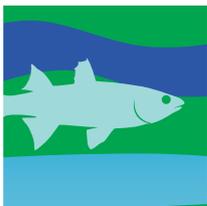
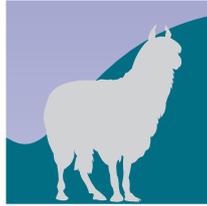


COUNTRY REPORTS



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

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SOW BIODIVERSITY FOR FOOD AND AGRICULTURE COUNTRY REPORTS

1. Assessment and monitoring of biodiversity for food and agriculture

1.1. General context:

(a) Country overview

Samoa is an independent small island developing state (SIDS) in the central South Pacific, lying about latitude 14 degrees south and longitude 170 degrees west and not far from the international dateline. The country is located 2 600 miles north-west of Hawaii, and north east of New Zealand 1 800 miles and 2 700 from Sydney, Australia. The total land area is about 2 930 km². Of the two main islands, Savaii is the largest at about 1 700 km². The islands are of volcanic origin clearly visible in the form of several dormant volcanoes and lava fields. Beyond the narrow coastal plains, mountain ranges rise steeply to a maximum of 1 860 metre (m) on Savaii and 1 100 m on Upolu intersected by fertile valleys. The greatest part of the country was covered by lush vegetation and rain forest. The climate is tropical with abundant rainfall. Humidity is high averaging about 80 percent (%). The average monthly temperature averages about 27°C with little seasonal variation. There are two main seasons with the rainier season from November through April when cyclones may occur, and the drier season from May through October, the latter with more regular south east trade winds. The mean annual rainfall is about 2 900 mm although there is great variation with latitude and location.

With the exception of land owned by government and institutions (mainly churches), land in Samoa is held under customary title. The matai, or holder of the customary title, is entrusted with the management of the land which cannot be sold. The matai in turn, distributes land to his or her 'extended' family for their use. Village councils and the Land and Titles Court are active in allocating unused land and settling disputes over claims to land¹

Samoa's agriculture sector is in decline, with its agricultural production base limited to a few root and cash crops, vegetables, and fruits grown on a small scale. During the 1990s, the agriculture and fisheries sectors contributed to around 20% of the gross domestic product (GDP), but by 2012, the sectors' contribution had declined to only 9.7% of GDP, with the agriculture sector contributing 4.5% and the fisheries sector 5.2%. Food and beverage manufacturing contributed 2.1% to GDP in 2012, most of which was beer production². Agri-food imports increased (in current values) from ST123 million to ST217 million from 2002 to 2012, while total exports declined from ST61 million to ST45 million,³ significantly contributing to Samoa's widening trade deficit, with decreasing fish exports having the largest impact. Export-based commodities such as copra, cocoa, and taro have also declined markedly since the 1990s. Despite these trends, the agriculture sector, including fisheries

¹ <http://www.fao.org/ag/AGP/AGPC/doc/Counprof/southpacific/Samoa.htm>

² Samoa Bureau of Statistics. 2013. Gross Domestic Product by Sector. Apia

³ Samoa Bureau of Statistics. 2013. Annual Trade Statistics 2002–2012. Apia

and food manufacturing, remains Samoa's largest employer, with 39.0% of the workforce⁴, the majority of them involving subsistence farming⁵.

The country's farming systems are characterised by closely independent production activities that cut across the crops, livestock, fisheries and forestry sub-sectors. The food crops sector is dominated by the production of root crops such as taros (*Alocasia macrorrhiza* (giant taro), *Colocasia esculenta*, *Xanthosoma* sp.), yams, manioc/cassava, etc., and bananas and plantains. Colocasia taro, the main staple and export, was devastated by taro leaf blight (TLB), caused by *Phytophthora colocasiae* in 1993 and has largely been replaced by giant taro, bananas and plantains. The majority of those engaged in farming in one way or another in Samoa falls under the category of subsistence farming with a smaller portion of commercial farming - people primarily grow crops for family food and excess yields may be sold for income.

Employment within the crop sector is considered less favourable even for school dropouts. There has been an increasing trend of internal migration of rural to urban areas in search of employment in other sectors such as industrial and the tourism industry. The crop sector includes farmers, processors, exporters, wholesalers, retailers, government ministries, nongovernment organizations, government corporations, regional and international corporations and cooperatives.

Samoa's fisheries sector GDP contribution was ST66M in 2008 and has not significantly grown in real terms over the last 7 years. It made up 4.6% of total GDP in 2008, adding to a steady decline in representation of total GDP since 2001. The majority of this sector is in subsistence (non-monetary) fishing and this accounts for 70% of fisheries. Fishing engages 24.8% of all households (MAF, 2011) with 66% of these fishing for home consumption only while 32% sell fish to supplement income and 2% of all households fish commercially. Forty two percent (42%) of the average households contain at least one fisherman. These numbers show a decline in the number of households engaged in fishing from 10,884 in 1989 to 5,572 (25%) in 2009, due to a range of factors. Important however is that fishing and fish is traditionally a main source of protein, as well as for income generation⁶

Most households do not engage in commercial fishing, with only 6% of households fishing for commercial purposes⁷. Monetary fisheries were SAT19M in 2008, a large decrease of SAT5M from a very abundant year in 2007. Seafood caught locally included tuna (yellow fin, albacore, skipjack etc.), masimasi (dolphin fish), snapper, trevally, utu and reef fish such as parrot fish. There are a significant number of lobsters, crabs and bay bugs also sold at the market. Long line fishing accounts for the bulk of monetary activity - the majority of this produce (98%) is exported. There are no value added processes conducted in Samoa. Catches are a major contributor to foreign exchange, accounting for 55% of total export earnings⁸. Exports grew by SAT4M to SAT16.5M in 2009 with almost SAT14M being sold to American Samoa.

Many of the reefs surrounding the country are overfished and this is potentially due to poor education. There are many small fish on the market as well as undersized and pregnant lobsters and crabs. The sustainability of these practises is a major concern. Samoa has no large sheltered bays

⁴ Samoa Bureau of Statistics. 2011. Population and Housing Census. Apia.

⁵ <http://www.adb.org/sites/default/files/linked-documents/46436-002-ssa.pdf>

⁶ Samoa Bureau of Statistics 2011 cited by Mohamed Nizar (2011). Pro-poor and MDGs Acceleration Policy

⁷ Strategy for the Development of Samoa 2008-2012, May 2008, p. 28.

⁸ National Export Strategy of Samoa (2008-2012), March 2009

which make fish farming very difficult. Ensuring security of such an operation is also an issue to be addressed. Although tilapia has been introduced to the country, ponds require reasonably sized flat land. Samoa's land is very rugged which makes this type of business quite challenging. The high costs of setup are also a barrier for potential investors⁹.

Forests and forestry in Samoa are impacted by a number of factors acting sometimes singly but more often, in combination. The most pronounced and dramatic in effect have been environmental, economic and demographic. While commercial logging and local timber milling had declined markedly since the late 1980's with the near depletion of merchantable forests, forests continue to serve a vital role in supporting local livelihoods as a source of traditional building materials, herbal medicine, firewood, and nuts and fruits. Forests also play a central role in the provision of ecological services including the hydrological cycle, water for drinking, farming and for power generation, soil renewal and protection against erosion, and in carbon sequestration and storage, now important in the context of mitigating the impacts of global warming and climate change¹⁰

Samoa's national census of 2011 recorded its population at 187,820 persons. According to the World Factbook the July 2012 estimated population is higher at 194,320, with a growth rate of 0.596%. The SPC (SPC, 2012) mid-year 2020 population estimate is 188,357. The 2011 Census showed a male to female ratio of 100:93. The 2013 Samoa's State of the Environment Report noted that Samoa's population has been growing at a declining rate because of outmigration. Based on growth rates over the last 20 years an annual growth rate of between 0.5% and 1.5% is expected.

Most people live in villages on or near the coast and normally farm the coastal strip and directly inland to the highest point or ridge line. There is a strong trend for people to move from rural areas to the capital, Apia, seeking better work and income opportunities¹¹. The distribution pattern of people between rural and urban areas has changed. There has been an increasing internal migration of people moving towards the urban areas, as well as external migration to overseas countries. It is usually the working middle class that migrate leaving the young and the very old population in the rural areas. As a result, the remaining people in the rural areas are less capable of working the land for food security and rural development declined. In other words, rural poverty increases¹².

(a) Role of biodiversity for food and agriculture in your country

For a human population where 72% of households are agriculturally active, agro-biodiversity species such as taro, bananas (*Musa spp*) and breadfruit (*Artocarpus spp*) are major contributors to food security, local incomes and export revenues. There is a similar dependence on marine species of fin fish, shellfish, crustaceans, and echinoderms as a source of dietary protein for most families and for income for 25% of all households. Many plant species are used for traditional medicines, building materials, fuel, and raw material for handicrafts, traditional canoes and many wooden implements.

Of ecosystem services, forests contribute to protecting catchment areas, stabilizing erosion-prone slopes, minimizing surface run-off, sequestering and storing atmospheric carbon, regulating microclimates, and ensuring the continued recharging of underground and surface water sources for

⁹ <http://www.sbecsamoa.ws/publications/Sector%20Profile%20-%20Fisheries.pdf>

¹⁰ NBSAP

¹¹ <http://www.fao.org/ag/AGP/AGPC/doc/Counprof/southpacific/Samoa.htm>

¹² NBSAP

human consumption, agricultural crops, hydropower generation, and for supporting freshwater species and habitats. Bird and mammal fauna contribute to pollination processes, and seed dispersal for many native trees species. Most if not all of these services, directly contributes to Samoa’s pursuit of MDG goals of poverty eradication and environmental sustainability.

86% of all fishing occurs in the reef and inshore area that are the habitats to the bulk of Samoa’s marine biodiversity and 66% of all households in Samoa fish for home consumption.

Samoa, as a country, understands the importance of the healthy ecosystems to agriculture production and resilience to climate change. Being a small island with limited natural resources, there needs to be a sustainable approach to production at the same time, protecting biological diversity and the natural ecosystem. The steady increase in population has caused an increase in demand for food and water, and also increased the pressure on agriculture. This in turn, may motivate others to carry-out un-sustainable agriculture. The government ministers in Samoa are collaborating to stem such practices and increase sustainable agriculture using a multi-sectoral approach to get their messages across.

Table 1: Production Systems present in Samoa

Production system	Indicate if present in the country (Y/N)	Description ¹³
Livestock grassland-based systems	Yes	Grassland with Cattle and sheep
Livestock landless systems	Yes	Pig and poultry sheds
Naturally regenerated forests	Yes	Upland rainforests – modified natural.
Planted forests	yes	Land was cleared for timber – semi-natural
Self-recruiting capture fisheries	Yes	Marine, coastal and inland – natural ecosystems
Culture-based fisheries	Yes	Introduction of tilapia
Fed aquaculture	No	
Non-fed aquaculture	No	
Irrigated crops (rice)	no	
Irrigated crops (other)	Yes	Veggies under protected shelters
Rainfed crops	yes	Orchards and root crops
Mixed systems (livestock, crop,	yes	Cattle under coconuts/cocoa
Others (please specify)	yes	Agro-forestry

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

Biodiversity for food and agriculture is that biodiversity associated with different supporting and regulating ecosystem services within production systems and is influenced by the status and health of the ecosystem and also the production system.

Samoa’s upland habitats are largely intact and undisturbed by human activities with a high percentage of forest cover (99%) for both Upolu and Savaii. The nature and quality of forests in the uplands of the two islands are now significantly different. For Savaii, 91% of the upland forest area is dominated by native species. For Upolu, non-natives dominate 99% of the upland area. The impact

of the invasive vine *Merremia* is the main threat with recent estimates suggesting 24% of all forests affected including upland forests.

Lowland habitats consist of cultivated areas and lowland forests. The total lowland area of Samoa is 218,520 ha, of which cultivated areas comprises 80,589 ha and lowland mixed forests 137,931 ha. Cultivated areas are largely of small sized holdings and with some exceptions, are low tech, use composting and are largely of mixed cropping systems. This typical mixing of trees and crops is ecologically more stable and less vulnerable to outbreaks of pest and diseases. Having said this, invasive species are also widespread including *Merremia* vines, African snails and Taro Leaf Blight. Other than invasive species, the other main threat to lowland habitats is the indiscriminate clearing for cultivation, particularly of forests within sensitive environments including riparian strips and catchment areas, steep and erosion-prone slopes.

Of coastal habitats, mangroves are generally in good condition with a high number of viable populations for the two main species *Rhizophora samoensis* and *Bruguiera gymnorhiza* scattered throughout Samoa's coastline, despite losses in some areas due to harvesting for firewood, land reclamation and waste disposal. The third species – *Xylocarpus moluccensis* is represented by only a small population occupying about 2.5 acres of coast in Siutu Salailua.

Within the inshore and offshore marine habitats, the health of corals and coral reefs vary throughout Samoa, but the most healthy reefs and coral assemblages are found in north-western Savaii, with the least healthy of coral reefs along the northern coast of Upolu from the Manono/Apolima strait to the Fagaloa coast. Similarly reef fish is more abundant in the same general areas with northern Savaii having the highest level of abundance, and the northern coast of Upolu the least. Reef and inshore habitats are the most degraded and overfished, with inshore fisheries, particularly bad.

Rivers and stream water quality is not a major issue based on indicators of turbidity, pH and dissolved oxygen but reported incidences of high *E.coli* counts in several villages water springs is a reminder of the impacts of land use, sanitation and waste management practises on underground water sources. Direct waste disposal into rivers and streams especially for the major rivers in the urban setting has contributed to a lot of pollution to the coastal areas and is now being targeted by the rehabilitation efforts of the Water Resources Division. Increasing levels of demand on water sources for water supply and hydropower generation is also an important issue, with stream flow reduced significantly at developed river systems, and salt water upcoming degrading over developed groundwater sites.¹³

Native agrobiodiversity in Samoa is limited because genetic diversity in the Pacific declines from west to east. This limited genepool increases vulnerability to pests and diseases as seen by the decimation of local taro varieties by *Phytophthora colocasiae* in the early nineties. Food production for export tends to lead to a decrease agrobiodiversity because of the focus on the market. Generally one variety is demanded by the market and obviously yield and quality are important factors. Unless an organic market is targeted, production practices can diminish associated biodiversity.

¹³ State of the Environment Report (SOE) 2013

Drivers of change:

Land use change

Forest clearance for agriculture, settlements and land profiteering has occurred. Coastal areas (including its natural forests) have been impacted by coastal development, including settlements and other infrastructure. Natural marshes have also been encroached by settlements.

Despite efforts on the part of the Government to provide a framework within which all development activities are properly screened and vetted for environmental sustainability, many local initiatives and activities are occurring without proper vetting. Many activities are coastal in nature and involve sand mining, coastal reclamations and constructions within hazardous zones. Many mangrove areas are destroyed to make way for construction, by waste dumping and for firewood. Water is abstracted without proper licenses and formal assessments. Cultivation in sensitive habitats including catchments, forests of high conservation value and on steep erosion-prone slopes is widely observed. Some positive developments and progress can be seen with the host of planning frameworks and guidelines now in place for regulating developmental initiatives, for example, PUMA Act 2004, PUMA (EIA) Regulation 2006 and the Environment Code of Practice (2006)

Unsustainable harvesting of products

Fuelwood harvesting from natural forests as wood is the major source of cooking energy in Samoan households. Samoa instigated a logging ban in 2009 but forest quality continues to be degraded and harvesting of mangrove trees for both fuelwood and construction continues in some areas. It is also reported in fisheries and water resources. In the fisheries sector, overfishing in the inshore area is a major issue that will continue to threaten the integrity and sustainability of coastal resources and coral reefs. The underlying drivers are the combined effect of population, the open access nature of coastal fisheries resources, and the increasing demands of an increasingly cash based lifestyle in rural communities.

Being of small islands, the coastal zone assumes a disproportionately large role in its biogeography, and the interface between the coastal area and the marine environment a prominent feature. Add to this a high human population (70% of Samoa's population and infrastructure is located within the coastal area) and infrastructure concentrated along the coast, the result is a highly active zone where coastal habitats and species are under on-going pressures from land-based pollution, exploitation and other stresses. This is further compounded by the impacts of climate change and climate variability (SOE, 2013)

Pollution

Household level waste and agrochemicals in some instances have been the main pollution issues in Samoa.

Invasive alien species

The TLB fungus was invasive as all the local taro varieties were susceptible. The *Merremia* vine is estimated to cover up to 50% of the lowland native forests – impacting on native vegetation and affecting forest quality and therefore likely to be diminishing its ecosystem services through loss of biodiversity used for food, fibre, fuel, medicine and disrupting mutualisms important for pollination and pest control. Kirkham (2005) found that *Merremia peltata* behaved differently depending on

whether it occurred in the forest canopy or as ground cover. It was found to suppress species diversity when acting as ground cover and also aided the spread of other invasive vines such as *Mikania micrantha*; however, it seemed to support species diversity when occurring in the forest canopy¹⁴

Natural hazards, extreme weather events and climate change

Samoa is prone to natural disasters and in particular cyclones, flash floods, earthquakes and fires. Cyclones in particular cause extensive damage and fragmentation to native forests, coastal ecosystems and coral reefs, as well as habitats of many threatened bird species. The degradation caused by natural disasters also often creates conditions favourable to the spread of invasive species of vines and trees, aggravating the degradation of habitats and increasing the threat of extinction for some local species. Changing weather is affecting pest and disease patterns and intensity of infestation.

The biggest threat to Samoa's sustainable development is now widely acknowledged to be the extreme events - cyclones, flash floods and heavy rainfall events - associated with climate change. Recent experience with Cyclone Evan (2012) showed how these events set back gains in development progress made over the years, with the extensive damage and loss inflicted on physical infrastructure, crops, properties and human lives, not to mention the damage and degradation to fragile habitats and to native species, some of which were already critically endangered.

Prolonged periods of drought – usually lasting for three months or more, severely affect forests from high risk of forest fires. Samoa experienced four major forest fires from the drought/dry periods of 1982- 83, 1997-98, 2001-02 and 2002-03; and more recently, 2011/12 (SOE, 2013). Prolonged periods of drought are also affecting crop production and grassland development for livestock.

Access to resources and land tenure systems

Access to environmental resources is intricately linked to the traditional land tenure system which controls over 80% of Samoa's land resources. Lack of regulation can result in a free-for-all situation wherein individuals maximize their own benefits until the resource is depleted (Boulding, 1966). Village inshore marine resources are a classic example where fishing effort is often unregulated. The inevitable result is overfishing leading to resource depletion in the inshore fisheries in many villages (Samuelu-Ah Leong, 2000; Kendall, M and Poti, M.(eds), 2011). But the same laxity in the way access and user rights are allocated is observed in the allocation of use-rights on customary lands - in particular the customary rule where the right of use (and de-facto ownership) of village communal land is acquired and claimed by whoever of the village clears the forest on it. This rule encourages many to clear forested lands merely to stake a claim with little or no long term commitment to its development. Moreover, this right of ownership is then inherited directly by those individuals' children (SOE, 2013).

- b) Indicate whether the country has any national information system in place on associated biodiversity and identify the most frequently monitored components of associated biodiversity – you should be able to check with the various sectors – environment, fisheries etc. to see if this happens

¹⁴ Kirkham W. S. 2005. Valuing invasives: understanding the *Merremia peltata* invasion in postcolonial Samoa. Unpublished PhD, University of Texas, Austin, USA, 257 pp.

In 2014 the Samoa Law Reform Commission considered that a database of Samoa’s TK, that would host information relating to traditional cultural expressions and traditional biological knowledge for which an Authorised User Agreement or Benefit Sharing Agreement exists, would assist in the documentation of Samoa’s TK, and could also contribute to its preservation. The establishment of such a database would require resources for ongoing requirements associated with data management, training, updating and reporting¹⁵.

Table 2: List of associated biodiversity species that are actively managed in production systems for the provision of ecosystem services¹⁶

Associated biodiversity species	Ecosystem functions and services provided by the species in the production system
Species 1 Giant African Snail,	
Species 2 Myna Bird	
Species 3 Pigeon pests	
Species 4 Coconut rhinoceros beetle,	
Species 5 Fruit fly species Bactrocera	
Species 6 Fruit piercing moth	

Table 3: Wild food species used for food in the country¹⁷

Wild food species	Change in state (2,1,0,-1,-2, NK)
Species 1 Palolo sea worm ¹⁸	-1
Species 2 Ifi plant ¹⁹	-1
Species 3 Ufi vao (wild yam)	-1
Species 4 Fai tae manu banana	0
Species 5 Pulaa plant	-1
Species 6 Wild pigs	0

Information is not available on the proportion of the population in your country that uses wild food on a regular basis for food and nutrition

The state and trends of and the drivers of change affecting associated biodiversity, ecosystem services and wild food resources.

The state and the trend of associated biodiversity and wild food resources are difficult to assess/determine because of a lack of monitoring. In Samoa’s National Environment Sector Plan 2013-2016 the need for a systematic on-going monitoring of environmental health including

¹⁵ <http://www.palemene.ws/new/wp-content/uploads/05.Annual%20Reports/LRC/SLRC-Annual-Report-2014-Eng.pdf>

¹⁶ Reference: question 27 of country report guidelines.

¹⁷ Reference: question 34 of country report guidelines.

¹⁸ Samoan palolo worm (Palola viridis) is a Polychaeta species

¹⁹ Inocarpus fagifer (Polynesian chestnut)

biodiversity using SMART indicators to better track environmental changes is highlighted and the strengthening of the agencies capacity for monitoring and environmental management.

The 5th NBSAP reported that that Samoa had 60% of its forest cover with no primary forests remaining primarily due to the impact of cyclones. Twelve priority ecological sites have been targeted for protection with 9 of the 12 sites at various levels of vulnerability with at least three seriously degraded as a result of a combination of clearing for agriculture, logging and settlement. The forests on the island of Upolu are effectively non-native and mostly of highly invasive low quality species. These forests are, in general, more valuable for their protection functions and for maintaining ecosystem services than for wood products except, to an extent, fuelwood. Overall there is loss and fragmentation of native forests, especially on the island of Upolu

Under the NBSAP Theme of ecosystem management – the 5th National Report states effective management with the science part of ecosystem management well advanced. Collaborative projects with NOAA have helped in implementing comprehensive assessments of marine habitats, including coral reefs’ health and of fish populations. However the 5th NBSAP report does highlight the degraded condition of coastal and inshore habitats especially along the entire northern coast of Upolu.

The main drivers of change for the regulating and supporting ecosystem services, associated biodiversity and wild food resources are:

- (a) changes in land use, for example, an increase in deforestation for taro production and cattle farming. Changes in land use can impact on coral reefs which are already stressed by warming temperatures and ocean acidification – coral reefs are vital for sustaining fisheries (spawning grounds for fish) and for buffering waves and protecting coastlines from storm damage.
- (b) invasive pests and diseases, for example, Merremia vine affecting forest quality; taro leaf blight decimating local taro diversity
- (c) agricultural intensification (increased pesticide and fertilizer use). Increase in mono-cropping leading to a decline in the biomass and/or quality of native/natural vegetation.
- e) Unsustainable use of resources - overfishing in the inshore area is a major issue that will continue to threaten the integrity and sustainability of coastal resources and coral reefs. The underlying drivers are the combined effect of population, the open access nature of coastal fisheries resources, and the increasing demands of an increasingly cash based lifestyle in rural communities. The damage caused by extreme weather events, such as cyclones, storm surges also affect ecosystem services
- (f) increasing development (eg increase in new and existing urban settlements)
- (g) climate change through extreme weather events such as cyclones, floods, storm surges and changing temperature, moisture levels etc., affecting the life cycles, dissemination and balance of organisms.

Box 1: Countermeasures that have been taken in the country to reduce adverse effects of drivers on associated biodiversity, ecosystem services and/or wild foods

Using Mucuna vines to reduce pesticide use in taro plantations and improve soil fertility

IPM and Use of organic compost for fertilization to substitute for inorganic fertilizer

1.3 Needs and priorities

Increased awareness on the importance of BFA is needed – especially associated biodiversity, ecosystem services and wild foods. Improved cross-sectoral collaboration would help to ensure that legislation, strategies and action plans are supportive of BFA and to guarantee the same message is being disseminated – in particular agriculture, fisheries, health, education and environment. The fact that the same solutions can address the challenges of nutrition-related health problems and climate change must be emphasised by these sectors. The importance of Upland Savai’i for its biodiversity and watershed value should be the focus of an education program in schools and to the public.

Limited capacity is a significant constraint in the monitoring and collecting of data. More regular surveys and assessments are needed to update and ascertain the status of various marine species’ groups in Samoa’s inshore and offshore habitats, and to inform conservation and management planning. This applies to seaweeds and algae, as well as molluscs, crustaceans and echinoderms. Monitoring of inshore and offshore habitats and species should be a priority and an on-going activity of both MAF-Fisheries Division and MNRE. The approved SOE indicators should be used for consistency. Similarly, collaborative arrangements with relevant regional organizations including SPC and SPREP, and other international conservation organizations such as IUCN and GBRMN should be cultivated and encouraged.

Strengthened capacity is needed for monitoring and promoting use of biodiversity for food and agriculture, either at the national level or regional level. A user-friendly system for recording and exchanging information would benefit monitoring.

II. Sustainable use and conservation of biodiversity for food and agriculture

2.1 Sustainable use

Table 4 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 ²⁰	Trends in the application of the practice over the past ten years
Integrated Pest Management	Reduce chemical use-monitor and promote alternative approaches to controlling pests for example, improved soil health therefore encouraging natural control, tolerant/resistant varieties (as with taro) and optimum use of organic matter	2
Landscape management	Drainage system use in vegetable production. The growing layout design	1

²⁰ Reference: questions 52, 53 and 56 of country report guidelines.

	utilizes the contours of the land for the benefit of the crop being grown	
Sustainable soil management practices	Indirect interventions such as use of mucuna, Appropriate use of fertilizer, limited land tillage, reduced water drainage	1
Organic agriculture	Used for banana production	1
Reduced impact logging	Commercial logging and local timber milling had declined markedly since the late 1980's	-1

Box 2: Describe a successful programme or project that has been undertaken in the country to support one of the practices listed in Table 4.

Samoa is a partner, along with Fiji, Solomon Islands and Tonga, in the ACIAR funded Strengthening integrated crop management research in the Pacific islands in support of sustainable intensification of high-value crop production. Project activities include development of plant health clinics, trials of disease resistant vegetables etc.

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.

Taro export market demand in the late 80s/early 90s resulted in a production system which relied on cropping one variety of taro – a mono-cropping system. This variety was susceptible to *Phytophthora colocasiae* which caused taro leaf blight wiping out taro production in Samoa with huge implications for food and nutritional security. A significant export market was lost and has only recently been revived thanks to investment in a breeding programme for over 10 years. Not only was taro the most important export crop, it was the traditional staple and taro leaves provided the main green leafy vegetable in Samoa – a vital source of vitamins and minerals.

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 ²¹	Promoting diversification of root crops- sweet potatoes, cassava, taro
Use of BFA to manage the spread of/control invasive alien species ²²	Use of mucuna legume to suppress weeds
Use of BFA to prevent natural or human-made	Mangrove planting

²¹ Reference: question 69 of country report guidelines.

²² Reference: question 46 of country report guidelines.

disasters and/or reduce their effects on livelihoods, food security and nutrition ²³	
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Ecosystem/landscape/seascape approaches that have improved the management and use of biodiversity for food and agriculture in the country

Experience has shown that an integrated approach from ridge to reef (and ocean-Ridge to Reef or R2R) is necessary for poverty reduction, sustainability, and capacity enhancement for small countries with few human resources to undertake projects. The occurrence of natural disasters underlines the vulnerability of Samoa and the need for a coordinated response that protects the lives and assets of the Communities. The Government of Samoa through the LDCF programme intends to address the barrier of a fragmented policy and programmatic approach, by putting in place an enabling framework that will guide interventions on climate change adaptation/mitigation and DRR/DRM, and will make CC a priority of 'economic and social concern'. This will reflect integrated approaches and contribute to the R2R programme²⁴.

This project 'Economy-wide integration to climate change adaptation and disaster risk management and reduction to reduce climate vulnerability of communities in Samoa' aims to enhance a more efficient integration and management of adaptation and DRR/DRM into national development planning and programming and the resilience of communities' physical assets and livelihoods across Samoa to climate change and natural disasters. The three major components are:

- (a) Strategic integration of climate change adaptation and disaster risk management in national policy frameworks and development planning through an economy-wide approach
- (b) Enhanced resilience of communities as first responders of climate change-induced hazards
- (c) Knowledge about CCA and DRR is captured and shared at the regional and global level

The Togitogiga Catchment is WANI's (IUCN Water and Nature Initiative) selected demonstration project in Samoa. Located on the eastern Upolu Island, Togitogiga is the main source of water supply for downstream communities and has a unique biodiversity. It is also well known for recreational purposes as part of the "Togitogiga National Park". This catchment area has become significantly degraded due to increasing population and development pressures, soil erosion, sedimentation, and water pollution. The project also aims to develop and implement a watershed management plan that creates a balance between anthropogenic demands on the catchment and biodiversity conservation²⁵.

Samoa's GEF Pacific IWRM Demonstration Project entitled "Rehabilitation and Sustainable Management of the Apia Catchment" has made great progress in strengthening legal frameworks for water resource management and securing access to safe drinking water. Key project results include: Protection of land for inclusion in land reserve to reduce stress on water systems; finalisation of 3 Watershed Management Plans that define buffer zones and natural reserves; development of the

²³ Reference: question 43 of country report guidelines.

²⁴ <https://sustainabledevelopment.un.org/partnership/?p=7315>

²⁵

<http://www.pacificwater.org/userfiles/file/pacific%20partnership%20newsletter/april%202010/wani%20strenghens%20water%20management%20in%20fiji%20and%20samoa%20.pdf>

Watershed Conservation Policy to guide legislation to reserve upland areas for water resource conservation; and on ground rehabilitation works to improve water quality. This Pacific IWRM 'Progress Snapshot' highlights results achieved to date.²⁶

Examples of activities undertaken to maintain and use traditional knowledge of associated biodiversity and wild foods.

The 5th NBSAP report stated that the areas of least implementation include traditional knowledge. The relative low level of implementation of activities dealing with Traditional Knowledge may be attributed to both the relative lack of resources and capacities, but also the highly complex nature of the research required to investigate if TK has potential benefits for the pharmaceutical industry. Since 1989, three ABS agreements have been signed between the Government of Samoa and foreign parties for bio-prospecting and Research & Development (R&D) using Traditional Knowledge (TK) from local healers and the local plant 'mamala' for AIDS research. Under Theme 4 (NBSAP) – Community, Strategic goal - Empowering and encouraging traditional communities to protect, conserve and sustainably use and manage our biodiversity objective 1 is Preserve traditional knowledge and practices of Samoa that are important for the protection, conservation and sustainable use of biodiversity. TK is also covered under Theme 7 – Agrobiodiversity - The conservation and sustainable use of agrobiodiversity contributes to national development and the preservation of traditional knowledge and practices.

Possible needs and priorities in terms of the sustainable use of biodiversity for food and agriculture, and in particular of associated biodiversity and wild foods

Evaluation of past/present programmes and policies is needed to better assess their impact on biodiversity for food and agriculture and linked to this identification of research priorities to understand how through optimizing biological processes and ecosystem function can meet production objectives and better understanding of measurement indicators.

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 or, for example, permit or limit sale of large areas of land to producers likely to engage in mono-cropping.

Certification systems 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.

2.2. Conservation

The status of *in situ* conservation of associated biodiversity and wild food species in your country:

²⁶ <http://www.pacific-iwrm.org/>

Samoa has already determined that 15% of its terrestrial area will be dedicated for protection, to preserve the essential ecological services it provides and to protect representative populations of its unique and native flora and fauna species, assemblages and ecosystems. Site based (in-situ) conservation is the approach used, in the form of national parks, reserves, community conservation areas (CCAs), and co-managed sites, where species are protected in-situ. (SOE, 2013)

Marine protected areas (MPAs) in Samoa are large, community-based, multiple-use areas governed by a number of villages (9 villages in the case of Safata, and 11 villages for Aleipata). They are managed in partnership with the Government of Samoa (Division of Environment and Conservation, Ministry of Natural Resources and Environment), and CRISP and CI have been providing operational support since January 2005²⁷.

Sub-regional/regional in situ conservation initiative(s):

The Framework for nature conservation and protected areas in the Pacific Islands region, 2014-2020²⁸ 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'²⁹

The Coral Reef Conservation Programme (CRCP) supports coral reef conservation efforts that build on synergies with the national CRCP priorities and promote basin-wide collaboration. A priority focus is independent Samoa, which shares cultural, geographical and biological links to American Samoa, located just 73 miles away. The leaders of Samoa and American Samoa have initiated the Two Samoas Initiative that brings together local and regional environmental agencies and organizations to promote efficient management for addressing shared marine and terrestrial environmental concerns³⁰.

The status of *ex situ* conservation of associated biodiversity and wild food species in your country:

Native species of trees (malili, tava, pau) were conserved to provide stocks for improvement under the South Pacific Regional Initiative on Forest Genetic Resources (SPRIG) project and mass produced in the Forestry nurseries. The mangrove species *Xylocarpus molluccensis* (grantum) is recommended by the National Environment and Sector Plan (NESP) for priority conservation action including the option of ex-situ conservation. Samoa holds an ex situ tissue culture genebank but all accessions are cultivated crop varieties.

There is no sub-regional/regional ex situ conservation initiative(s) that Samoa is involved in but on a regional or sub-regional level ex situ conservation can be achieved through SPC and USP. In 2011, the Secretariat of the Pacific Community developed the Pacific Islands Tree Seed Centre to help research, conserve and disseminate seeds of socio-economically important tree species for its 22 member countries and territories, including Samoa. Constraints for ex situ conservation in the region

²⁷ <http://www.conservation.org/NewsRoom/pressreleases/Pages/funds-awarded-to-samoas-largest-marine.aspx>

²⁸ https://www.sprep.org/attachments/Publications/BEM/Framework_Nature_Cons_Prot_Areas_PIR_2014_2020.pdf

²⁹ <https://www.cbd.int/sp/targets/>

³⁰ <http://coralreef.noaa.gov/aboutcrp/international/ssp/>

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.

Similarly 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.

Needs and priorities in terms of the conservation of biodiversity for food and agriculture, and in particular of associated biodiversity and wild food species

The promotion of best practices for sustainable agricultural production, using an ecosystem approach (using biodiversity and related biological processes), will support the more efficient use and conservation of biodiversity for food and agriculture, including in situ and ex situ conservation. This can be achieved through the promotion of the development of national policies and programmes (e.g. Farmers Field Schools) that use the ecosystem approach.

Close coordination and collaboration with MAF is needed to ensure planned expansion in agriculture does not impact negatively on sensitive habitats including catchment areas, riparian strips, steep slopes prone to erosion and slips and areas earmarked for biodiversity conservation.

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.

Effort should be made to contain the spread of invasive vines especially *Merremia peltata*. These measures should also be incorporated into management plans for national parks, KBAs and catchment areas

Replanting and conservation initiatives for mangrove forests - the only stand of *Xylocarpus molluccensis* found in Siutu Salailua should be an urgent priority for protection. MNRE should implement restoration measures for the existing stand and should also at establishing other *X.molluccensis* populations in other sites.

Regional strategy to address BFA is required as in reality it is an area that little is known about.

2.3 Access and exchange

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.

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	Samoa ratified the ITPGRFA so ABS is through the IT MLS	
AnGR	Samoa acceded to the Nagoya Protocol in October 2014	
FGR	Samoa acceded to the Nagoya Protocol in October 2014 Also Samoa signed the MTA with SPC for access to and exchange of FGR	
AqGR	Samoa acceded to the Nagoya Protocol in October 2014	
<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	Specific agreements established with US for access to and use of the local plant mamala (<i>Homolanthus nutans</i>) – 3 agreements signed. 1 st agreement allowed access to the rainforest for biodiscovery and then following two agreements built on the 1 st one. Falealupo village has benefited both financially and in other ways from the initial covenant. ABS is included in the Environment Management and Conservation Bill 2015. Basic requirement is that proper consent is developed between the Samoa Government (provider) and the researcher (user) through the signing of the Letter of Agreement (LoA) or the Prior Informed Consent (PIC) and the Mutually Agreed Terms (MATs).	
<i>Wild foods</i>		

[Insert rows as needed]

Needs and priorities in terms of the policies and regulations governing the access to and ensuring the fair and equitable sharing of benefits arising from the utilization of biodiversity for food and agriculture, and in particular of associated biodiversity

1. Capacity building with regards the CBD, Nagoya Protocol and ITPGRFA
2. Capacity building in negotiating ABS agreements?

Lessons learnt from ABS of mamala plant:

1. It is important that the risks involved and long timelines for pharmaceutical R&D are clearly communicated to potential beneficiary communities with regular updates on progress.
2. The extent to which cooperation and transboundary benefit-sharing is necessary and will occur is likely to be something that the Parties will resolve amongst themselves, through regional agreements, or through further negotiations at the Intergovernmental Committees of the Nagoya Protocol (ICNP).
3. The case study also raises an interesting question about requirements for benefit-sharing relating to R&D towards synthetic analogs that are based on a naturally occurring compound. The Nagoya Protocol definition of ‘utilization of genetic resources’ includes derivatives, meaning ‘naturally occurring biochemical compounds’. Because analogs are synthetically produced, they probably do not fall under the scope of the Nagoya Protocol. However, this does not preclude Governments from specifying in benefit-sharing

agreements that synthetic analogs utilised by the researchers involved must also share benefits (see Article 5.1 of the Nagoya Protocol on 'subsequent applications'). Enforcing third party benefit-sharing upon the development of synthetic analogs would be complex.

III. Policies, institutions and capacity

3.1 Policies, programmes, institutions and other stakeholders

Relevant policies and programmes the country has adopted and is implementing to support the conservation and sustainable use of biodiversity for food and agriculture, and specify to which extent they address associated biodiversity and wild foods.

Relevant policies and programmes are those that aim at:

Biosecurity act 2005

Crops Act: Pending

Animals Act: Pending

National Coconut Day – Tree of Life

Agriculture Show for Upolu and Savaii

World Food Day Celebration

Climate Change Crop Adaptation programs

Integrated Pest management and Crops Management for selected crops

Sustainable land management programs

Agro-Forestry Programs

Promotion of high value nutrition crops – especially green leafy veggies and fresh local fruits (MAF and MOH collaboration) sweet potato, pele

- the coordinated use and conservation of sectoral genetic resources
- addressing food security and nutrition
- the sustainable use and conservation of associated biodiversity
- the maintenance of ecosystem services
- improving resilience and sustainability of production systems
- supporting farmers, livestock keepers, forest dwellers and fisher folk to adopt and maintain practices that strengthen the conservation and use of biodiversity for food and agriculture
- the application of an ecosystem/landscape/seascape approach

b) Provide a short analysis of the strengths and weaknesses of the policies and programmes mentioned above and indicate their level of implementation.

BOX 3. Provide up to three examples to highlight how stakeholder groups in the country, such as groups or associations of farmers, forest dwellers, fisher folk and livestock keepers, NGOs or other civil society organizations, have actively contributed to the improved sustainable use and/or conservation of biodiversity for food and agriculture and the maintenance of ecosystem services.

On 4th December, 2010, in marking the International Volunteer Day (IVD), over 100 local and international volunteers joined hands in cleaning up and planting mangroves in Fasitootai, northwest

of the Samoa's Upolu Island. The event was organized by the United Nations Volunteers (UNV) programme in cooperation with the Fasitootai village, the Government of Samoa, other United Nations agencies and various local and international volunteer-involving organizations including Samoa Umbrella for Non-Governmental Organizations (SUNGO), Samoa Red Cross Society, Australian Agency for International Development (AusAID), Japan International Cooperation Agency (JICA), New Zealand Agency for International Development (NZAID) and US Peace Corps³¹.

c) Provide examples of successful inter-ministerial cooperation in the area of conservation and sustainable use of biodiversity for food and agriculture and describe the relevant collaboration mechanisms.

d) Identify possible needs and priorities in terms of policies, programmes and institutions governing biodiversity for food and agriculture, and in particular associated biodiversity and wild food species.

- Cross-sectoral collaboration needs to be strengthened with appropriate mechanisms in place
- Increase in the implementation of ridge-to-reef/landscape type approaches to foster cross-sectoral collaboration
- Capacity strengthening in monitoring and evaluation
- Knowledge management systems to improve information access and sharing

3.2 Capacity

a) Identify and prioritize training and education needs that target the conservation and sustainable use of **associated biodiversity** and describe possible constraints.

The following are approaches that can be used to prioritize training and education needs that target the conservation and sustainable use of associated biodiversity.

- Farmer Field Schools
- Community outreach
- Farm visits
- Workshops and seminars
- Pest and disease identification programs
- Plant Health Clinics
- Consultation with Mayors, village council and women

As far as institutions go – the following are relevant:

1. The Scientific Research Organisation of Samoa (SROS) – key activities/outputs are:

³¹ <http://www.adaptation-undp.org/resources/news-article/cba-samoa-fasitootai-100-volunteers-mangrove-planting-news-article-dec-2010>

- a. The installation and operation of a pilot plant for the production of biodiesel, which has been used to fuel the SROS fleet of motor vehicles for the past three years. This activity has now started fuelling vehicle fleets of other agencies.
- b. The development of a procedure to produce flour from breadfruit and cassava that is abundantly available in Samoa. This gluten-free flour has a large potential to substitute for flour imported into Samoa and supply the growing international market for healthy foods.
- c. The installation and operation of an industrial processing line for producing and bottling avocado oil in 2012. This has led to the sale of a promotional prototype at local supermarkets to raise public awareness of Samoa's first locally manufactured avocado oil and provide the local Samoan community the first opportunity to enjoy the prototype product.

Other projects are outlined at <http://www.sros.org.ws/proj.aspx>

2. The National University of Samoa - <http://www.nus.edu.ws/s/index.php> is a member of the Pacific Islands University Research Network (PIURN). - <http://www.nus.edu.ws/s/index.php/pacific-islands-university-research-network-piurn>
3. National Agriculture Research Station, Ministry of Agriculture – some conservation in tissue culture? Taro breeding programme building on TLB resistance breeding programme – now breeding for drought tolerance.

b) Identify and prioritize research needs to strengthen the conservation and sustainable use of associated biodiversity, wild foods and ecosystem services and describe possible constraints.

Generally limited resources are a constraint to research in the conservation and sustainable use of BFA and in particular associated biodiversity and wild foods. Traditionally any activities within this area would be the responsibility of the specific sectors, for example, any plant-based research would be carried out by agriculture and any marine based work would be the responsibility of fisheries. SROS plays a key role in research into the use of agricultural biodiversity but as the focus of the institute tends to be on trade – research is into key crops such as cocoa. SROS was a partner in an ACIAR-funded project which was looking at soil fertility and soil organisms so the institute has this capacity. ACIAR works in the region linking national partners to regional and international agencies – this can help in implementing research into those areas, such as associated biodiversity where the expertise is not available in country.

As for training – training can be carried out but then that person has to be employed which requires sustainable funding. Raising awareness regarding the importance of associated biodiversity is certainly a priority and also identifying where the priorities are. Some priorities are likely to be common across the countries and therefore in this case a regional approach has to be determined. Improving how Samoa can access information on this area would be a benefit – some form of regional database through which countries can share information and expertise. But overall awareness is the key priority and showing how the different sectors inter-link to contribute to the quality of ecosystem services and therefore food security. This awareness is missing across the sectors.

IV. Regional cooperation

4.1 Regional initiatives the country is involved in to conserve and use biodiversity for food and agriculture

Table 7 Description of relevant regional policies and programmes that embed the conservation and/or use of biodiversity for food and agriculture, and in particular associated biodiversity, wild food species and ecosystem services.³²

Regional policies and programmes	Description
Pacific Islands Regional Ocean Policy (PIROP)	PIROP'S goal to ensure the sustainable use of the Pacific Ocean and its resources by Pacific peoples and external partners. One of the four guiding, thematic principles calls for Sustainably developing and managing the use of ocean resources.
Pacific Plan	The Pacific Plan ¹ was adopted by Pacific Island Forum Leaders in 2005 as the principal regional policy instrument for strengthening and deepening regional cooperation, regional integration and the regional provision of public goods and services, under four pillars of sustainable development; economic growth; governance and security. In their Vision for the Pacific Plan:
Framework for Nature Conservation and Protected areas in the Pacific Islands region 2014-2020	The framework provides guidance on key priorities for biodiversity conservation and ecosystem management with clear linkages to the global Aichi BD targets and NBSAPs.
Pacific R2R programme	Goal is to maintain and enhance Pacific Island countries' ecosystem goods and services (provisioning, regulating, supporting and cultural) through integrated approaches to land, water, forest, biodiversity and coastal resource management that contribute to poverty reduction, sustainable livelihoods and climate resilience"
Pacific Wastewater Framework for Action	six guiding principles to deliver the vision, 'Protect the health of the people and safeguard our fragile environment through improved, effective and efficient management of wastewater.
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,

³² Reference: question 84 of country report guidelines.

	monitoring and enforcement functions, from community to national government.
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 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

- a) Identify possible needs and priorities in terms of embedding biodiversity for food and agriculture, and in particular associated biodiversity, wild foods and ecosystem services into regional and international initiatives.

The main priority is improved coordination and information sharing between the different initiatives, highlighting 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
-

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

Countries may wish to use Table 8 to summarize their needs and priorities, and possible actions to be undertaken, with respect to the four priority areas of the guidelines.

Table 8. List of the country's needs and priorities, and possible actions to be undertaken, to conserve and use biodiversity for food and agriculture.

Priority areas	Needs and priorities	Possible actions to be undertaken ³³
1. Assessment and monitoring		
2. Conservation and sustainable use		
3. Policies, institutions and capacity		
4. Regional and international cooperation		

³³ Reference: questions 92, 93, 94, 95, 96 and 97 of country report guidelines.