

Food security and climate change in the South Pacific

Pacific Islanders traditionally have enjoyed diverse ways to achieve food security, through gardening, fishing, hunting, and selling products or labour for cash, reports **JON BARNETT**. But robust local food production has significantly been eroded with urbanisation and cheap, poor quality food imports. Climate change will increase threats to food security, through its impacts on food production, health, infrastructure, the ability of countries to import food, and the ability of households to purchase food. Commercial agriculture, fisheries and tourism are also likely to be badly affected as will the ability of the regions governments to cope with increasing climate-related disasters.

Food security is defined as: "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary and food preferences for an active and healthy life."¹ It includes: the availability of food, and the ability to access and make use of food. The availability of food depends on local production and imports. The ability to access food depends on how people are able to grow and/or buy their own food, which assumes markets for local products and labour, including labour costs relative to food costs.

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How well people can "use" food is a health matter. Common illnesses like malaria and gastro-intestinal disorders impede the body's ability to effectively extract the necessary calories, protein and micronutrients from food, leading to what is called "secondary malnutrition."

Food security problems in the islands of the Pacific are not as serious as in parts of South Asia and Africa, largely because poverty is generally not as acute, and there are few instances of death due to hunger in the region.

However, many Pacific communities have problems with micronutrient deficiencies, where access to an adequate range of healthy foods is restricted by local growing conditions or the types and costs of foods available on the market. Penetration of local markets by cheap, poor quality imported foods with little nutritional value has brought health problems with increased rates of non-communicable diseases, such as obesity, diabetes and heart disease.

In the Pacific region there are clear indications

food insecurity may increase in the future,² given anticipated climate change is likely to have negative impacts on factors that determine food security in Pacific Island countries.

Regional changes in climate

Projections of possible changes in climate in the Pacific Islands region apply to the region as a whole, not to specific countries. Scenarios of future greenhouse gas emissions indicate air temperature in the Southern Pacific is likely to increase by between 0.99 and 3.11°C by the year 2099.³ These projections may be conservative, given decadal increases in annual temperatures in the region of 0.3–0.5°C since the 1970s.⁴ Changes in precipitation arising from climate change are less certain, with an expected range of between –14% and +14.6% by 2099.³ Mean annual changes, however, matter less than the frequency and intensity of rainfall events, particularly as the region is already prone to floods and droughts, and water for agriculture is supplied almost entirely by rainfall, rather than by irrigation. More rainfall is expected in summer, the traditional wet period, and less in the already dry months, highlighting difficulties for sustaining crops throughout the year. At the same time, rainfall events are likely to be more intense and possibly less frequent, with predictable implications for flooding and drought.⁵

Climate change is also expected to bring increases in sea levels. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change suggests sea level may rise by between 18cm and 59cm by 2100.⁶ Another climate change expert believes a mean 50cm rise by 2100 seems reasonable.⁷ These projections exclude the possibility of increased melting from ice sheets, the risk of which is uncertain. However this

cannot be entirely discounted and some more recent research on this was unable to be considered in time for the latest IPCC report. A sea-level rise in excess of one metre by the end of this century would have catastrophic effects for many Pacific Islands.

The El Niño Southern Oscillation (ENSO) weather pattern has particular importance in the South Pacific with El Niño years bringing drought to most of the region. How climate change may affect the frequency and severity of El Niño events is uncertain, but El Niño patterns have been more frequent and severe since the 1970s. The relationship between climate change and tropical cyclones is equally unknown, but it's thought such cyclones might become stronger, last longer, have higher wind speeds and unleash more rainfall.⁸ In many Pacific Islands, cyclones are already a cause of injury, death and widespread crop damage.

Food production: impacts on agriculture

Agricultural production in Pacific Islands is likely to be adversely affected by climate change in several ways. In coastal communities the effects of erosion, increased contamination of groundwater and estuaries by saltwater incursion, cyclones and storm surges, heat stress and drought may individually or in combination undermine food production. Cyclones are a significant cause of lost agricultural production. Cyclone Ami, for example, caused over US\$35 million in lost crops in Fiji in 2003.⁹ Drought presents problems for agriculture everywhere in the region, particularly given the lack of irrigation. Increased risk of flooding in river catchments also threatens food production. Heavy flooding of the Wainibuka and Rewa rivers in Fiji in April 2004, for example, damaged between 50% and 70% of crops.¹⁰ Increasingly extreme rainfall, coupled with ongoing deforestation and longer dry spells, may all impact on soil fertility.

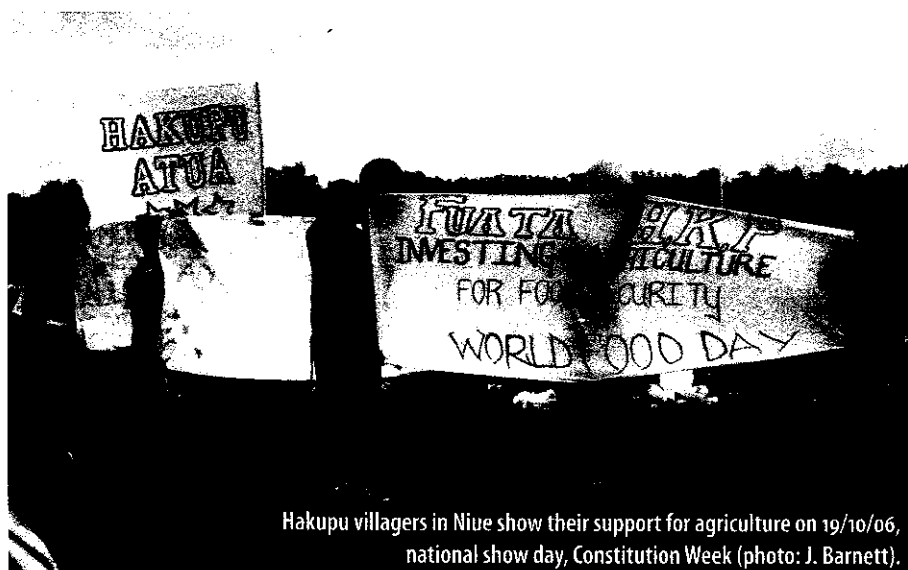
Effects of climate change on critical infrastructure may also undermine both subsistence and commercial agriculture. Storm and cyclone damage to equipment for processing and storing food, and to roads, rail and vehicles, can upset the effective supply of food, and goods to markets, and thus threaten the livelihoods of rural growers. Larger scale economic changes can also undermine food production.

Climate change impacts on production in key sectors such as tourism, and increasing public expenditure on repairing and replacing lost infrastructure, may affect employment and incomes, which in turn could suppress demand for locally grown foods sold in local markets.

Traditionally Pacific Island communities have grown multiple crops, an agricultural practice that gave resilience to the food supply as not all crops were affected by specific hazards such as a drought or cyclone.^{11,12} However, greater penetration of international markets and development assistance of various kinds, as well as increased urbanisation (and some decreases in security of land tenure) have weakened the diversity and intensity of local production in many areas.¹² Attempted shifts towards modern agricultural economies and more affluent industrial societies have failed to deliver the resilient agricultural and food systems developed countries enjoy. If anything, they have weakened traditional agricultural systems.

Repeated efforts to develop monocultural cash crops, like copra, coffee and sugar cane, combined with the effects of the cash economy and penetration of markets by often cheaper but less healthy foods, have weakened the diversity and intensity of local production in many places. This has caused greater dependence on the market for food, less resilience of food supply to hazards (given low incomes and relatively high food prices), and a "nutrition transition" associated with increased rates of obesity and cardiovascular disease in the region.¹³

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Hakupu villagers in Niue show their support for agriculture on 19/10/06, national show day, Constitution Week (photo: J. Barnett).

Importance of fisheries

Fisheries play a critical role in food supply and economic development in the Pacific region, not surprisingly given a land/sea ratio of 1:300. Fish is an important source of protein for most coastal communities. Per capita consumption of fish is very high by global standards with an average of 70kg of fish consumed per person per year in the early 1990s.¹⁴

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Fisheries also provide income to many coastal communities who harvest shellfish and shells, corals, crustaceans, marine plants, finfish and other species. Inland freshwater fisheries are also important sources of food in Papua New Guinea, the Solomon Islands and Fiji.

Domestic fishing activity accounts for 13% of GDP in the Solomon Islands and 12% in Kiribati; and fish exports provide 95% of exports from the Federated States of Micronesia, 73% from Palau and 61% from Samoa.¹⁵ For some countries, including Kiribati and the Solomon Islands, remittances sent home from workers on fishing boats are also important.

A 2001 study,¹⁴ estimates the industrial tuna fishery accounts for half of all exports, 25,000 jobs, and 11% of production in the Pacific region.

Tuna is the most valued deepwater fishing species in the region. The value of landed tuna caught in

South Pacific waters is approximately US\$1.9 billion, with an end-market value of US\$6 billion. Of this, around 45% comes from the islands' Exclusive Economic Zones, although only a small proportion is actually landed on the islands themselves. Most of the fish is caught by distant water fishing nations, which pay Pacific Island governments around US\$60–\$70 million a year in access fees.⁵

Pacific Islanders are highly skilled at fishing and many societies have a rich body of traditional knowledge about where and how to catch fish. There is considerable uncertainty about climate change effects on artisanal fisheries on which many Pacific Islanders depend, but it's possible the increasing temporal and spatial variability in fish abundance caused by degraded reefs, mangroves and the turbidity, salinity and temperature of water is due to climate change. These changes may make it difficult for Pacific Islanders to sustain fish catches. The increasing variability in abundance may affect nutrition and the incomes of coastal populations dependent on artisanal fisheries. It may also increase the time and fuel costs associated with catching fish, with opportunity costs for other livelihood strategies.

Changes in ENSO conditions have been shown to cause variations in catch per unit of effort rates across the South Pacific.¹⁶ If ENSO activity intensifies in frequency or severity, fish catches may fluctuate in the Exclusive Economic Zones of the equatorial Pacific Islands. This will then affect the revenue these countries earn from access fees paid by distant water fishing nations. Climate change may also extend the present

range of tuna to higher latitudes, causing a drop in net productivity and increasing catch variability, and so decrease the catch per unit of effort with consequent impacts on production costs and prices.¹⁶

Increases in climate-driven storm damage may also impact on fisheries development through damage or loss of boats, boat launching and fuel facilities, and fish storage and processing facilities. So, through changes in fish habitats, migration patterns and fishing-related infrastructure, climate change presents significant risks to fisheries and to the people and islands that depend on them for food and income.

Niue food market, October 2006
(photo: J. Barnett).



Economic growth and poverty

The past ten years has seen a decline in per capita food production across the region and an increase in dependence on imported foods.² All countries import almost all their cereals, and imports have risen steadily since 1991. At the same time, food exports have decreased and trade deficits increased.² Declining per capita food production is a function of population growth, insufficient private and public investment in agricultural production, limitations on production due to water scarcity and effective scarcity of land (due to absolute shortages, or insecurity of tenure discouraging capital investment), increasing costs of inputs relative to production value, natural disasters, and rural-urban migration. Total food availability in the Pacific Islands is becoming increasingly a function of the ability to pay for food imports.

At an aggregate level, the ability to pay for food imports is a function of national income, so assessing the impacts of climate change on food security involves assessing its impacts on the ability of Pacific Island countries to pay for food imports as populations grow. Additionally, climate change impacts on labour markets in New Zealand, Australia and the United States is important for Pacific countries heavily dependent on remittances. These impacts are uncertain. There may be grounds for concern for Pacific Islanders working in agriculture and agriculture-dependent industries, as these industries in donor countries may also be impacted by climate change. But the assumption of the higher capacity of developed donor countries to adapt to climate change may well insulate Pacific Islands against declines in remittances due to climate change.

For island countries heavily dependent on aid, the impacts of climate change on the capacity of donors to sustain aid flows, and the motives for those flows, is also important. Reasons given for delivering aid vary; they include strategic, historical and constitutional, economic, and humanitarian reasons. We might surmise that the strategic and historical/constitutional reasons for giving aid are relatively independent of climate change effects; that economic reasons may change depending on the distribution of economic impacts within and among donor countries; and that aid for humanitarian reasons may increase as climate change results in more damages due to disasters and increasing poverty.

Island economies may face significant climate change costs. The World Bank¹⁷ in 2000 estimated that by 2050 damages from climate change could cost Tarawa atoll in Kiribati \$8–\$16 million, or 17–34 percent of current GDP. Another study estimates economic impacts of climate change on Pacific Island economies may be “so profound that they dwarf any

strategic issue currently confronting a major peacetime economy.”¹⁸ Cyclone and drought disasters already have significant costs, so increases in their intensity or frequency in future will place further demands on donors and families to substitute for lost crops, income, infrastructure and housing.

Impacts on tourism

Tourism is also sensitive to climate change. Impacts have yet to be seriously examined, but the industry may be affected directly for example, through loss of beaches, and indirectly through milder winters in traditional markets reducing the motivation to holiday abroad.¹⁹ Extreme weather will be increasingly costly for tourism infrastructure, and may dampen demand for travel to Pacific Islands if potential tourists fear for their safety. Further, climate change could generate the spread of malaria and dengue fever to tourist-dependent countries like the Cook Islands, Palau and Fiji, encouraging tourists to seek alternative destinations. Rising airfares, due to increasing fuel costs associated with potential policy measures to implement the Kyoto Protocol and post-Kyoto agreements, coupled with increasing scarcity of jet fuel, may also undermine demand for tourism.

It seems likely some of the region's main forms of income generation – agriculture, fisheries and tourism – will be adversely affected by climate change. Employment in these sectors may suffer, through long-term contraction in job numbers, short-term fluctuations and/or increasing casualisation of jobs in response to increasing variability in production, downward pressure on wages as employment opportunities decrease and demand for jobs grow because of population growth. There may be other important secondary effects; for instance, those whose livelihoods depend on agricultural production:

transport, information and credit suppliers, may be at as much risk as farmers. Impacts in one sector may impact on others – declining incomes from agriculture may promote migration to urban areas, increase urban poverty and place greater demands on urban services like running water, disease prevention programmes, and health care.

If climate change results in economic contraction and increasing unemployment, the ability of

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governments to provide these services may also decline, further exacerbating poverty and food insecurity.

Through impacts on agriculture, fisheries and tourism, climate change may increase levels of chronic and transitory poverty, and subsequently decrease the ability of households to purchase food. This, coupled with potential impacts on household food production for subsistence purposes, suggests that not only may per capita food availability contract due to the combined effects of climate change on domestic production and the ability to pay for food imports, so too the ability of people to access food may also decline.

Health effects

In most Pacific Island countries people are relatively healthy compared to other developing regions in the world. But there are problems of under-nutrition in parts of Melanesia and some of the more remote islands in several countries. Malaria is a major cause of illness in Melanesia, and outbreaks of dengue fever occur across the region. Disasters cause injury and loss of life. Diarrhoea and other waterborne diseases such as cholera are serious problems in some islands and in urban areas. Incidences of ciguatera (fish poisoning) appear to be increasing.

Climate change may extend the spread of malaria and dengue fever as factors that encourage the breeding of mosquitoes that carry these diseases are influenced by climate. Warming in Papua New Guinea, for example, is likely to cause a contraction of the cooler malaria-free zone in the highlands. Studies show positive associations between temperature increases

and diarrhoea, and between warmer sea-surface temperatures and ciguatera outbreaks.^{20,21} Heat stress, and increased injuries and deaths from extreme events are other likely results. With health services in most Pacific Island countries already ill equipped and struggling to cope with existing health problems, it's unlikely there will be capacity to adequately respond to the increased health burden caused by climate change.

Conclusions

Many rural Pacific Islanders combine selling products or labour for cash, and gardening, fishing and sometimes hunting, to meet their food needs. Such diversity of livelihood assures a degree of food security, as it means one or two of these activities can still meet basic food needs even if one activity ceases to do so. This diversity helps explain why in even the poorest communities severe disasters do not result in mass mortality in Pacific Islands. But climate change may cause chronic and or sporadic contractions in the food people are able to access through agriculture, fisheries and in the marketplace, which may create other ongoing, transitory food problems. Thus, through impacts on food production, the ability of countries to import food, the ability of households to purchase food, and its effect on human health, climate change puts at risk the very basic and universal need of South Pacific peoples to have access to sufficient, safe and nutritious food at all times. ■PE

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