lack of data in the structure and function of ecosystems.</p> <p>Lack of relevant socio – economic and policy planning capacity and data.</p> <p>Lack of human resources, resulting in a lack of technical expertise necessary to carry out activities prioritized in the NBSAP.</p>   |

<sup>9</sup>

<http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Integrating%20Environment%20into%20Development/ncsa/final%20report%20and%20action%20plan/english/ncsa-palau-fr-ap.pdf>

|  |  |
|--|--|
| Promotion and encouragement of understanding of the importance of biodiversity | Lack of effective enforcement of the laws especially with regards to wildlife and poor understanding of biodiversity conservation and sustainable use issues and practices.<br><input type="checkbox"/> Inadequate environmental education campaign efforts.<br><input type="checkbox"/> No / little biodiversity teaching in schools  |
| Implement the Cartagena Protocol on Biosafety                                  | Poor capacity in biotechnology as well as poor awareness of the impact of products of biotechnology on human health and the environment.<br><input type="checkbox"/> No comprehensive legislative and policy framework to guide the use of biotechnology in the country.<br><input type="checkbox"/> No national institutional structure to regulate and monitor the use of biotechnology and biosafety issues |
| Control of Alien Invasive Species  | Poor understanding and information on status of invasive alien species and their impact on biodiversity as well as the methods to eradicate them.<br><input type="checkbox"/> Lack of a comprehensive legal and legislative framework on invasive alien species including non- enforcement of existing laws.   |
| Promotion of access and benefit sharing  | No legislative policy or administrative measures to facilitate ABS in the use of genetic resources as well as lack of ABS negotiation skills.<br><input type="checkbox"/> Lack of national capacity to implement a regulatory regime on ABS.   |
| General Implementation   | No national body charged with coordinating the NBSAP to ensure that all aspects of the plan are being addressed and that minimizes the duplication of effort.<br><input type="checkbox"/> Lack of adequate financial assistance  |
|  |  |

Also:

- Increase and improve communication on biodiversity, using a variety of media (books, electronically) at all levels (from elementary school to technical publications)
  - Improve awareness about biodiversity
    - Prevent fires
  - Conduct targeted outreach to developers and their supporters on sustainable development
- b. Identify and prioritize research needs to strengthen the conservation and sustainable use of AB, wild foods and ecosystem services

Firstly consultations should be held with all key stakeholders, conservation and management organizations and others to determine priority research needs.

- Improve knowledge of species and habitat level biodiversity – what occurs in Palau and where, relationships.
- Develop an identification system for critical ecosystems to be protected under the PAN
- Conduct carrying capacity studies for expanded tourism<sup>10</sup>

<sup>10</sup> [Palau Conservation Society 2011. Biodiversity conservation in Palau, a complex picture with many diverse priorities](#)

- Expand/improve research on terrestrial BFA, collecting baseline data and implementing monitoring programmes for selected sites.
- Research into best practices for land use to reduce the sedimentation which is degrading the reefs – this is a particular problem in the watersheds of Babeldaob.

#### IV. Regional Cooperation

##### 4.1 Regional initiatives the country is involved in to conserve and use BFA

| Regional policies and programmes   | Description   |
|--|---|
| Pacific Plan   | Pacific Forum leaders agreed to the development of a ‘Pacific Plan’ with the goal to “Enhance and stimulate economic growth, sustainable development, good governance and security for Pacific countries through regionalism. The Plan has reference to ‘Improved Natural Resource Management and Environmental Management’ in the plans Strategic Objective no. 5, with initiatives being promoted in: sustainable development, fisheries, forestry, coastal waters, waste management, energy, freshwater management, biodiversity and climate change.   |
| The Framework for Nature Conservation and Protected Areas in the Pacific Islands region, 2014-2020 | The Framework will provide guidance for the region on key priorities for biodiversity conservation and ecosystem management with clear linkages to NBSAPs and the Aichi Biodiversity targets. Strategic goal C is ‘to improve the status of biodiversity by safeguarding ecosystems, species and diversity  |
| Pacific Islands Regional Marine Species Programme 2013-2017  | A regional strategy for cooperative conservation and management of dugongs, marine turtles, whales and dolphins in the Pacific Region. Other marine species of conservation concern will be added as the need arise.  |
| A New Song for Coastal Fisheries: Pathways to Change   | In March 2015, regional Pacific stakeholders and Governments engaged in collaborative planning to establish a new direction in the management of Coastal Fisheries. A New Song for Coastal Fisheries: Pathways to Change calls for a “...new and innovative approach to dealing with declines in coastal fisheries resources and related ecosystems”. The paper makes five recommendations designed to strengthen community-based ecosystem approaches to fisheries management (CEAFM) across the region by adopting a capacity development approach as an integrated strategy, to develop capacity in CEAFM in information, management, monitoring and enforcement functions, from community to national government. |
| Pacific Islands Regional Ocean Policy and Framework for Integrated Strategic Action (PIROP)        | The Pacific Islands Regional Ocean Policy is a policy for all the islands of the Pacific: it has been adopted by the leaders of all Pacific Island countries through the Pacific Islands Forum and is additionally supported by all Pacific Island territories. The Policy underscores the continuing importance of ocean and coastal resources and environments to the region’s nations, communities   |

|   |   |
|---|---|
|   | and individuals. Central to the policy is the belief that ocean, coastal and island ecosystems contain high biological diversity that has sustained the lives of Pacific Island communities since first settlement and that it is vital to reduce the negative impacts of human activities and implement measures that protect and conserve biodiversity. It is important that biodiversity protection be pursued in a way that is compatible with community control of resources, and not unduly restrictive of social and economic development, particularly at the community level |
| Regional Strategic Plan on the Conservation, Management and Sustainable Utilization of Forests and Trees Genetic Resources in the Pacific | Regional Strategic Plan on the Conservation, Management and Sustainable Utilization of Forests and Trees Genetic Resources in the Pacific approved in 2008 by Ministers and Heads of Agriculture and Forestry - serves as the framework for planning and implementing the conservation, management and sustainable use of forest and tree genetic resources with the PICT. One major recommendation from that Regional Strategy and Action Plan is the establishment of the regional tree seed centre   |
| Pacific Ridge-to-Reef Program   | Goal of the programme is to maintain and enhance Pacific Island countries' ecosystem goods and services (provisioning, regulating, supporting and   |
| Pacific Regional Action Plan on Sustainable Water Management  | One of the three key messages is: Implement strategies to improve the management of water resources, and surface and groundwater catchments (watersheds) for the benefit of all sectors including local communities, development interests, and the environment.  |

## 4.2 Needs and priorities

The main priority is improved coordination and information sharing between the different initiatives, which highlights the importance of:

- Clarifying the agency and staff responsible for this area of work which is embedded in different sectors
- Improved monitoring, evaluation, reporting and documentation to ensure information is shared across the initiatives
- Improved national to regional data collecting and reporting mechanisms
- Better knowledge management systems so data collected can be easily accessed and shared between programmes
- Increase in integrated policy planning with a ridge-to-reef /ecosystem/landscape approach
- Improved utilization of regional programmes/initiatives for capacity building
  - Establishment of a regional coordination post – possibly based in FAO

## V. Synthesis of needs and priorities and the possible way forward

- Table 8 - Summary of needs and priorities, and possible actions to be undertaken with respect to the four priority areas of the guidelines

| <b>Priority areas</b>              | <b>Needs and priorities</b>   | <b>Possible actions to be undertaken</b>  |
|------------------------------------|---|---|
| <b>Data collection</b>             | Overview of existing knowledge on biodiversity for food and agriculture at national level   | <p>Compile existing metadata at national level and identify information gaps</p> <p>Identify species or functional groups present at national levels</p> <p>Prioritize areas that need more knowledge, in the countries</p> <p>Strengthen the role of CGRFA, CBD &amp; Treaty focal points, <i>inter alia</i> by providing support in the form of human resources</p> <p>Improve the collaboration of regional and international agencies</p>         |
|                                    | Collection of baseline information on biodiversity for food and agriculture   | <p>Support training for collection of baseline data and create guidelines for this process</p> <p>Involve FAO and other agencies for technical and financial support, as appropriate</p>  |
|                                    | Development of knowledge management systems   | <p>Standardize data collection and monitoring methods to improve efficiency of data sharing</p> <p>Document existing datasets</p> <p>Establish/improve data storage and access systems to enable ongoing use of data and identify institutions that already have data management systems</p>  |
| <b>Knowledge/awareness raising</b> | Improvement of knowledge of native species and properties/uses/benefits (plants, birds, marine species, animals, forest, bees, associated biodiversity) | <p>Integrate knowledge about native species, associated biodiversity and their uses into school and university curricula</p> <p>Improve the dissemination of information on native species and their uses, at the national level</p>  |
| <b>Research</b>                    | Research on the role of biodiversity for food and agriculture for production systems and ecosystem services   | <p>Strengthen capacity for funding and research</p> <p>Identify, at the national and regional levels, priority species, productive systems or ecosystem services within each sector</p> <p>Monitor regional and international developments for clear research methods and understanding of interactions</p> <p>Increase collaboration between international and regional organizations, including national focal points and relevant stakeholders</p> |
| <b>Monitoring</b>                  | Identification of responsibilities for monitoring and assessing biodiversity for food and agriculture   | Mandate a national agency with the role of data collecting, monitoring and assessing biodiversity for food and agriculture (e.g. agriculture or environment or both)  |
|                                    | Identification of clear goals for monitoring and assessing biodiversity for food and agriculture  | Integrate assessment and monitoring of biodiversity for food and agriculture into national strategic plan   |
|                                    | Monitoring of established or newly introduced species specifically for pests (weeds, pathogens, invertebrates)  | <p>Establish monitoring and effective emergency response systems</p> <p>Identify risks and threats in the region, and promote collaboration and effective early warning systems</p>   |
|                                    | Monitoring of effectiveness of management decisions on biodiversity for food and agriculture, at national and regional levels                           | Design/adopt systems to monitor the impacts of management decisions on biodiversity for food and agriculture  |
| <b>Collaboration</b>               | Better collaboration  | Strengthen collaboration between agencies at the national level, possibly   |

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|  |  | through a committee chaired by a BFA focal point  |
| <b>Resources</b>   | Increased resources  | Evaluate existing projects at the regional level to identify overlaps and expertise that can be shared between countries.<br><br>Involve regional and international organizations for financial and technical support<br><br>Identify priority areas to maximize efficient use of resources   |
| <b>Training</b>  | Better knowledge of biodiversity for food and agriculture  | Provide training and capacity building on biodiversity for food and agriculture at all levels<br><br>Support local experts undertaking monitoring and assessment  |
| <b>Sustainable use – linking associated biodiversity and production system</b> | Identification of the associated biodiversity found within the different production system   | Study associated biodiversity which will require collaboration at international, regional and national levels to facilitate information sharing and research  |
|  | Knowledge on how management practices and diversity based interventions influence biodiversity for food and agriculture  | Study impact of specific management practices on biodiversity in different agricultural systems and at different locations and disseminate information to all relevant organizations  |
|  | Knowledge (technical a/field) on management practices and diversity-based interventions that support sustainable use of biodiversity for food and agriculture  | Collate and disseminate information and knowledge on the various practices and interventions and provide training for farmers, fishers, etc.  |
| <b>Sustainable use - policy support and enabling environment</b>               | Policy support for the sustainable use of biodiversity for food and agriculture  | Review existing policies including their implementation as to their coverage of and possible (negative or positive ) impact on sustainable use of biodiversity for food and agriculture (BFA)   |
|  | Adoption of sustainable management practices, genetic resources improvement practices and diversity-based interventions that strengthen sustainable use of BFA | Establish national policies and strategies that improve support to farmers, livestock keepers, forest dwellers, fisher folks and other stakeholders applying practices that favour the maintenance and sustainable use of BFA, strengthening food security and climate change   |
|  | Evidence based policies supporting sustainable use of BFA  | Improve monitoring and assessment of BFA in production systems to provide data/information for policy makers  |
|  | Use of local/traditional foods to support linkage of BFA with nutrition and health   | Strengthen public awareness building on the lessons learnt on the ‘Go Local’ campaign, including coverage in the school curriculum  |
| <b>Sustainable use - traditional knowledge</b>                                 | Use of traditional knowledge supporting the sustainable use of BFA   | Promote use of traditional knowledge through documentation and sharing of the knowledge between countries<br><br>Investigate the scientific basis of traditional knowledge related to BFA, as appropriate<br><br>Establish relevant policy and legislation to enable measures such as traditional bans to be enforced and strengthen community buy-in |
| <b>Sustainable use – data generation and information sharing</b>               | Integration and collaboration between key agencies and other stakeholders to   | Explore mechanisms at the national and regional levels for strengthening collaboration, including more effective information sharing  |

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|                                   | improve information sharing   |  |
| <b>Conservation</b>               | Knowledge on the linkage between production, conservation and ecosystem services  | Explore opportunities for using native species to strengthen ecosystem service and BFA   |
|                                   | Understanding of how ecosystem approaches can contribute to the conservation of BFA   | Evaluate ecosystem approaches and engage existing projects to contribute to information pool   |
|                                   | Access to information on the sustainable use of BFA   | Develop/adapt knowledge management systems at national and regional levels   |
|                                   | Knowledge on conservation techniques (in situ and ex situ) with emphasis on in situ BFA   | Collate knowledge on both in situ and ex situ conservation practices, and address capacity needs<br><br>Conduct community training and awareness – raising regarding value of BFA  |
|                                   | Conservation strategies   | Develop a rational conservation strategy for BFA addressing resource constraints, in particular funding and capacity of existing facilities  |
| <b>Access and benefit sharing</b> | National laws and regulations aligned with international requirements of conventions, protocols and ITPGRFA                                     | Review laws and regulations to ensure compliance with international instruments  |
|                                   | Protection of Intellectual Property/traditional knowledge   | Clarify the use of traditional knowledge under the ITPGRFA and Nagoya Protocol   |
| <b>Policies and programmes</b>    | Recognition of importance of BFA  | Source, document and disseminate success stories by social media and education programmes  |
|                                   | Knowledge/information on policies that address BFA at the national and regional levels, identifying opportunities to address BFA issues         | Review current policies for acknowledgement of BFA, and achievable goals and ensure policies are harmonized  |
|                                   | Coherent policies and programmes that inter-link the sectors (Agriculture, Environment, Education, Health, Forestry, Fisheries, Community, etc) | Promote the development of cross-sectoral policies and programmes at all levels through establishment of a cross-sectoral working group taking into account existing efforts   |
|                                   | Implementation of existing policies   | Strengthen capacity at the national and local level to implement policies<br><br>Engage and empower communities in the development and implementation of relevant policies   |
| <b>Institutions</b>               | Coordination and responsibilities across agencies addressing BFA  | Profile institutions dealing with BFA<br><br>Identify best institutional mechanisms to coordinate responsibilities across relevant agencies<br><br>Identification of leading agencies together with other supporting partners to drive BFA work at the national level<br><br>Establish a system/mechanism that provide integrated and multi-sectoral |

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|                        |  | support at the national level  |
|                        | Information hub for research priorities, contactable people and funding sources in the PICTs for BFA | Establish/strengthen information hub to collect, maintain and disseminate information on research priorities, contactable people and funding sources                                 |
| Training and education | Better understanding of BFA  | Training at required levels – targeting different stakeholders, age groups, gender etc. (Schools, Government ministries, Church groups, NGAs, short promotional videos, politicians) |
|                        | Assessment of capacity and identification/prioritization of training needs at the national level     | Implement training programs according to needs identified and available resources  |
|                        | Implementation of BFA activities and programmes  | Targeted training of committed and active staff within relevant agencies   |
|                        | Capacity building in access and benefit-sharing  | Establish guidelines and mechanisms to assist countries in access / exchange activities  |