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Priority adaptations to climate change for fisheries and aquaculture in Samoa

1. Introduction

This report summarises the outputs from the workshop held by the Ministry of Agriculture and Fisheries (MAF), the Secretariat of the Pacific Community (SPC) and the United Nations Food and Agriculture Organisation (FAO), with support from AusAID and GIZ, to identify priority adaptations to climate change for the fisheries and aquaculture sector in Samoa. The workshop was designed to select the best adaptations and supporting policies for minimising the risks posed by climate change to the plans that Samoa has to (1) sustain the use of fisheries and aquaculture resources for food security and livelihoods, and (2) maximise the sustainable economic benefits from tuna. Adaptations to capitalise on some opportunities expected to eventuate from climate change were also identified.

The plans to ensure that fisheries and aquaculture contribute their full potential to food security are based around continuing to provide Samoa's growing population with access to traditional levels of fish consumption (60 kg of fish per person per year).

Wherever possible, the adaptations identified during the workshop were designed to address issues facing the management of fisheries and aquaculture in the short term (e.g. population growth), and climate change in the longer term. Such measures are considered to be 'win-win' (W-W) adaptations. In some cases, 'lose-win' (L-W) adaptations were also recommended. These adaptations involve foregoing some benefits now to strengthen the capacity of resources to cope with the changing climate.

In identifying priority adaptations to climate change the workshop recognised that the coastal fisheries of Samoa differ to those of most other Pacific Island countries. In particular, Samoa has relatively large areas of rough bottom down to depths of 200-300 m. While this habitat does not have live coral, it does support substantial (but as yet unquantified) stocks of reef fish. Thus, the productivity of coastal fisheries in Samoa is not tied closely to the area of shallow-water coral reefs, as it is in other nations in the region. A key outcome of the workshop was the need to assess the sustainable production of fish from the deeper coastal waters around Samoa to provide a reliable estimate of sustainable coastal fisheries production for the nation.

The workshop also recognised that many of the adaptations to climate change involve strengthening management actions that are already in place to deliver sustainable benefits from the nation's fisheries and aquaculture resources. A prime example is integrated coastal zone management (ICZM). The need for improved ICZM to help maintain coastal fisheries

production has been recognised for many years and should build resilience of coral reefs and other coastal fish habitats to climate change.

2. Adaptations for food security and livelihoods

The adaptations and suggested policies for maintaining the important role of fish for food security and livelihoods in Samoa centre on (1) minimising the size of the gap expected to emerge between the fish required to maintain traditional levels of fish consumption and the fish available from coastal fisheries through effective management of fish habitats and stocks; and (2) increasing access to tuna and Nile tilapia grown in freshwater ponds to fill the emerging gap.

2.1 Effective management of habitats and stocks

- Improved coordination, adoption and implementation of ICZM and catchment management principles among relevant government departments. Better ICZM is needed to reduce the negative effects of sedimentation, nutrients and pollution from agriculture and forestry operations on coral reefs and mangroves to maintain their natural resilience to climate change (W-W).
- Maintain and strengthen community by laws to promote cohesive local governance arrangements to lay the foundation for stable and widely inclusive sustainable use of coastal fish habitats and fish stocks (W-W).
- Expansion of community-based management based on the principles of ‘primary fisheries management’ and an ecosystem approach to help (1) safeguard coral reef and mangrove fish habitats; and (2) maintain the replenishment potential of targeted fish and invertebrate species. Such approaches can include but not be limited to locally marine managed areas. In particular, restrictions on fishing gear, size limits, closed seasons etc should also be used (W-W).
- Enhance the resilience of coral reefs by balancing the catch of herbivorous fish to take advantage of their expected increase in abundance but retain enough of these fish to limit the overgrowth of corals by algae.
- Improved monitoring of coastal fish stocks using indicators suitable for multispecies fisheries to evaluate the effectiveness of management strategies. Modifying household income and expenditure surveys to measure changes in the types of fish caught by coastal households, and bought and sold, will be important (W-W).
- Update the mapping of all coastal fish habitats (including seagrass beds) and implement regular monitoring of habitat area (W-W).
- Harmonise opportunities for expansion of freshwater fish habitats due to higher rainfall and greater river flows with protection of agricultural land and infrastructure from inundation (L-W).

2.2 Increasing access to fish for food security and livelihoods

- Increased use of inshore fish aggregating devices (FADs) to improve access for coastal subsistence and artisanal fisheries to skipjack and yellowfin tuna and other

large pelagic fish as coral reef fish production declines under climate change. Stockpiles of materials to replace lost or damaged FADs should be maintained by MAF so that FADs can become a permanent part of the infrastructure for food security (W-W).

- Monitor the catches made around FADs to evaluate the social and economic benefits of this adaptation and better inform MAF and communities about the number, design, placement and maintenance of FADs (W-W).

Assess the stocks of fish associated with deep reefs surrounding all islands in Samoa to estimate annual sustainable catches from this habitat, and the costs of distributing the fish to the main fish markets in the country.

- Improved post-harvest technology for large pelagic fish caught around FADs to increase the availability of fish for food security for communities without access to refrigeration. This will help provide access to fish at times when it is not possible to go fishing, or when catches are low. This adaptation should include assessment of the application of solar power for drying/freezing in remote areas (W-W).
- Ensure that all health clinics are capable of diagnosing ciguatera fish poisoning and that all cases are recorded using the form for recording cases of ciguatera poisoning developed by SPC.
- Commission a marketing study to assess the potential for retaining more of the albacore tuna caught by alias within Samoa for local consumption as opposed to exporting the fish to American Samoa.
- Invest in a climate warning system for fishermen and fish farmers to alert them to weather conditions expected to endanger the safety of people involved in these operations, and which may cause damage to boats and aquaculture infrastructure.
- Develop tourism based on coastal habitats and fisheries resources in places where live coral cover can be maintained (e.g. by moving colonies) as coral reefs degrade (W-W).
- Expand Nile tilapia farming by:
 - Using GIS analysis to identify sites for pond aquaculture likely to be favoured by higher rainfall and warmer temperatures, but exclude sites with unacceptable risks of flooding (W-W).
 - Training fish farmers in the best aquaculture practice, pond construction, farm management, and small business skills (W-W).
 - Developing an efficient system for maintaining genetically selected, fast-growing tilapia, and for distributing them to all growing areas (W-W).
- Assess the potential for integrated aquaculture-agriculture systems using animal waste to fertilize ponds, and aquaponics (W-W).

- Investigate the economic viability of small-scale aquaculture of ‘sea grape’ (W-W).
- Identify microsites where farming of marine ornamental species (e.g. giant clams and hard corals) can continue as sea surface temperature and ocean acidification increase (W-W).
- Assess the potential for wild milkfish juveniles to be grown-out practically and profitably (W-W).
- Establish loan schemes to promote development of local enterprises based on fishing around FADs, post-harvest to extend shelf life of catches, and pond aquaculture. (W-W).
- Include the effects of climate change on fisheries and aquaculture in the science and geography curricula for high schools (W-W).

2.3 Supporting policies

- Strengthen governance to achieve ICZM and sustainable use of all coastal fish habitats by: (i) building the capacity of management agencies to understand the threats posed by climate change; (ii) empowering communities to manage fish habitats; and (iii) changing agriculture and forestry practices to prevent sedimentation, addition of nutrients to coastal waters, and pollution.
- Minimise barriers to landward migration of mangroves and other coastal habitats during development of strategies to assist other sectors respond to climate change.
- Promote mangrove replanting programmes in suitable areas to meet the twin objectives of enhancing habitat for coastal fisheries and capturing carbon.
- Mandate the use of ‘primary fisheries management’ and an ecosystem approach for stocks of coastal fish and shellfish to maintain their potential for replenishment.
- Include inshore FADs as part of the national infrastructure for food security, and make provision for regular maintenance and replacement of FADs.
- Promote the benefits of Nile tilapia farming to increase the supply of fish but limit Nile tilapia farming to catchments where the Mozambique tilapia is already established to reduce any possible effects on freshwater biodiversity.
- Encourage private sector investment in coastal tourism designed to accommodate climate change, particularly the projected changes in sea level, storm surge and changes to coral reefs and other coastal habitats.
- Strengthen national capacity to adopt and implement aquatic animal health and biosecurity measures, including monitoring, detecting and reporting aquatic animal diseases to prevent introduction of new pathogens.
- Ensure household income and expenditure surveys are modified to assist adaptive management of the fisheries and aquaculture sector.

3. Adaptations to maintain the contribution of tuna to economic development

The adaptations required to maximise the benefits from tuna fisheries for Samoa involve development of flexible management measures to ensure that local vessels can switch between species as the relative abundances of albacore, yellowfin and skipjack tuna are altered by climate change.

- Compliance with the WCFPC and FFA conservation and management measures for all species of tuna to keep stocks at healthy levels and maintain any natural capacity of these species to adapt to climate change (W-W).
- Energy efficiency programmes for tuna fishing vessels: Energy audits to identify how to reduce fuel use during fishing operations should assist national fleets to cope with rises in oil prices. Energy audits should also reduce the costs for vessels fishing further afield as the distribution of tuna changes (W-W).
- Environmentally-friendly fishing operations: Minimising the effects of existing fishing operations on non-target species will help meet the requirements of certification schemes for tuna exported from Samoa. Emissions of CO₂ from vessels should also be minimized to reduce the carbon footprint of fisheries (W-W).
- Re-assess safety-at-sea provisions/regulations/ practices to ensure that offshore vessels are able to cope with more severe weather and sea conditions (L-W).
- Design facilities to withstand sea-level rise and increased severity of cyclones when upgrading existing (or building new) fishing port facilities (L-W).

3.1 Supporting policies

- Support the inclusion of the implications of climate change in the future management objectives of the WCPFC.
- Require all vessels fishing for tuna in Samoa's EEZ to provide operational-level catch and effort data to improve the models for estimating the redistributions of tuna stocks.