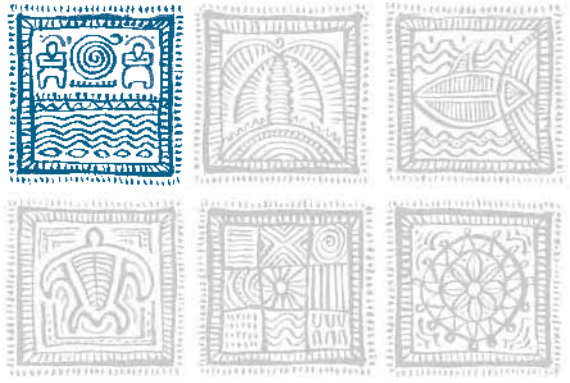
CLIMATE CHANGE AND FOOD SECURITY IN PACIFIC ISLAND COUNTRIES

ISSUES AND REQUIREMENTS



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INTRODUCTION

The overall purpose of this paper is to address food security and poverty reduction in the face of climate change and energy security. It attempts to bring to the fore food security threats associated with climate change in the food production and supply environments, as well as the broader livelihood and ecological changes that will occur as a consequence. Recognizing the different geographical regions around the Pacific and how climate change would impact on their food security situations opens up new opportunities for understanding why changes happen. An attempt will also be made to address how Pacific Islanders can be assisted to enhance their capacity to reduce risk and make optimal use of current climate resources in order to capitalize on benefits that may arise due to the changing climate. In doing so, it will attempt to highlight some of the current impacts of climate change reported by Pacific Island Countries in their national communications to the UNFCCC and their National Adaptation Programmes of Action (NAPAs), and what attempts have been made to seriously address these issues. It is recognized that climate change is an additional stress that needs to be managed by the agricultural and broader development communities but it should also be emphasized that climate change will further exacerbate current development stresses that are already plaguing the agriculture community and national governments. This paper will try to draw out these links and discuss ways to proactively address the situation now rather then later.

Pacific Island Countries and Territories (PICs) comprise a land area of only 553 959 km^2 spread in the world's largest ocean, with Papua New Guinea (PNG) accounting for 83 percent of the land area. The population is predominantly rural; however, urbanization is rapid, resulting in more than 40 percent of the population residing in urban areas in a few countries (SPC, 2004). Climate associated disasters such as tropical cyclones, flash floods and droughts impose serious constraints on development in the islands, so much so that some PICs seem to be in "constant mode of recovery". Food availability and people's accessibility to food are among the first to be affected following such disasters. It seems obvious that any

significant change in climate on a global scale will impact local agriculture, and therefore affect the world's food supply. In a changing climate regime, the need to strengthen food security[1] is, therefore, paramount.

Addressing the challenges of food security by taking into account current and future changes in climate is critical to reducing poverty and food insecurity. Food security assessments carried out in four Pacific countries (Fiji, PNG, Tonga and Vanuatu) by the CGPRT Centre (2000) showed that provincial and household food security are of more serious concern than national food security. Food security systems in rural areas are mainly natural resources based while urban areas are more dependent on imported food.

The eradication of poverty and hunger is one of the United Nations Millennium Development Goals (MDGs) adopted in the year 2000. Its target is to halve the proportion of people who suffer from hunger, in the timeframe 1990 and 2015. New information from the Intergovernmental Panel on Climate Change (IPCC) points to the fact that climate change is a phenomenon that would seriously threaten current food security situations globally, and jeopardize governments' abilities to deliver on their MDG goals. Not only that, it also poses further risk in shifting development priorities from land for food security to biofuel and biodiesel production in light of high fossil fuel prices in the international market.[2]

It is also critical also to address the dichotomy between land and coastal zone management for food security and the Clean Development Mechanism.[3] The use of arable land for growing green oil and biofuel is already taking place in one country in the region, PNG. If it will expand to other islands with a quarter of PNG's landmass in an unsustainable way, serious food security issues may arise. Related to the above are the issues of afforestation[4] and reforestation,[5] a

1 As defined by the FAO, *food security* refers to a condition for all people, at all times, having both physical, social and economic access to sufficient, safe and healthy variety of food, satisfying dietary needs and food preferences while having an active and healthy life in a sustainable manner.

2 Currently priced at approximately US$100/barrel.

3 Established under the Kyoto Protocol to market carbon credits accrued from sustainable development projects in developing countries, and to sell these to developed countries falling short of their Kyoto targets.

4 Planting of new forests on lands that historically have not contained forests.

5 Replanting of forests on lands that have previously contained forests but that have been converted to some other use.

mechanism for carbon substitution and sequestration/reduction currently being deliberated in the climate change negotiations of the United Nations Framework Convention on Climate Change (UNFCCC).

CLIMATE CHANGE IN THE PACIFIC

The Fourth Assessment Report of the IPCC (IPCC AR4) Working Group II (2007) identifies small island states as being among the most vulnerable countries of the world to the adverse impacts of climate change. Hay, *et al*., (2003) in discussing the Pacific's observed climate noted that compared to earlier historical records during the twentieth century, the southern Pacific had experienced a significantly drier and warmer climate (by 15 percent and 0.8°C, respectively). The Central Equatorial Pacific is facing more intensive rain (about 30 percent) and a similarly hotter climate (0.6°C), and sea surface temperatures in both areas have increased by about 0.4°C. These conditions are linked to an increased frequency of El Niño episodes since the 1970s (without alternating La Niña events). Other studies show that climate projections for the South Pacific indicate warming of 0.8 to 1.8°C and precipitation changes that range from -8 to +7 percent by mid-century (Ruosteenoja, *et al.,* 2003). By the end of the century, projected warming is 1.0 to 3.1°C and precipitation changes range from -14 to +14 percent. Projections of globally averaged sea-level rise range from 0.18 m to 0.58 m in 2090–2099 relative to 1980–1999; while tropical cyclones are likely to become more intense, have higher peak wind speeds, and bring heavier rainfall (IPCC, 2007). Thus, it is clear that there are winners and losers when it comes to climate and food security with mostly the countries in the mid to higher latitudes benefiting from global warming and the small island countries of the Pacific in the warmer latitudes standing to lose the most. The IPCC has concluded that the mounting evidence shows that climate change is unequivocally happening and may worsen in future; there is a need to act urgently to minimize these impacts.

Pacific Island Countries because of their unique geophysical features, social, economic and unique cultural characteristics are particularly vulnerable to the effects of global warming, including more frequent and intense natural disasters,

such as cyclones, floods and land droughts – as has recently been experienced. In the 1990s, for example, the cost of extreme events in the Pacific Island region is estimated to have exceeded US$1 billion (Bettencourt and Warrick, 2000). This included the cost of Cyclones Ofa and Val, which hit Samoa in 1990/91, causing losses of US$440 million, which was greater than the country's average annual gross domestic product (GDP) in recent years. In Niue, Cyclone Heta is estimated to have caused an impact of about NZ$37.7 million, which is approximately 25 percent of its GDP (McKenzie *et al.,* 2005). In February 2008, Fiji incurred in excess of FJ$45 million in damages to agriculture (excluding the sugar industry), infrastructure, utilities and properties as a result of Cyclone Gene. In addition, the government had to provide FJ$1.7 million worth of food rations (ReliefWeb, 2008).

PACIFIC FOOD SOURCES AND WATER

Food sources[6] in PICs are similar to sources of food in other parts of world. This section focuses on the present and projected climate impacts on the major food sources, not on how these food sources contribute to climate change. Drinking water is included because of its close linkages to food and nutrition. The analysis presented here is based on available information in the literature and the expert judgment of the authors. The key constraint in this analysis is the lack thereof and limited information on in-depth analysis of climate change impacts on the food sources of PICs.

AGRICULTURE

The governments of some Pacific Islands, in particular the larger islands, have embraced commercial crop and livestock production from the late 1970s to the present. In some countries, large-scale deforestation has led to monoculture crop production solely aimed at earning foreign exchange. As a result, prices of locally produced crops are higher compared to imported goods such as rice

6 In this paper, food sources refer to the productive sectors (agriculture, forestry, fisheries and drinking water) and food imports.

and flour. Many urban populations in the Pacific are now very much dependent on cheap foreign imports for their daily sustenance. However, according to a recent study by the University of Copenhagen (2007), in the Solomon Islands, the majority of rural people still live and depend on subsistence food production and fisheries. A multitude of cultivated plants such as yams (*Dioscorea spp.*), taro (*Colocasia esculenta*) and sweet potatoes (*Ipomoea batata*) and other crops such as bananas (*Musa spp.*) and watermelon (*Citrullus lanatus*) are still part of people's main staple diet.

In the Pacific, about 70 percent of the gross cropped area is geographically located so as to benefit from rains in the summer season (November–April). Production is, therefore, heavily dependent on the seasonal rainfall. Climate change predictions for the region suggest prolonged variations from the normal rainfall which can be devastating to agriculture. Fiji's experience with the 1997/98 El Niño Southern Oscillation (ENSO) event is a case in point, where losses in the sugar cane industry were around FJ$104 million while other agriculture losses including livestock death amounted to FJ$15 million (McKenzie, *et al.,* 2005). In the past, flooding and strong winds associated with tropical depressions and cyclones have curtailed agriculture production (Mataki, *et al.,* 2007). In 1990, Tropical Cyclone Ofa turned Niue from a food exporting country into one dependent on imports for the next two years (Adger, *et al.,* 2007). Such disruptions to food production and the economy may intensify in future, given the projections for more intense tropical cyclones and precipitation variations of up to 14 percent on both sides of normal rainfall (IPCC, 2007) by the end of the century. More so, in between climate extremes, altered precipitation and increased evapotranspiration (including its intensity as well as temporal and spatial shifts) will also be of concern as these changes take root. The increase in atmospheric carbon dioxide may benefit agriculture but these positive effects are likely to be negated by thermal and water stress associated with climate change (Lal, 2004) and changes in pests' voracity and weeds' growth; loss of soil fertility and erosion resulting from climatic variability being another problem. Increasing coastal inundation, salinization and erosion as a consequence of sea-level rise and human activities may contaminate and reduce the size of productive agricultural lands and, thereby, threaten food security at the household and local levels.

FISHERIES

Per capita consumption of fish in PICs is very high by global standards, with an average of 70kg of fish consumed per person per year in the early 1990s. Fish exports account for as much as 73 percent of the total exports of some countries (Barnet, 2007). In 1998, the landed value of tuna fisheries from PICs' waters was US$1.9 billion (Gillett, 2002) indicating the economic significance of fisheries to national economies and subsequently their food security. Both oceanic and coastal fisheries are bound to be affected by climate change. The combination of increasing temperatures and sea-level rise will result in changes to coastal circulation patterns, thereby affecting nutrient supply, lagoon flushing, coastal erosion, and possibly ocean acidity and coral bleaching (SPREP and PIFs, 2007). These will affect both the reef-building capacity of corals as well as the spawning cycles of reef fishes and invertebrates. Increased incidences of ciguatera fish poisoning will also be seen (Adger, *et al.,* 2007). Given that coastal fisheries provide a significant source of food and economic security for coastal populations (most Pacific Islanders are coastal dwellers), climate change poses a serious threat to the livelihood of Pacific people. Industrial fishing (oceanic), which is mainly based on tuna, is also known to be related to ENSO, where skipjack and yellowfin tuna are displaced eastwards during ENSO events and westward in La Niña (Kirby, 2007). Such distributional effects may become more pronounced with projections for more ENSO-like climate and may deprive some PICs of the much needed income from the tuna industry. The survival and growth of any fishery is intricately linked to environmental variables such as sea temperature and primary production. As such, the projected increase in sea level, sea surface temperature changes and alteration of the mixing layer thickness will ultimately affect plankton productivity. This will mostly likely result in the decline of fisheries productivity (Lal, 2004) and food security. Most of the coastal ecosystems on which coastal fisheries depend will be adversely affected. For example, coral reefs that are close to their threshold temperature tolerance will suffer irreversible damage if the seawater temperature exceeds 29.5°C. There has been widespread coral bleaching during ENSO episodes following threshold crossing. More stormy weather and intense cyclones may render fishing trips unsafe and less productive, consequently affecting fish supply and depriving fisherfolk and industries of income.

FORESTRY

Forest ecosystems are essential component of Pacific Islands' environment and are, by nature, highly fragile and vulnerable to external disturbances. Increasing population, impacts of human-induced activities (e.g., logging and forest clearance for agricultural activities) and the introduction of invasive species can severely degrade island ecosystems bordering on the margins of ecological collapse. Pressure for global market economies also has seen significant commercial harvesting of natural forest resources as well as subsistence harvesting. Beside the ecological functions of the forests, they are sources for food, income, medicine, fuel and building materials and, therefore, are linked to the overall food security of communities near these "biological warehouses". Wild harvests of edible nuts, fruits, plants and meat from the forests form a significant source of food for Pacific island people. In a region where the delivery of medical services is often limited by physical isolation and affordability, traditional medicines from the forest are often the only difference between life and death.

Increased atmospheric carbon dioxide may be beneficial in terms of plants' and forests' growth and yield. However, this is also dependent on the photosynthetic pathways, moisture, temperature and nitrogen application (Adger, *et al.*, 2007). More specific information on the impacts of climate change on wild harvests and different communities within forests are largely unknown and, therefore, weakened our assessment of the overall food security implications of this important food source within a climate change context. However, the increased pressure of human activities on forests could threaten wild harvests, curtail income and destroy traditional medicine, consequently affecting food security at the local level.

IMPORTED FOOD

There is a worrying trend throughout the Pacific today that demand for food is increasingly being serviced by imports. Basic staples such as rice and wheat for flour are key substitutes of traditional diets that are now part and parcel of a Pacific Islander's daily diet. This is a critical situation in terms of food security and nutritional security, given the volatility of international commodity prices. During the Gulf war, in 1998, the cost of rice in Palau almost doubled from US$9 to US$16 for a 25kg bag (*Pers. Com.*. Aitaro, 2008). Currently, in the Solomon

Islands, a 20kg bag of rice costs around US$15–20. Deteriorating terms of trade, rising external debts and inflation plague the capacity of Pacific Islanders to adequately meet their nutritional requirements from imported food alone. The above examples denote that future food security for the Pacific cannot be left solely to dependency on imports. If that is the case, then poverty would increase and the ability of a Pacific nation to deliver on its MDG obligations would be seriously compromised. Moreover, cheap food imports have contributed to the rise in heart diseases, obesity and other health complications in the Pacific Islands. Thus, improvements to local food production are pertinent to strengthening resilience, especially in a changing climate regime.

DRINKING WATER

The five main drinking water sources are; (1) rain water, (2) ground water, (3) surface water, (4) desalinated water, and (5) imported drinking water. In most PICs, not all sources are accessible and available readily to islanders, rendering them extremely vulnerable to natural variability in precipitation patterns or changes in storm tracks. This is particularly true for the atoll states in the region (Salinger, *et al.,* 1995). Droughts associated with ENSO events have depleted rainfall collection supplies and the freshwater lenses and parched aquifers on many Pacific islands. For example, in 1998, 40 atolls of the Micronesian Subregion ran out of drinking water supplies during an ENSO event (Tutangata, 1996), resulting in the declaration of a national emergency. In the same year, rainwater tanks in substantial parts of Kiribati dried up and shallow groundwater reserves became brackish (World Bank, 2000). The main island of the Marshall Islands also had access to drinking water for only seven hours every 14 days, and rationing occurred on all islands in the North Pacific (East-West Center, 2001). Regular tropical cyclones also imperil drinking water supplies. Storm surges also have been known to overtop some small low-lying islands (e.g. some low-lying limestone islands in Ha'apai Group in Tonga), contaminating freshwater lenses with saltwater for months and damaging rainfall collection systems (Falkland and Custodio, 1991, and Falkland, 1999). In keeping with climate projections for the future, drinking water supplies will be negatively impacted unless drastic adaptive measures are implemented.

LAND AND MARINE TENURE SYSTEM

Future food security for the Pacific would depend by and large on access to land. Already, agricultural development experts in the Pacific are concerned that changing development priorities have seen the loss of arable agricultural lands to housing, tourism developments and industries (Ratukalou *et al.*, 2000). In Papua New Guinea, large tracts of forests are being cleared to make way for palm oil production, which is proving to be the next generation of fuels developed in many developing countries for global markets. An analysis of the above trend points to a competition between multinational corporations and smallholder farmers with limited financial and land resources. Resource owners, now better educated and with better grasps of the value of their land resource, could be tempted to seek out potential benefits from climate change mitigation at the expense of food security. Revenue flows from carbon markets and biofuels could tempt a change that could evolve into a food security crisis for the region. PICs are also introducing new land and marine tenure systems' development policies, laws, and regulations mainly to facilitate economic activities (e.g. sea weed and *bêche-de-mer* trade, and tourism development). More often, food security implications of these new policies and legislation are not high in the issues considered. Such changes have indirectly placed and forced many poor Pacific Islanders to reduce their access to productive land for farming and also to some of their traditional fishing grounds, which they normally rely on for their protein supply.

CASE STUDIES

In 2007, the FAO Sub-regional Office for the Pacific Islands in Apia, Samoa, commissioned three case studies as a contribution to the understanding of the impacts of climate change on agriculture and food security in the Pacific. The case studies were undertaken in Vanuatu, the Republic of the Marshall Islands and the Cook Islands (FAO, 2007, 2008), illustrating the different circumstances faced by high islands with significant land area (Vanuatu) and atoll countries (Republic of the Marshall Islands and the Cook Islands).

The case studies acknowledged that the likely impacts of climate change and increased carbon dioxide concentrations in the atmosphere are not well understood.

However, in both cases, the changes are expected to be detrimental to agriculture and food security, particularly in relation to changes in rainfall patterns.

For the Republic of the Marshall Islands (RMI), the case study highlights the importance of reviving subsistence agriculture to support its rapidly growing population. The most important food crops are copra, breadfruit and pandanus. These crops used to be abundant during their seasons, but harvests are reported to have been disrupted by climatic extremes such as typhoons and droughts in recent years. Increased preference and reliance on imported foods is putting pressure on the national economy and having implications for nutrition and health.

Being composed of 29 atolls and five low elevation islands, RMI is particularly vulnerable to sea-level rise. This and the incidence of extreme events such as droughts and tropical cyclones could result in increased salinity of the soils and freshwater lens, thus impairing food production. There is also increasing pressure on coastal and marine environments, a particular concern given the role of seafood in the diet. Conversely, mariculture is seen as an area having potential for expansion.

The study calls for immediate action to minimize the adverse effects of climate change and sea-level rise on the country's already vulnerable atoll environment. The report observes that this "will be a long hard battle" and states that "the international community is duty-bound to assist the RMI with its efforts to adapt to climate change" (FAO, 2007).

For Vanuatu, an archipelago of 80 high islands, the case study found that some agricultural crops are already showing signs of stress under current climatic conditions. Water scarce areas and small islands that depend entirely on rainwater and underground water sources are also experiencing severe water shortages. Coastal erosion and inundation are reported from coastal communities and fish poisoning has been an emerging problem in recent years. The report indicates that these problems will be aggravated by any further changes to current climatic conditions and observes that there is currently limited data to enable Vanuatu to plan effective responses to climate change impacts.

The case studies illustrate the different conditions faced by Pacific Island Countries according to their geography and human and natural resources.

However, some common themes can be drawn from the studies that have wider applicability in the Pacific Islands regions:

- The potential for climate change to impact negatively on agriculture and food security is acknowledged.
- There is a clear need to focus on supporting agricultural production in the context of changing climatic conditions and future climate change scenarios.
- The limited human capacity among Pacific Island Countries highlights the need to focus on capacity development.
- There is a lack of awareness and information available to governments and communities to asses the potential effects of climate change and make appropriate decisions.
- There is need to have a coordinated, systematic approach rather than activities carried out in isolation (i.e., mainstreaming food security issues into budget, planning and related policy areas).
- Practical responses must be designed to be implemented in a way that is consistent with local capability and circumstances.
- There are potential opportunities for increased food in coastal marine area through mariculture/aquaculture.
- Real progress can only be made with support from development partners.

WHAT HAS BEEN DONE?

Climate can be considered a valuable natural resource that is of enormous economic and social importance, but it is usually taken for granted. Considering the gravity of the issues involved, PICs view the impacts of climate variability including extreme weather events, climate change and sea-level rise as an impediment to sustainable development in the region. Realizing this development dilemma, PICs have committed to a number of international and regional agreements, such as UNFCCC and its Kyoto Protocol and the Pacific Plan, for addressing climate change impacts within the context of their sustainable development strategies (Koshy, 2005).

In 2005, the Pacific Islands Forum Leaders' meeting adopted the Pacific Islands Framework for Action on Climate Change (PIFACC). PIFACC explicitly

recognizes the need to identify vulnerable sectors in order to better design and target adaptation measures. In terms of action on the ground, about 24 projects focusing mainly on climate change adaptation and basic human capacity building have been carried out in the Pacific region[7] during the last decade. This is a small portfolio of projects in contrast to other regions of the world. Overall, PICs' response to climate change so far can be described as being, project-based, ad hoc and heavily dependent on external resources. Competing priorities, lack of national government commitment, limited capacity and the dominance of international priorities over national ones in the climate change agenda are some of the common justifications for such feeble response (Nunn, 2007 and Mataki *et al.,* 2007). Internationally driven documents such as the NAPAs and National Communication for the UNFCCC, and regional frameworks (e.g. PIFACC and the Pacific Plan) are pertinent to guide climate change activities. However, national development plans should be the basis of adaptation and mitigation work in PICs. After all, the salient elements of these documents were supposed to be incorporated into development plans at various levels of governance. The other features of PICs' climate change response are the limited participation of the private sector, limited mitigation projects, and the dominance of projects led by regional organizations[8] over projects led by individual countries and territories.

It is worth noting that PICs with the assistance of CROP[9] agencies, donors and international agencies have also been working towards improving their food production and economies without clear reference to climate change. In 2002, FAO launched an initiative to help Small Island Developing States review and update their national policies and strategies for food security and agricultural development. In conformity with the Food and Agriculture Organization Plan of Action on Agriculture on Sustainable Agriculture in SIDS, Pacific Island Countries are encouraged to move towards more intensified, diversified and

7 GEF (Global Environment Facility), 2006: Pacific Islands Adaptation to Climate Change Project (PACC), PDFB Document.

8 Secretariat of the Pacific Regional Environment Programme (SPREP), the South Pacific Applied Geoscience Commission (SOPAC) and the University of the South Pacific (USP).

9 Council of Regional Organisations of the Pacific.

sustainable agriculture in order to create an enabling environment for agricultural intensification and diversification, remove production constraints, and improve domestic and export marketing and processing in the years to come. The intention is to build and/or strengthen national capacities and institutions to accommodate and take advantage of the new international trade regime, strengthen support services to agriculture, forestry and fisheries and provide a coherent framework for sustainable natural resource management and environmental protection in a rapidly changing world. This indicates that even before the threat of climate change came to to the fore, food security challenges were already entrenched in PICs; and some win-win adaptation measures have been implemented. However, these adaptive efforts need to be invigorated and strategically targeted to avoid maladaptation.

The development, completion and implementation of the PIFACC Action Plan will contribute to the coordination of activities in the region. The Action Plan is intended to support implementation of the Framework through actions taken in response to meeting the key outcomes under each Framework principle:

- implementing adaptation measures;
- governance and decision-making;
- improving our understanding of climate change;
- education, training and awareness;
- contributing to global greenhouse gas reduction; and
- partnerships and cooperation.

The Action Plan is regional in nature, with national activities complemented by regional programming in support. It provides an indicative menu of options for action on climate change. An accompanying matrix will also be developed by the Pacific Climate Change Roundtable in order to provide a clear overview of ongoing and planned activities at the national and regional levels, with responsible agencies or entities, and ensure that interested donor countries and agencies are able to identify initiatives to support, so that their work aligns with Pacific priorities. By clearly identifying actual existing programmes and projects within the matrix of activities, it is expected that national officials and local stakeholders, as well as interested donor countries and partner organizations can ensure greater leverage of resources to the region for climate change work. This will also allow for a clearer alignment among different initiatives.

The re-establishment of the Pacific Climate Change Roundtable in 2008 will also provide for thematic discussion of particular topics such as climate change and food security.[10]

WHAT MORE NEEDS TO BE DONE?

Climate change impacts on food security will not be uniform throughout PICs because of differences in the expected climate change among islands, island topography, production systems and economic bases. Therefore, the uniqueness of each PICs must be at the fore of any action implemented to safeguard food security. To this end, PICs should focus on adaptation and, to a lesser extent, on mitigation. Adaptation to climate change in each of the food sources will be complex because of the effect of intricate linkages and feedbacks of the climate on the food sources and society, barriers and the economy. In terms of specific adaptation measures, PICs may need to focus on win-win measures, such as switching to drought-resistant crop varieties,[11] improving climate information dissemination systems and farm level management, strengthening the enforcement of fisheries and forestry legislation, and eliminating bureaucratic inefficiencies in governments. In addition, the cross-sectional vulnerabilities of different stakeholders and sectors of the society must also be factored in, when responding to the impacts of climate change. For example, Pacific women are mostly responsible for gleaning inshore waters and reefs for fish, shellfish and other marine products (Tawake, 2008), the projections for more intense tropical cyclones and rise in sea surface temperature will negatively impact inshore fisheries, affect women's source of income and, more importantly, hamper household food supply, especially in the rural areas.

Pacific Island Countries need to review their agriculture, forestry, fisheries and drinking water development policies seriously, in light of new information on climate change from the IPCC. Nations that have pushed for monoculture crop

10 SPREP press releases and circular detailing Action Plan, 2008.

11 Secretariat of the Pacific Community (SPC) is working in this area, establishing a climate ready collection in the Centre for Pacific Crops and Trees (CePaCT). This collection will be available for farmers to access.

production for foreign markets will need to assess their food security potential. It is well established that diversified economies and strong agricultural sectors will fare better under climate change scenarios. Thus, establishing an enabling environment, ensuring markets are working, putting social protection in place, and strengthening research and development will enable the agriculture sector and agricultural livelihoods to be more resilient while stimulating wider economic growth. In other words, income generation and food production in vital food sources such as agriculture will have to be strengthened to match regional population growth which is presently increasing an average of 2 percent annually (ESCAP and PIFS, 2008).

The mainstreaming of climate change knowledge at every level of planning is imperative, and must be followed by appropriate action at field or people level. For example, the forging/strengthening of genuine partnerships with the farmers in providing them the best available guidelines on choice of crop varieties, soil and water management options under changed environmental conditions to avert the risk of crop failures is crucial for food security and economy of the region. In addition, when addressing the issue of food security, four climate change parameters ought to be carefully monitored for current and future planning purposes, namely: temperature (warm and cold nights), precipitation, sea level change and extreme events. Extreme events need to be carefully monitored considering the devastation they can inflict on ill-prepared PICs. More importantly, this climate information must be analyzed and made into communication products easily understood by both farmers and fisherfolk.

FUTURE INITIATIVES

While much has been done in relation to climate change in the Pacific Islands region, it has focused on generic aspects of climate change, largely through *environment* departments and officials. This has led to a high level of engagement in the international climate change policy negotiations, and meeting reporting requirements under UNFCCC (including production of National Communications, NAPAs, etc.). Relatively little effort has been devoted to raising the level of awareness and understanding in the key food production sectors, and even less on creating an integrated approach incorporating the full range of stakeholders and policies that contribute to food security in a changing climate.

The realization that climate change (and the policy responses to climate change) can have profound negative impacts on food security has raised issues of critical importance for the Pacific Island Countries. The discussion above has highlighted the need for action to address the climate change and food security issues in the Pacific Islands context.

In addition, the case studies have identified the need for support from the international community. This is consistent with the Bali Action Plan (the "Bali Roadmap") adopted by UNFCCC COP 13 in December 2007. The Roadmap identifies enhanced action on adaptation as a key area for cooperative action, in light of the need for urgency in addressing climate change. It sets out the urgent need for international cooperation to support implementation of adaptation actions through, for example, capacity building and response strategies, integration of adaptation actions into sectoral and national planning, specific project and programmes and other initiatives to reduce vulnerability. The Roadmap also highlights the urgent and immediate needs of small island developing states and least developed countries (UNFCCC, 2007).

Against this background, the following have been identified as specific areas where support from the international community is needed:

- raising awareness and understanding of climate change and its potential impacts on food production and food security, particularly in sectors beyond the environment departments and NGOs that have previously been at the forefront of climate change discussions;
- mainstreaming climate change across government agencies, to ensure that food security is addressed in a way that includes all the relevant government stakeholders, and is recognized in both national and sectoral planning and budgeting;
- designing cross-sectoral policies to support domestic food production (incorporating agriculture, fisheries, water, trade/tariff policy, appropriate incentives, legislation, research and development etc.), as a key element or product of mainstreaming;
- intensifying efforts at capacity building for agriculture across the Pacific Islands region that focus on climate change impacts and adaptation;

- implementing capacity building efforts for integrated coastal management, taking into account future climate change scenarios to limit adverse effects and optimize food production opportunities;
- supporting programmes and projects that target agricultural (including seafood) production to promote food production and food security in light of climate change focusing on specific agricultural (including mariculture and aquaculture) products and processes.

CONCLUSION

Climate change is already affecting PICs. Climate variations and extremes have disrupted food production, water supply and economies of PICs. Climate projections for the future, although coarse for islands, are bleak and indicate reduced food security, especially at household level. The primary food sources (agriculture, fisheries and forests) and water will be impacted by climate change and, in most cases, these impacts will be negative. In terms of action against climate change and to cope with its impacts, PICs are at various stages of the continuum from the ratification of UNFCCC to the implementation of concrete mitigation and adaptation measures. The exact magnitude and nature of the climate change impacts on food sources are relatively unknown in PICs. However, the strengthening of the adaptation enabling environment (e.g. legislation and policy adjustments relating to food sources, coordination among and across key stakeholders and research and development) and implementation of adaptation measures (e.g. expanding seed banks and increasing investments in primary food sources) must start now with a focus on win-win measures. PICs need the support of the international community to achieve this.

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