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## Food and nutrition security in Solomon Islands



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## Summary

Solomon Islands is a group of islands situated in Oceania, northeast of Australia. Based on the Human Development Index, the country is ranked as number 142 out of 187. Over 80% of Solomon Islanders live in rural areas, and much of their food supply is from subsistence gardens and the sea. Agricultural production throughout the country is quite diverse due to variations in climate, soil and topography. Increased availability of imported foods, high in carbohydrates and fat is changing the dietary pattern towards a less nutritious diet, and at the same time, lack of cash income limits access to nutrient-rich foods. Fresh marine fish and canned tuna are the most common animal-source foods, however, due to high cost, consumption of marine fish is declining.

The nutritional status of children below five years of age is poor; one-third is stunted (low height-for-age), however, only 4.3% are wasted (low weight-for-height). This indicates that while children may be meeting their energy requirements through the daily diet, they suffer from micronutrient deficiencies that impair growth and development.

The nutritional status of adults is characterized by high rates of overweight (BMI 25–29.9 kg/m<sup>2</sup>) and obesity (BMI ≥ 30 kg/m<sup>2</sup>). The prevalence is especially high among women, with 29.9% overweight and 14.2% obese, whereas 25.0% of men are overweight and 5.8% obese.

The diet in the first 1,000 days of a child's life (from conception to the child's second birthday) is crucial for optimal growth and development. Breastfeeding practices are generally good in Solomon Islands, with 74% of children being exclusively breastfed in the first six months of life.

The combination of both stunted children and overweight adults creates a double burden of diseases, as stunting is associated with infectious diseases, whereas overweight increases the risk of non-communicable diseases. This is a huge challenge for the health system that lacks resources and functions poorly, and more importantly, has large negative consequences for individual and national development.

## Table of contents

Preface .....	4
Abbreviations and terminology.....	5
Introduction .....	6
Food prices .....	7
Nutritional status .....	8
Food diversity.....	9
Nutrition in pregnancy, during lactation and in childhood.....	10
The double burden.....	11
Gender inequity .....	12
Food production interventions.....	13
Conclusion .....	13
References.....	14

## **Preface**

This report is a literature review on Food and Nutrition Security in Solomon Islands, based on data from surveys conducted by Solomon Islands National Statistical Office, as well as from national and international organizations working in Solomon Islands.

The purpose of the report is to present information outlining the current food and nutrition situation in Solomon Islands before implementation of the CGIAR Research Program on Aquatic Agricultural Systems (AAS), led by WorldFish. The aim of the AAS program is to enhance production in natural freshwater and/or coastal ecosystems to improve household livelihood, including income and food security (CGIAR Research Program on Aquatic Agricultural Systems 2012a).

This report summarizes national statistics and also focuses in more detail on a subset of provinces: Guadalcanal, Malaita and Western. In 2012, the AAS program was rolled out in Guadalcanal, Central and Malaita Provinces, designated the Central Hub. In 2013, roll out is beginning in the Western Hub (Western and Isabel Provinces). The priority province for the Central Hub has been identified as Malaita (CGIAR Research Program on Aquatic Agricultural Systems 2012b).

This review also supports a detailed nutrition analysis as part of the Australian Centre for International Agricultural Research (ACIAR) funded project FIS2010/057 "Developing inland aquaculture in the Solomon Islands". This project primarily focuses on Guadalcanal, Malaita and Western Provinces (ACIAR 2012), which are therefore given more detailed analyses in this review.

## Abbreviations and Terminology

### AAS: Aquatic Agricultural Systems

- Places where farming and fishing in freshwater and/or coastal ecosystems contribute significantly to household income and food security.

### ACIAR: Australian Centre for International Agricultural Research Systems

### BMI: Body Mass Index [ $\text{kg}/\text{m}^2$ ]

- A measure of thinness and fatness, often used for adults.

### Consumer Food Price Index:

- A measure of the quartile changes in food prices in percentage at the Honiara market; the fourth quartile of 2005 is used as a reference.

### DHS: Demographic and Health Survey

- A national survey that is conducted periodically, in which representative data on, for example, population, health, nutrition and education are collected, analyzed and disseminated.

### Double burden:

- The presence of undernutrition, especially among children, that often leads to increased frequency and severity of infectious diseases, together with an increasing prevalence of overweight and obesity, as well as concomitant non-communicable diseases. These two malnutrition conditions can be present within the same household; for example, an overweight mother and stunted child.

### Food and Nutrition Security:

- "Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life." (Committee on World Food Security 2012)

### HDI: Human Development Index

- A broad definition of well-being, encompassing three areas: health, education and income.

### Hidden hunger:

- Deficiencies of essential vitamins and minerals, leading to reduced growth, impaired development and decreased ability to fight infection. Hidden hunger is due to long-term consumption of diets that are inadequate in vitamins and minerals, and/or to frequent exposure to infections.

### Incidence:

- The rate at which new cases occur in a population during a specified time period.

### Infant and toddler feeding scorecard:

- Summarizes good breastfeeding practices in the first two years of life. The 73 developing countries that together stand for 95% of global child deaths are ranked.

### IRRI: International Rice Research Institute

### JICA: Japanese International Cooperation Agency

### MDGs: Millennium Development Goals

- Eight international goals for development on, for example, reduction of child mortality, achievement of primary education, and eradication of extreme poverty and hunger, that 193 states and 23 international organizations have committed to achieve by the year 2015.

### NGASI: Nut Growers Association of Solomon Islands

### NGO: Non-Governmental Organization

### Obesity:

- In adults, those individuals with a BMI  $\geq 30 \text{ kg}/\text{m}^2$ .

### Overweight:

- Adults with a BMI between 25-29.9  $\text{kg}/\text{m}^2$ .
- Children with weight-for-age  $> +2 \text{ SD}$  from the mean weight of the World Health Organization (WHO) reference population at the same age.

### PhilRice: Philippine Rice Research Institute

### Prevalence:

- The total number of cases of a given factor in a population at a given time.

### Stunting:

- Children with height-for-age  $< -2 \text{ SD}$  from the mean height of the WHO reference population at the same age. Severely stunted children have a height-for-age  $< -3 \text{ SD}$ .

**1,000 days:**

- Refers to the first 1,000 days of a child's life, including nine months of pregnancy and up to the child's second birthday. Nutrition of the pregnant and lactating woman, as well as breastfeeding and complementary feeding for the infant have a major impact on the child's growth and development.

**Underweight:**

- Children with weight-for-age  $< -2$  SD from the mean weight of the WHO reference population at the same age. Severely underweight children have a weight-for-age  $< -3$  SD.

**Under-five mortality:**

- Number of deaths in children under five years per 1,000 live births.

**UNDP: United Nations Development Programme****UNICEF: United Nations Children's Fund****Wantok:**

- A Solomon Islands phenomenon loosely defined as an extended family in which people speaking the same language/dialect and often coming from the same community look out for each other in order to assist each other in times of need.

**Wasted:**

- Children with weight-for-height  $< -2$  SD from the mean weight of the WHO reference population at the same height. Severely wasted children have a weight-for height  $< -3$  SD.

**WHO: World Health Organization**

## Introduction

Solomon Islands is a group of around a thousand islands situated in Oceania, northeast of Australia (Figure 1). The capital, Honiara, is located in Guadalcanal Province, one of nine provinces in Solomon Islands. The total population is about 515,000, with 19% living in urban areas (Solomon Islands National Statistical Office 2009a).

The human development index (HDI) of Solomon Islands is estimated as 0.510, ranking 142 out of 187 countries (range: 0.943 [Norway] – 0.286 [Democratic Republic of the Congo]). The HDI is a broad definition of well-being, encompassing

three areas: health, education and income (UNDP 2011). Most rural households in Solomon Islands have some land, which is used for subsistence gardens that meet basic food needs to avoid hunger. However, the majority of households have only limited cash income for purchasing nutrient-rich foods, such as animal-source foods, as well as for non-food expenses (Solomon Islands National Statistical Office 2008). Thus, poverty in the context of Solomon Islands does not entail hunger and destitution, but a daily struggle to meet living expenses for nutritious foods, non-food items and school fees. Loans are sometimes taken locally to meet these costs, often resulting in many being in debt (Solomon Islands National Statistical Office 2008).

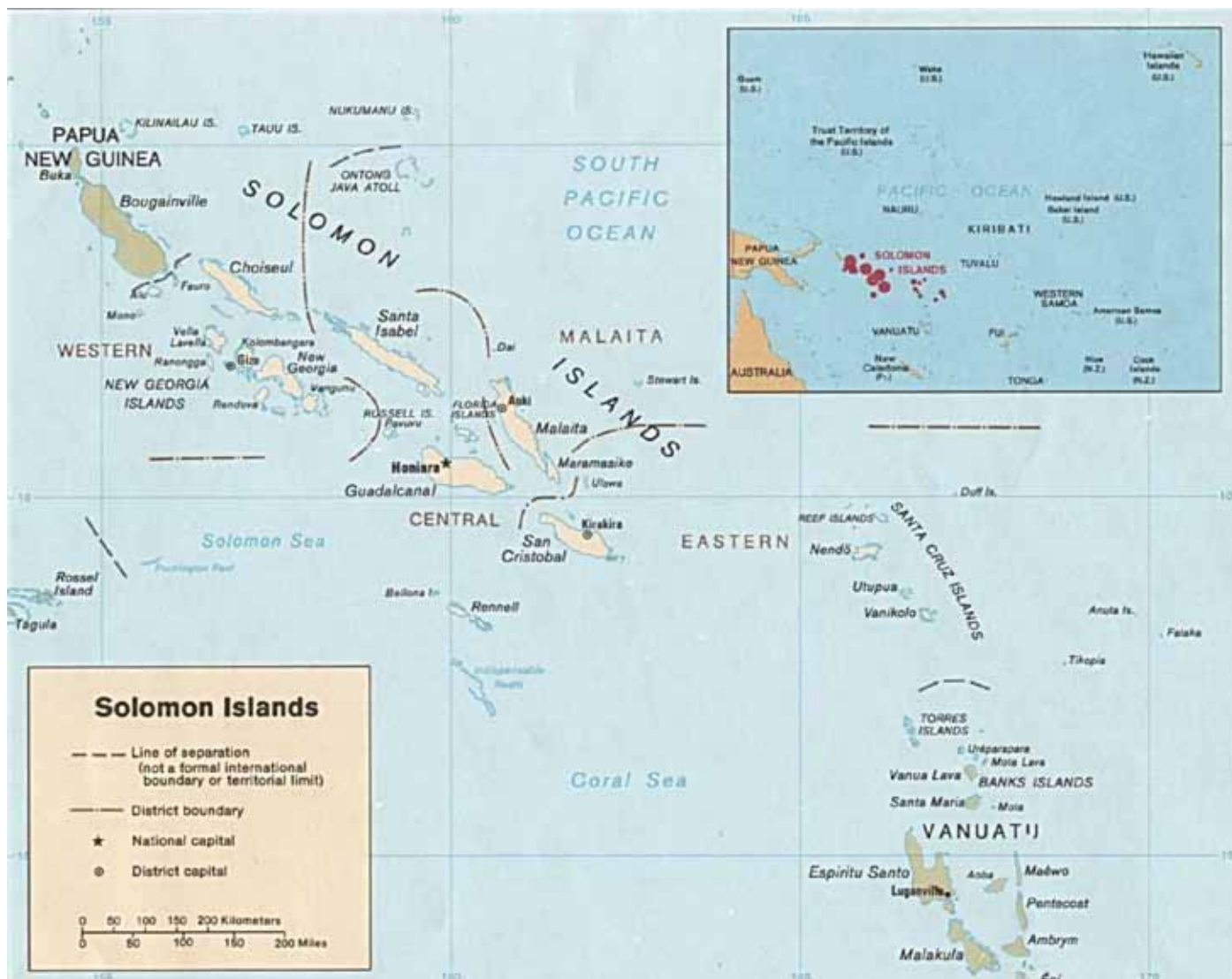


Figure 1. Map of Solomon Islands with provinces (Worldstatesmen.org).

## Food Prices

The global financial crisis, beginning in 2007, had a major impact on rising food prices in the Solomon Islands. The Honiara Consumer Food Price Index showed that the overall price for food increased by 53 percentage points from the last quarter of 2005 to the same period of 2010. Increases were especially seen for imported foods such as rice, flour and noodles, which have become staple foods in the diet of Solomon Islanders (Solomon Islands National Statistical Office 2011). The increased food prices affect the urban population more than the rural, as the rural population produces a larger part of their own food, and they have the opportunity to trade their produce for other foods. However, imported foods have also become popular in the rural diet, but with limited cash income, rural households

cannot buy much of these foods, especially the nutrient-rich foods (e.g., animal-source foods). On average, rural Solomon Islander households produce about 60% of their own food, whereas those from provincial urban areas and Honiara produce about only 15% and 10% of their own food, respectively, and therefore have a greater dependency on cash income (Solomon Islands National Statistical Office 2008).



## Nutritional Status

Solomon Islanders suffer from both under- and overnutrition, placing a large burden on the health system.

From the latest Demographic and Health Survey (DHS), conducted in 2006-2007, anthropometric measures were obtained from a representative sample of 2,029 children under five years of age (Table 1). Stunting (low height-for-age) was found in 32.8% of the children, with 8.5% severely stunted. Stunting is a result of long-term deficiency of energy and nutrients, as a consequence of repeated exposure to illness and/or inadequate food intake for a long period. The prevalence of stunting in the rural areas of Guadalcanal, Malaita and Western Provinces almost equaled the country's average; the prevalence in the capital, Honiara, was slightly lower at 24.1% (Solomon Islands National Statistical Office 2009b).

The prevalence of wasting (low weight-for-height) was low: 4.3%, with 1.4% severely wasted. Wasting reflects recent inadequate energy intake and/or acute illness, and is affected by seasonal food shortage. The prevalence of wasting was more pronounced

in Malaita and Western Provinces: 5.8% and 5.9%, respectively; however, these two provinces also had the highest prevalence of childhood overweight (high weight-for-height): 5.6% and 4.2%, respectively. The overall prevalence of childhood overweight in Solomon Islands was 2.5% (Solomon Islands National Statistical Office 2009b).

The overall prevalence of underweight (low weight-for-age) in children was 11.8%, with 2.4% severely underweight. This may reflect the high number of stunted children, since the height of the child also affects the weight of the child (Solomon Islands National Statistical Office 2009b).

The low prevalence of wasting indicates that most children under five years cover their energy requirements through the daily diet; however, the high prevalence of stunting shows that they are affected by "hidden hunger" - deficiencies of essential vitamins and minerals, leading to reduced growth, impaired development and decreased ability to fight infection (Solomon Islands National Statistical Office 2009b). Hidden hunger is due to long-term consumption of diets that are inadequate in vitamins and minerals and/or frequent exposure to infections.



**Table 1.** Percentage of children under five years classified as malnourished according to anthropometric measures (Solomon Islands National Statistical Office 2009b).

	Total	Honiara	Guadalcanal	Malaita	Western
<b>Height-For-Age</b>					
< -2 SD	32.8	24.1	34.3	33.5	32.6
< -3 SD	8.5	5.7	11.7	10.4	10.1
<b>Weight-For-Age</b>					
< -2 SD	11.8	10.0	14.3	11.7	16.6
< -3 SD	2.4	0.4	3.0	3.3	4.1
<b>Weight-For-Height</b>					
< -2 SD	4.3	4.3	4.9	5.8	5.9
< -3 SD	1.4	0.3	1.8	2.9	2.7
> +2 SD	2.5	2.9	0.9	5.6	4.2
<b>Birth Weight</b>					
< 2.5 kg	12.5	11.4	12.7	17.1	12.6
≥ 2.5 kg	87.5	88.6	87.3	82.9	87.4

Children with height-for-age, weight-for-age and weight-for-height below -2 SD are defined as stunted, underweight and wasted, respectively. Below -3 SD is termed severe. Children with weight-for-age above +2 SD are defined as overweight.

Based on body mass index (BMI, kg/m<sup>2</sup>), anthropometric measures were reported for a representative sample of 3,247 women and 1,693 men above 15 years (Table 2). Overweight (BMI 25–29.9 kg/m<sup>2</sup>) was seen in 29.9% of women and 25.0% of men, with 14.5% of women and 5.8% of men being obese (BMI ≥ 30 kg/m<sup>2</sup>). Only 1.9% of women and 2.2% of men were underweight (Solomon Islands National Statistical Office 2009b).

The highest prevalence of adult overweight and obesity were seen in the capital, Honiara, with 57.8% of women and 45.5% of men overweight or obese. However, overweight is not just an urban phenomenon; the prevalence was also high in Malaita and Western Provinces, as well as Guadalcanal, outside Honiara, with rates of 30.3%, 28.7% and 21.9% for women, and 19.9%, 28.4% and 24.6% for men, respectively (Solomon Islands National Statistical Office 2009b).

**Table 2.** Percentage of women and men ≥ 15 years classified as overweight, obese and underweight (Solomon Islands National Statistical Office 2009b).

	Total	Honiara	Guadalcanal	Malaita	Western
<b>Overweight</b>					
Women	29.9	32.9	21.9	30.3	28.7
Men	25.0	27.5	24.6	19.9	28.4
<b>Obese</b>					
Women	14.5	24.9	11.0	12.0	18.9
Men	5.8	18.0	3.8	3.5	3.5
<b>Underweight</b>					
Women	1.9	1.6	2.7	2.3	1.3
Men	2.2	0.6	3.8	0.7	3.2

Overweight: Body mass index (BMI) 25–29.9 kg/m<sup>2</sup>;  
 Obese: BMI ≥ 30 kg/m<sup>2</sup>;  
 Underweight: BMI < 18.5 kg/m<sup>2</sup>.



Mozambique tilapia for sale

## Food Diversity

The foods eaten in Solomon Islands vary between urban and rural people, as well as in different parts of the country due to diverse agro-ecology. Over 80% of Solomon Islanders live in rural areas where most of the food supply comes from subsistence gardens and from the sea. However, dietary patterns have also changed over time for the rural people. A major impact in almost every area of life for Solomon Islanders is their safety nets: households, families, and importantly, the wantok (literally meaning “one talk”) system. Wantok is loosely defined as an extended family in which people speaking the same language/dialect look out for each other. It means that often more hungry mouths are fed from “the pot”, using less expensive, bulky foods such as rice, root crops and noodles which can “go a long way”, and thereby leading to a less nutritious diet. Furthermore, almost all villagers have wantoks or family members in urban areas who provide supplies of imported foods high in carbohydrates and fat to the villages. These two factors lead to the combination of malnutrition and overweight being not just an urban phenomenon, but also a problem in rural areas (Pike 2012).

Despite the increasing supply of imported foods, subsistence gardens are still the most important source of staples and vegetables in the rural diet. The most produced staple foods are the starch-rich sweet potato, cassava, yam, banana, taro, breadfruit and corn. Vegetables produced are cucumber, tomato, shallot, snake bean, green bean and Chinese cabbage, as well as green leafy vegetables, such as pumpkin shoot, taro leaf and various bush greens, which are rich in vitamin C, calcium and iron (Siliota et al. 2009). Increased production and consumption of locally produced nuts and legumes can contribute high-quality protein. In the markets, various fresh and cooked foods can be purchased; the type of food depends on location and size of the market. Most markets supply (in decreasing order of volume): sweet potato, banana, taro, slippery cabbage, Chinese cabbage, cucumber, tomato and pawpaw, as well as fresh fish. In bigger markets, baked or fried flour-based products such as bread and cake are available, as well as oil, canned fish, chicken and sometimes pork (Allen et al. 2006).

Some products are grown for export. These include copra, cocoa and timber. In 2007, fish and fish products accounted for 12%

of all export from Solomon Islands, the vast majority being tuna products, such as canned and frozen tuna. Processing of tuna prior to export is mainly undertaken by the local company Soltai, located in Western Province (Gillet 2009).

Non-fish animal-source foods are rare in the diet of Solomon Islanders; some households have a little livestock, such as a couple of pigs and/or chickens. Fish make up about 90% of the animal-source food intake (Allen et al. 2006).

In spite of the proximity of the islands to the sea, an increasingly large proportion of the fish consumed, especially by the urban population, is canned tuna produced in Solomon Islands. This increase is largely due to the high cost of fresh marine fish (CGIAR Research Program on Aquatic Agricultural Systems 2012b; WorldFish 2011). The annual fish consumption per capita has been reported as 33 kg/capita/year, with a higher intake in the urban population compared to the rural, and a higher intake in coastal communities compared to those in the inland areas (Bell et al. 2009; Molea & Vuki 2008). This also varies regionally; for example, a survey conducted in 1996 and 1997 in the artificial islands of north Malaita showed that fish was consumed every day, and the average fresh fish consumption was 225 g/person/day ( $\approx$  82 kg/person/year) (Molea & Vuki 2008).

It is predicted that fish consumption will continue to decrease in the future due to shortfalls in supply from capture fisheries caused, for example, by poorly managed coastal resources and increasing population pressure (Bell et al. 2009; Gillet 2009; WorldFish 2011).

Aquaculture is limited in Solomon Islands, restricted to relatively informal backyard ponds with introduced Mozambique tilapia. Owing to the limited distribution of ponds and the absence of structured farming practices, leading to low yields, these fish do not contribute significantly to the national diet (CGIAR Research Program on Aquatic Agricultural Systems 2012b). There are regional exceptions; however, for some inland communities, Mozambique tilapia (found in Lees Lake in Guadalcanal) can be a significant local animal-source food, consumed on a daily basis (Schwarz 2012).

Increasing population growth (presently 2.8% annually) has led to intensification of cropping, reduced fallow and soil degradation. Slash and burn practices result in increasing clearance of forest for gardens, although it is recognized that the fertility of this new land will only last for a short period (Kastom Garden Association 2012a). In some areas, lower yields from gardens may also be contributing to an increasing dependence on costly imported rice and flour-based foods like noodles and biscuits.

Climate, soil and topography are very diverse through Solomon Islands, and this is reflected in the diversity of agricultural produce. The three provinces that are the focus of this report have some similarities and some differences with respect to possibilities for food production.

#### **Guadalcanal Province**

Guadalcanal Province consists of the large island of Guadalcanal (5,310 km<sup>2</sup>) and some smaller islands. This province is climatically divided into three areas: the plains in the north, with an annual rainfall of about 2,000 mm; the south coast, also called the Weather Coast, with around 5,000 mm of rain annually; and the mountains, in the interior of the island, with a rainfall of 8,000 mm annually. In the fertile northern coastal plains, with adequate but not excessive rainfall and some dry seasons throughout the year, plain fields and fertile soil make the produce more diverse than in other areas of Solomon Islands. Furthermore, the villages benefit from close proximity to Honiara, which provides the opportunity to earn cash income by selling surplus produce in the market. In the south coast, on the other hand, with its excessive rainfall, steep topography and infertile soil, agricultural production is difficult.

In the northern area, subsistence gardening provides most of the food for villagers, and there is also some fishing. Since this area is close to Honiara, consumption of imported foods such as rice and flour-based foods is high compared to other parts of Solomon Islands.

In the southern part, food production from gardens is scarce in the wet months (May–October), and food shortage is common in these months. During this period, food habits change; less favored food items such as dry coconut, fern, leaf of sandpaper cabbage, and leaf and stem of the yam plant are eaten (Allen et al. 2006).

#### **Malaita Province**

Malaita Province has the highest population density of all Solomon Islands provinces. Some decades ago, the area was defined as having above-average agricultural potential, but because of the high population growth and consequent increase in intensive land use, productivity decreased. Furthermore, rainfall is high in some parts of the island: about 3,000 mm annually in the coastal areas and 6,000 mm annually in the center of the island, making it unsuitable for several crops, such as sweet potato and cocoa (Allen et al. 2006).

Inland dwellers do not have access to marine products, so garden products such as sweet potato and taro make up the largest part of their food intake. The dwellers from the adjacent islands depend on fishery and produce from the mangrove forests. They trade fish, shellfish and other marine foods for garden produce with the inland and coastal dwellers (Molea & Vuki 2008).

#### **Western Province**

The marine and forest resources of the Western Province are rich, securing a good income for the villagers in this province. However, the supply of fish is decreasing, and the forests are becoming over-logged; thus food availability is predicted to fall in the coming years. Most areas receive about 4,000 mm of rain annually, but with marked variation between the plains and mountains.

Western Province has the highest proportion of people in paid work in the Solomon Islands due to the forestry, fishery and tourism industries. Shellfish and lobsters are sold in the market, and are particularly important for income of the coastal dwellers (Allen et al. 2006).

## **Nutrition in pregnancy, during lactation and in childhood**

Save the Children published the *State of the World Mothers Report – Nutrition the First 1000 Days* in 2012. In this report, the 73 developing countries that together account for 95% of global child deaths are ranked. Using the *Infant and Toddler Feeding Scorecard* that summarizes good breastfeeding practices in the first two years of life, Solomon Islands was ranked as the fourth top country (Save the Children 2012). Within the first hour after birth, 75% of newborns in Solomon Islands were breastfed, and 74% of infants were exclusively breastfed in the first 6 months of life. Good breastfeeding practices continued as the children grew older; 81% of children received breast milk together with complementary feeding from 6–9 months of age, and 67% continued to be breastfed up to two years of age (Solomon Islands National Statistical Office 2009b). Breastfeeding is rated as the single most effective nutrition intervention for saving lives.

To get a full perspective on the nutritional situation of children in the first 1,000 days of life, it is important to consider the diet of the pregnant and lactating woman (from conception to the first 6 months of age), as well as the quality of the complementary foods given to children. Universal recommendations are that children must be exclusively breastfed from birth to 6 months of age, after which time small quantities of solid and semi-solid foods should



be given to the child: 2–3 times per day in the beginning, increasing to 3–4 times per day, in addition to breast milk. Solomon Islands National Statistical Office (2009b) reported that complementary foods were introduced to 32.6% of the breastfed children at four to five months of age, after which introduction of foods and liquids increased dramatically to 80.3% of children between 6 and 8 months of age. The most used complementary foods were vitamin A-rich foods such as pawpaw, sweet potato and pumpkin, which are easy to mash after cooking. These foods were given to 84.3% of children from 6 months to two years. The second most used foods were starchy roots and tubers, given to 67.1% of children. These foods were fed to both breastfed and non-breastfed children, in the age group 6 months to two years of age. However, the introduction of animal-source foods was somewhat different between these groups; meat, fish and eggs were given to 26.0% of breastfed children, whereas 39.1% of non-breastfed children were given animal-source foods. This difference could be due to a skewness in breastfeeding practices, with fewer mothers from families with higher socioeconomic status breastfeeding; these mothers are also the ones who can afford to give their children animal-source foods. However, no information is available to confirm this possibility (Solomon Islands National Statistical Office 2009b).

The diet of the mothers with a child below three years was made up of the same food groups as those used for complementary foods. The most consumed foods, consumed by 88.0% of mothers, were vitamin A-rich local foods such as red sweet potato, pumpkin, yellow yam, green leafy vegetables and mango. Foods made from roots and tubers were eaten by 78.5% of mothers, and 61.7% ate food made from grains. Animal-source foods such as meat, fish, shellfish, poultry and eggs were eaten by 39.5% of mothers, whereas milk and milk products were consumed by even fewer - only about 10% of women. This food pattern of a starchy diet with a low content of animal-source foods, as well as 67.4% of mothers having an intake of high-fat foods, characterizes a diet of low nutritional quality (Solomon Islands National Statistical Office 2009b).

Even though vitamin A-rich foods are commonly eaten both by mothers and their children, no information on amounts is available, which makes it difficult to gauge whether the vitamin A intake is adequate to meet requirements. A measure of vitamin A deficiency is prevalence of night blindness. Only 8.4% of women reported night blindness during pregnancy, indicating

that the prevalence of vitamin A deficiency was not very high. On the other hand, iron-rich foods were not commonly eaten either by mothers or their children, and the prevalence of anemia was 44.3% and 48.5%, respectively. It is, however, unknown how much of the anemia is due to iron deficiency from low intake of animal-source foods and legumes, and how much is due to other conditions such as malaria (Solomon Islands National Statistical Office 2009b).

Under-five mortality rate is a common measure used for child nutrition. In UNICEF's *State of the World's Children*, a large decrease in child mortality in Solomon Islands over the last two decades is reported: a 40% decrease from 45/1,000 live births in 1990 to 27/1,000 in 2010 (UNICEF 2012). Save the Children used these values in the *State of the World's Mothers* report, stating that Solomon Islands had one of the lowest rates of child mortality in East Asia and the Pacific region, and was on track towards achieving the Millennium Development Goal (MDG) 4, which is child mortality under 40/1,000 live births (Save the Children 2012). However, in the DHS report from 2007, a high under-five mortality rate of 37/1,000 live births was reported (Solomon Islands National Statistical Office 2009b), suggesting that there may be some uncertainty in the rates.

## The double burden

With a high prevalence of stunted children, as well as a high prevalence of overweight and obesity in adults, Solomon Islands is facing the double burden of diseases. In many developing countries, there is increasing evidence that both malnourished children and overweight adults live in the same household (Oddo et al. 2012).

Malnutrition in children is strongly linked to infectious diseases, as lack of nutrients weakens the immune system, precipitating infectious diseases. Data on the prevalence of diarrheal episodes in children under five years were collected in the DHS by asking the caregiver to report whether the child had diarrheal episodes in the 14 days preceding the survey interview (Table 3). The prevalence of children with diarrheal diseases was 9.5%, with the highest prevalence of 21.1% found in children between 12 and 23 months of age (Solomon Islands National Statistical Office 2009b). The prevalence of both tuberculosis and malaria has decreased in the past 10 years. The tuberculosis prevalence decreased from 360 per 100,000 people in 2000 to 178 per

100,000 in 2010, which is on track towards achieving the MDG tuberculosis goal of reducing the prevalence by 50% before 2015 (WHO 2011a). Solomon Islands is a high endemic country with respect to malaria, even though the prevalence has decreased from 88,778 per 100,000 people in 2000 to 16,071 per 100,000 in 2009 (WHO 2010). HIV/AIDS is not as much of a major public health issue in the Pacific region as it is in many other developing countries. The estimated prevalence is low; around 0.002% of the population in Solomon Islands suffer from HIV/AIDS. However, it is suspected that this rate is underestimated because many HIV/AIDS-infected people do not use the health care system due to the fear of stigma related to this disease (Solomon Islands Ministry of Health and Medical Services 2012).

The health care system is challenged by having to deal with infectious diseases as well as an increasing number of adults suffering from non-communicable diseases related to obesity and overweight, such as diabetes, cardiovascular diseases, cancers and chronic respiratory diseases. These non-communicable diseases are expensive because of the life-long treatment required, a wide range of concomitant complications and the loss of productivity. It is estimated that non-communicable diseases account for 60% of all deaths, in all ages, in Solomon Islands; cardiovascular diseases alone account for 29% of all deaths in all ages (WHO 2011b). The prevalence of diabetes was estimated at 14% in 2007, and the incidence is probably increasing due to the increasing rate of obesity (Cheng 2010; WHO 2011c). The prevalence of the risk factors for many non-communicable diseases, such as high blood pressure, high blood glucose and high cholesterol, is also increasing (WHO 2011c). This changing disease pattern is mainly due to increased availability of imported foods high in fat, carbohydrate and salt and low in fiber, and with these less nutritious foods replacing vegetables and fruits in the diet.

**Table 3.** Childhood infectious diseases during the 14 days preceding the survey interview, as well as use of and access to health facilities. Presented as percentage (ANU Enterprise 2011; Solomon Islands National Statistical Office 2009b).

	Total	Honiara	Guadalcanal	Malaita	Western
<b>Infectious diseases in children &lt; 5 years</b>					
Diarrhea	9.4	7.6	8.8	5.8	7.4
Fever	16.6	14.0	13.5	16.0	17.7
<b>Access to health facility</b>					
In the village/ community	10.1	2.2	5.3	11.7	9.8
≤ 1 hour away	56.8	88.4	30.1	47.5	75.1
1 hour to half day	29.2	9.4	61.8	32.1	13.7
One day or more	3.9	0.0	2.8	8.7	1.3
<b>Visited a health facility in the preceding year</b>					
No	28.9	38.7	25.3	30.4	23.3
Yes	71.1	61.3	74.7	69.6	76.7

## Gender Inequity

The two main activities in Solomon Islands to provide food and cash income are gardening and fishing. Both women (71%) and men (51%) are involved in gardening: planting, weeding and harvesting. However, it is estimated that women spend three times as much time working in the gardens as men. Fisheries are dominated by men (90%), who are mainly engaged in off-shore and reef fisheries, whereas women (50%) catch fish near shore (WorldFish 2011). Both women and men are involved in selling crops and fish in the market (CGIAR Research Program on Aquatic Agriculture Systems 2012a).

The educational level differs greatly between provinces; generally people from the capital, Honiara, are better educated compared to those in peri-urban and rural areas. Women are generally less educated than men (Table 4). In Honiara, as well as Guadalcanal and Malaita Provinces, the proportion of women with no education is higher than that of men, and fewer women than men have post-secondary school education (Solomon Islands National Statistical Office 2009c).

Women in Solomon Islands face a high level of gender-based violence; 64% of women aged 15–49 years have experienced some form of physical and/or psychological violence in a relationship. In some cultural groups, paying a bride price is common, and this leads to the general acceptance that the man owns his wife, and therefore has the right to beat her if she does not live up to the gender roles that “society” imposes (e.g., if food is not ready when the husband gets home). The bride price also hinders women from leaving their husbands. Most men and many women think that violence is a justifiable way to discipline women (Rasanathan & Bushan 2011). Only 28% of married women reported that they make decisions independently regarding their own health care, and 20% reported that they have the main decision-making power regarding visiting family and friends (Solomon Islands National Statistical Office 2009b; UNICEF 2011).

**Table 4.** Highest level of schooling attended by females and males by province (≥ 6 years). Presented as percentage (Solomon Islands National Statistical Office 2009c).

	Total	Honiara	Guadalcanal	Malaita	Western
<b>Female education</b>					
No education	26.9	17.9	30.8	38.9	10.2
Some or completed primary	53.5	41.7	51.0	46.9	64.5
Some secondary	15.3	30.6	14.1	10.2	20.5
Completed secondary	0.1	0.5	0.0	0.0	0.1
More than secondary	2.0	6.5	0.7	1.3	2.1
Do not know	2.2	2.8	3.2	2.7	2.6
<b>Male education</b>					
No education	22.8	13.8	24.0	28.8	13.7
Some or completed primary	51.1	36.0	51.0	51.3	60.5
Some secondary	19.5	36.2	20.0	15.3	18.2
Completed secondary	0.1	1.1	0.0	0.0	0.1
More than secondary	4.3	9.8	1.6	2.9	4.5
Do not know	2.1	3.0	3.4	1.7	3.1

## Food Production Interventions

Food security through increased food production and productivity are recognized as being vital to underpinning the Solomon Islands rural economy (Ministry of Development Planning and Aid Coordination 2011). A number of initiatives are underway to address food production, specifically through development of natural resources and use of alternative or improved crop varieties.

An example from the fisheries sector is the Pacific Islands Forum Fisheries Agency (FFA) project, funded by the European Union, which targets the Pacific Islands, including Solomon Islands. The aim of the project, DEVFISH II, is to develop fisheries, increase local business and employment, and control illegal fishing, through technical assistance and policy changes (FFA 2011).

In agriculture, the Ministry of Agriculture and Livestock has developed a framework (2010–2015) for rice production in Solomon Islands in order to meet the increasing demand for rice. The plan is to develop a sustainable local rice production that economically benefits the producers and the country. Attempts have been made previously to produce rice locally in Solomon Islands, but without success, due to low yield, bad taste and high insect infestation. New rice production systems to overcome these constraints are to be introduced in collaboration with the International Rice Research Institute (IRRI), the Philippine Rice Research Institute (PhilRice), Taiwan Technical Mission and the Japanese International Cooperation Agency (JICA) (Taki et al. 2010). Up to the end of June 2012, the following activities were reported as having been initiated: production of rice seeds, extension of the production area, planting of over five hectares completed, and workshops organized and held (Taiwan ICDF 2012).

The Nut Growers Association of Solomon Islands (NGASI) is a newly established national non-governmental organization (NGO) that promotes production and mainstreaming of indigenous fruits and nuts to increase the food variety and security for rural people in Solomon Islands. A program in which climate-resilient planting materials of fruit and nut varieties are collected and distributed to homestead farmers has been designed and is currently being implemented. Furthermore, traditional knowledge on the growing and use of fruit and nut trees is being collected (Land Resources Division 2012).

Funded by the Government of Australia, the Kastom Garden Association has projects throughout Solomon Islands to improve household gardens, as well as implement organic farming. Nutrition, hygiene and health training are also included in the projects (Kastom Garden Association 2012b).

In addition to the above projects focusing on food production, the national government as well as local and international NGOs, including World Vision (World Vision 2008), have a range of projects with the aim to improve education for women and children, including increasing knowledge of nutrition and hygiene.

## Conclusion

This literature review focuses on food production and diet. However, food, in addition to health and care are three main pillars which are essential for good nutrition.

The diet of the Solomon Islanders is characterized by large amounts of carbohydrate-rich staples, such as sweet potato, cassava, rice and noodles, as well as a limited supply of animal-source foods. Fresh marine fish and canned tuna are the most common animal-source foods; however, it is predicted that fish will decrease as a food source in the coming years. Production of staple foods and vegetables in subsistence gardens is also negatively affected by the increasing population, which has led to intensification of cropping, reduced fallow and soil degradation. However, for the majority of Solomon Islanders, most of their food is still produced in the subsistence gardens. The increasing consumption of less nutritious carbohydrate-rich foods has led to a high prevalence of adult overweight and obesity, as well as an alarming number of stunted children and poor nutritional status of the population overall.

In a United Nations Development Programme (UNDP) report from 2010, written in collaboration with the Ministry of Development Planning & Aid Coordination, progress towards achieving the MDGs is summarized. The two most important goals with respect to this literature review are MDG 1: *Eradicate Extreme Poverty and Hunger* and MDG 4: *Reduce Child Mortality*. With respect to MDG 1, not many Solomon Islanders live in extreme poverty and hunger, as they practice subsistence gardening and fishing. However, they lack cash income to purchase nutrient-rich foods and to meet basic non-food expenses. With respect to MDG 4, progress is being made, especially with respect to good breastfeeding practices, with a high proportion of infants being exclusively breastfed in the first 6 months of life (Mishra et al. 2010).

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