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TCP/NAU/3301

CONSULTANCY REPORT

**AN ASSESSMENT FOR INCREASED AGRICULTURAL PRODUCTION PROJECT
DEVELOPMENT IN NAURU
2-23 MAY 2012**

04 JULY 2012



**FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS**

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EXECUTIVE SUMMARY

This report is an output of a FAO Technical Cooperation Consultancy Mission (TCP Project Number: TCP/NAU/3301) to Nauru requested by the Government of the Republic of Nauru. The aim of the mission was to collect relevant information to provide an assessment and recommendations on the necessary actions required for sustainable crop and livestock developments in Nauru, and where appropriate, draft appropriate FAO Technical Cooperation Project proposals for funding to be considered by FAO.

The mission took place from 2-23 May 2012. The consultant was given seven main tasks for this mission in accordance with the Terms of Reference (TOR). A key part of the mission was focussed on consultations with government agencies and stakeholders involved in Agriculture activities. This was a major undertaking that required meetings with as many officials from government agencies and field visits to as many of the relevant stakeholders as possible.

This mission report outlines the findings of the consultancy and necessary actions for improving the development of agriculture in Nauru.

From the findings of the mission, 3 Technical Cooperation Projects (TCPs) have been identified as critical to the advancement of the Agriculture Sector in Nauru to contribute to improve food production, food security and sustainable livelihoods in Nauru. The TCP projects identified include:

1. TCP for the Strengthening of the Institutional Capacity of the Department of Agriculture.
2. TCP for Nauru Household Integrated Agro-Forestry & Crop Utilisation
3. TCP for Nauru Household Small Scale Poultry Production

The detailed draft TCP Project Proposals are attached as attachments 4, 5 and 6.

MAP OF NAURU



Figure 1: Map of Nauru

1. INTRODUCTION

The consultancy duration was 35 days from 01 May to 04 June 2012. It comprised of 21 days in Nauru and the remaining days at home base in Tonga.

The Terms of Reference (TOR) for the International Consultant enclosed as Attachment 1, is comprised of seven tasks. The format for this report follows the sequence of the seven tasks stated in the TOR.

An important part of the consultancy was to assess the status of past and present efforts to develop crops and livestock farming in Nauru. There have been many projects that were implemented in Nauru but limited documentation or reports were available to the consultant and in particular, the terminal reports. As the result, it is difficult to make fair evaluations about the impact and sustainability of those projects. Therefore, a considerable part of this consultancy mission was dedicated to visiting of as many relevant government agencies and non-government agencies, as possible, as well as farm visits and field observations.

CONSULTANCY TASKS

2. TOR 1: A BRIEF REVIEW OF PAST AND CURRENT NATIONAL POLICY AND DEVELOPMENT PLANS AND SECTOR STRATEGIC PLANS RELATING TO AGRICULTURE DEVELOPMENT AND IN PARTICULAR SUSTAINABLE DEVELOPMENT OF CROPS AND LIVESTOCK IN NAURU WITH REFERENCE TO:

- *Types of crops, livestock and agro-forestry traditionally grown and consumed, as well as, new ones with potential for comparatively higher productivity and food preference by the population and likelihood to improve nutrition status of vulnerable groups;*
- *Arable land available and to which people have access for farming; Availability of water for rain-fed agriculture and for irrigation;*
- *and, The numbers and status of likely beneficiaries (farming households, consumers) Likelihood to enable sustained reduction food imports.*

The Government of Nauru in 2005 developed a 20 Year Plan and revised it in 2009. This is well documented and known as the Republic of Nauru National Sustainable Development Strategy (NSDS) 2005-2025, Revised 2009. It states the National Vision of “**A future where individual, community, business and government partnerships contribute to a sustainable, quality of life for all Nauruans**”. The central message of this Plan and Vision is, “**Partnerships for Quality of Life**”.

The 2005 Plan was revised and the five long-term goals remained unchanged in the 2009 Revision as:

- (a) Stable, trustworthy, fiscally responsible government
- (b) Provision of enhanced social, infrastructure and utilities services
- (c) Development of an economy based on multiple sources of revenue
- (d) Rehabilitation of mined out lands for livelihood sustainability
- (e) Development of domestic food production**

It is important to note that the development of domestic food production is a national priority goal.

Also in developing the 2005 NSDS, consultations with the communities, business groups and individuals identified a number of priorities. Again, **“Increase level of domestic agricultural production initiatives such as kitchen gardens, fish farms, milkfish and yabbie ponds to reduce dependence on imported food and to address food security”**, was a priority.

During consultations with the Secretary of the Department of Commerce, Industry and Environment (CIE) and Director of the Department of Agriculture (DOA), both indicated their keenness to receive comments and suggestions on the following Agriculture Sector Goals, Strategies and Milestones of the NSDS Revised 2009.

Agriculture

Goal: Increased level of domestic agricultural production aimed at addressing food security and healthy livelihoods

Key Performance Indicators: Value of agricultural and livestock food imports

Value of domestic agricultural and livestock production

Proportion of land area covered by forest (MDG)

Strategies	Short-term Milestones 2012	Medium-term Milestones 2015	Long-term Milestones 2025	Responsibility
Develop local food and agricultural production initiatives such as kitchen gardens, fruit tree planting and root cropping	At least one nursery established and successfully functional providing seedlings and technical assistance to individual and community farmers (ROC) 10 percent of HH have successfully operating kitchen gardens with water storage supported (FAO)	30 percent of average Nauruan diet sourced from locally produced food (fruit trees e.g. breadfruit, banana, mango, pawpaw and vegetables and root crops) 30 % of HH successfully growing and producing root crops (sweet potato, cassava and taro) supported through SPC DSAP programs 30 percent of HH have successfully established and operating kitchen gardens with water storage	Over 70 % of average Nauruan diet sourced from locally produced food Over 70 % of HH successfully growing and producing root crops 20 percent of agricultural food sale in the market sourced from domestic food production Over 70 % of HH have successfully established and operating kitchen gardens with water storage	Department of Agriculture
Promote production of value added forestry and agro-forestry products for domestic consumption	A forest management plan developed	Forest management plan implemented starting with reforestation of the mined areas	Reforestation of the mined areas 15 percent completed Commercially viable forestry and agro-forestry products identified and associated business plans developed	Departments of Agriculture and Environment and NRC
Promote commercially viable piggeries, duck and poultry (egg production) and agricultural businesses	At least one new piggery or poultry farm business established and operating commercially in each district community	The community in each district has an average of 2 new piggery or poultry businesses established and operating commercially 15 percent of local demand for pork and poultry products met from local production	Over 70 % of local demand for pork and poultry products met from local production	Department of Agriculture
Set up a resource centre on agricultural and livestock production	A resource centre on agricultural and livestock production established providing technical advice, pamphlets, manuals to farmers and community	Over 50 percent of farmers regularly used the resource centre	Over 75 % of farmers regularly used the resource centre	Department of Agriculture

Table 1: The revised 2009 NSDS sector goals, strategies and milestones for Agriculture

Table 1 shows the Agriculture Sector Revised Sector Goals, Strategies and Milestones, and one Goal of increased level of **domestic agricultural production aimed at addressing food security and healthy livelihood, and four main strategies.**

It also shows that the responsibility for the implementation of the Agriculture Sector Goals, Strategies and Milestones rests with the DOA. Upon reviewing the existing organizational structure and capacity of the DOA, it is evident that the DOA is ill-equipped to fulfill its responsibilities and lacks the capacity for continual technical training of stakeholders including local households, women and community groups involved in agriculture production in Nauru. It is therefore an urgent need to strengthen the institutional capacity of the DOA. There is also a need to upgrade the capacity and technical knowledge, skills and interests of stakeholders through provision of training programs and workshops. This part is dealt with in more details in Section 2.9 on the institutional arrangements of the DOA.

It is also recommended that **Strategy 4: “Set up a resource centre on agricultural and livestock production”**, of the present strategic plan be substituted and replaced with two key strategies as suggested in Table 2.

Table 2: Proposed New Key Strategies for the Agriculture Sector

Strategies	Short-term Milestone 2015	Mid-term Milestone 2020	Long-term Milestone 2025	Responsibility
<p>(1) Strengthen the Institutional Capacity of the Department of Agriculture, through restructuring, staff allocation and training, provision for resources such as facilities, transport, equipment and funds to promote quality service delivery to stakeholders</p>	<p>-Formalize establishment of Administration and Planning Division of DOA to be responsible for Administration, Planning and Co-ordination of Development Projects (headed by Assistant Director of Agriculture)</p> <p>-Formalize establishment of Research Division comprising of the Crop & Livestock Farms, staff allocation and training, provision of equipment, facilities, and resources to attain needed technical information through adaptive research</p> <ul style="list-style-type: none"> ▪ Establish Crop Farm at Buada as a Research Center with offices and training center ▪ A 200 m² nursery available for propagation of seedlings for fruit trees, vegetables and crops ▪ Upgrading of 100 m² shed potting area for tools and equipment ▪ Provision of one 2-tonne truck for nursery use, transportation of trainees and distribution of seedlings. <p>- Formalize establishment of an Extension Division of DOA with staff allocation and training, provision of facilities, equipment, transport and resources to enable visible attention and training of farmers and stakeholders in all districts of Nauru</p> <ul style="list-style-type: none"> ▪ Construction 100 m² Extension Center for Offices and kitchen area for training of women in nutrition and food utilization ▪ Provision of 4 motorcycles, 3 for male Extension Officers and 1 Women Extension Officer <p>-Establishment of a Women in Development Section of the Extension Division through staff allocation, provision of facilities equipment and tools to trainings of women on nutrition, cooking and food processing</p>	<p>-Better Planning, Monitoring and Evaluation of Development Programs</p> <p>- Provision for appropriate agricultural and livestock technology and information for farmers</p> <p>- Develop close working relationships with farmers, train and encourage for achievement of Sector Strategies and Targets</p> <p>-Enable close working relationship with women to achieve sector strategies and targets</p>	<p>Key instructions for achieving the targets set for each strategy</p>	<p>Department of Agriculture</p>
<p>(2) Increase Capacity and Technical Knowledge, skills and Interests of Stakeholders through the implementation of training programs.</p>	<p>-Upgrading of the training centre at the DOA Research Farm at Buada District to include</p> <ul style="list-style-type: none"> ▪ provision of tables, chairs and office equipment ▪ provision of training equipment to include computers, printers, camera and projector ▪ conduct 3 workshops each for crops/livestock and women welfare per month (36 per year) ▪ production of extension leaflets for stakeholders 	<p>Over 50% of stakeholders trained</p>	<p>Over 75% farmers, stakeholders trained and involved in farming</p>	<p>Department of Agriculture in cooperation with Health, NGOs and Youth Groups</p>

Table 2: Proposed New Key Strategies for the Agriculture Sector

These two key new strategies will contribute to the achievement of NSDS Revised 2009 Agriculture Sector Goals, Strategies and Milestones, and will support funding requests from FAO through its Technical Cooperation Program.

3. TOR 2: ASSESSMENT OF THE STATUS AND IMPACT OF PAST AND PRESENT EFFORTS TO DEVELOP CROPS AND LIVESTOCK FARMING IN NAURU ON THE NAURU COMMUNITIES INCLUDING TECHNICAL, ECONOMIC, SOCIAL, ENVIRONMENTAL AND INSTITUTIONAL ASPECTS THROUGH COLLECTING NECESSARY INFORMATION AND DATA FROM GOVERNMENT AGENCIES CONCERNED AS WELL AS STAKEHOLDERS.

In order to have a good understanding of Nauru's agricultural situation to better assess present and past agriculture development strategies and plans, it is essential to consider Nauru's national circumstances.

3.1 GENERAL BACKGROUND, HISTORY AND CULTURE

The Republic of Nauru is an isolated, uplifted limestone island located about 41km south of the equator at Latitude 0° 30' South and Longitude 166° 50' West or about 2000km East-Northeast of Papua New Guinea and about 4450km South West of the Hawaiian Islands. It is the world's smallest republic, covering just 21 square kilometer with a population of 9,378.

Nauru is a phosphate rock island with rich deposits near the surface, which allow easy strip mining operations. It has some phosphate reserves which are presently (as of 2011) not economically viable for extraction. Nauru boasted the highest per-capita income enjoyed by any sovereign state in the world during the late 1960s and early 1970s. When the phosphate reserves were exhausted, the environment had been seriously harmed by mining.

Traditionally, Nauruans traced their descent matrilineally. Inhabitants practiced aquaculture: they caught juvenile *ibija* fish, acclimatized them to fresh water and raised them in the Buada Lagoon, providing a reliable source of food. The other locally grown components of their diet included coconuts and pandanus fruit.

Nauru is divided into 14 administrative districts and 169 villages. Meneng, Aiwo and the Location district are the most populated with about 1509, 1285 and 1148 residents respectively.

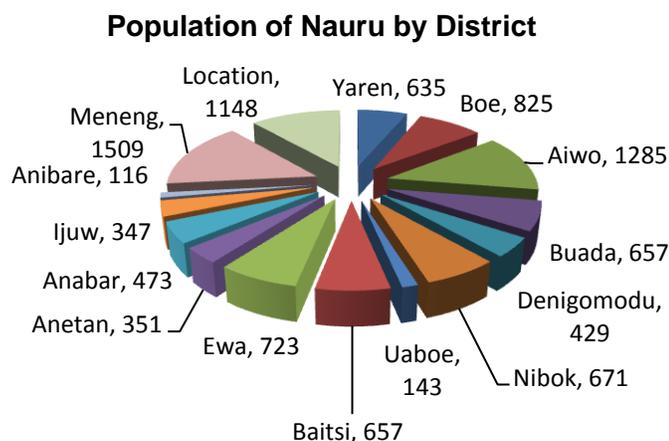


Figure 2: Estimate population of Nauru by District (Nauru household income & expenditure survey 2006,

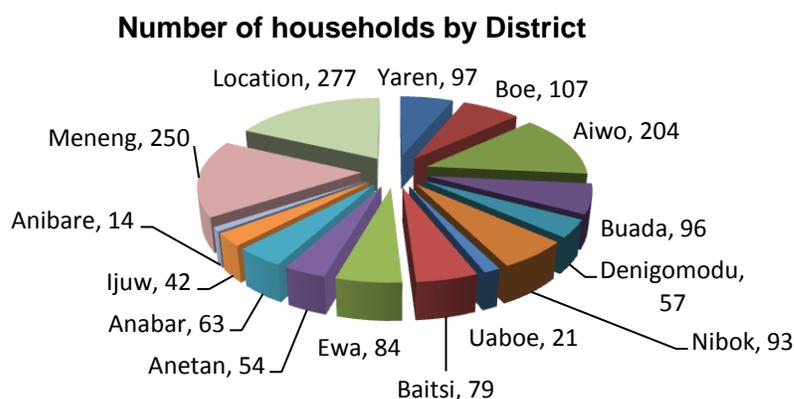


Figure 3: Estimated number of households by District (Nauru household income & expenditure survey 2006)

Figure 3 shows the estimated number of households by district. The most number of households per district are Meneng, Aiwo and the Location settlement with 250, 204 and 277 households respectively.

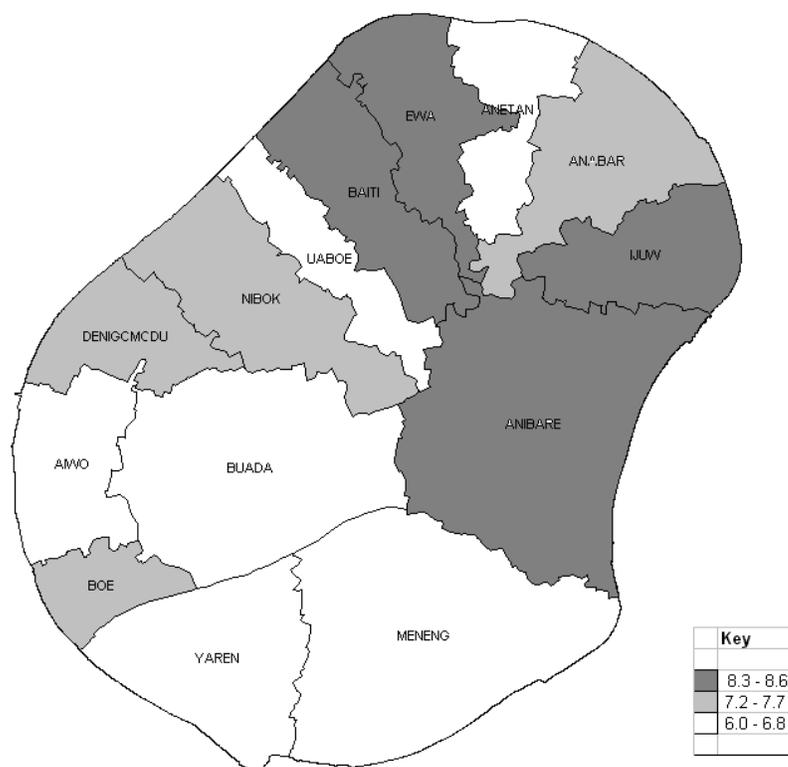


Figure 4: Average household size by district (Nauru HIES, 2006)

Based on the estimated population and number of households, the average household size in Nauru is 6.5 persons. However the average size of households differs by district (see Figure 4). The largest household sizes are in Ijuw, Anibare, Baitsi and Ewa districts with an average of 8.3 persons per household. Meneng has the lowest household size with an average of 6 persons per household. The location settlement has even a lower average household size (4.1 persons) which reflects the smaller physical size of the inhabited dwellings.

Nauru had 9,378 residents as of July 2011. The population was previously larger but in 2006 some 1,500 people left the island during a repatriation of immigrant workers from Kiribati and Tuvalu after wide-scale reductions-in-force in the phosphate mining industry.

The economy of Nauru is somewhat complicated. Due to the extreme financial crisis faced by the country, there exists 2 economies: a “Cash” economy and a “Cheque” (or virtual) economy. Essentially, the Government has frozen all savings accounts in the country and prohibits everyone from withdrawing any cash. Citizens are however allowed to make virtual local transactions from account to account through the usage of cheques. This is with the understanding that the Government will one day be in a financial situation to unfreeze all personal saving accounts again. For Government employees, the current situation is that salaries cannot be paid in full. This means each employee is given an amount less than what each employee should receive on every pay. The difference goes into a “pending” account and reserved until such a time that Government is in a financial situation to pay it back.

Most of household annual earnings come from wages or salaries, followed by gifts received, other income followed by imputed rent and others as per Table 3.

Notably, income generated from handicraft, agriculture and livestock is very low on the income table. This essentially means that there is room for improvement in the Agriculture Sector to improve household income.

Income source	Household annual average income	Per capita annual income
Wages & Salary	\$6565	\$1,013
Gifts Received	\$590	\$91
Other income	\$557	\$86
Imputed Rent	\$520	\$80
Home Produce	\$476	\$73
Home Produce	\$209	\$32
Benefits	\$162	\$25
Previous Jobs	\$141	\$22
Seafood	\$135	\$21
Other Business	\$73	\$11
Homemade Produce	\$65	\$10
Handicraft	\$20	\$3
Fruit & Vegetables	\$16	\$3
Livestock	\$16	\$3
Services	\$9	\$1
TOTAL	\$9,500	\$1,474

Table 3: Annual household and per capita income (Data from Nauru HIE Survey 2006)

On the other hand, household spending in Nauru is mostly on imported food, followed by gift giving, transportation, imputed rent and others as shown in Table 4.

Expenditure Sub-groups	Average annual household expenditure	Average weekly household expenditure
Cereal products	\$1242	\$24
Meat & poultry	\$849	\$16
Seafood	\$628	\$12
Gifts given	\$614	\$12
Transportation	\$529	\$10
Imputed rent	\$520	\$10
Miscellaneous foods	\$374	\$7
Dairy product	\$207	\$4
Miscellaneous expenses	\$200	\$4
Tobacco	\$185	\$4
Household maintenance	\$184	\$4
Household appliance	\$183	\$4
Household supplies	\$177	\$3

Gifts received	\$160	\$3
Meals away from home	\$145	\$3
Recreation	\$134	\$3
Fruit & vegetable	\$126	\$2
Clothing	\$118	\$2
Household bills	\$75	\$1
Alcoholic beverages	\$58	\$1
Non-alcoholic beverages	\$57	\$1
Personal products	\$52	\$1
Education	\$43	\$1
Health	\$39	\$1
Household furniture	\$30	\$1
Rent	\$13	\$0
Footwear	\$8	\$0
Communications	\$7	\$0
Total expenditure average	\$6,957	\$134

Table 4: Annual and weekly household expenditure (Data from the Nauru HIE Survey 2006)

It is apparent from the household expenditure data that the main imported food items are rice, meat and poultry. This means there is potential to dramatically reduce household spending on these food items by improving the production and utilization of potentially healthier locally grown poultry and root crops. Reducing reliance on imported food is a way forward in stabilizing the economy.

Literacy for Nauru is 96 per cent. Education is compulsory for children from six to fifteen years old and two more non-compulsory years are offered (years 11 and 12).

Nauruans are the most obese people in the world with 97% of men and 93% of women are overweight or obese. As a result, Nauru has the world's highest level of type-2 diabetes, with more than 40% of the population affected. Other dietary-related health complications include kidney and heart disease.

3.2 GEOGRAPHY

Nauru atoll was covered with a substantial deposit of phosphate material over thousands of years. The island central plateau is surrounded by a coral reef which is exposed at low tide and dotted with pinnacles. The only fertile areas on Nauru are on the narrow coastal belt where coconut palms flourish. It is a fertile coastal strip 150 to 300 meters (490 to 980 ft) wide that lies inland from the beach.

The land surrounding Buada Lagoon supports crops such as bananas, coconuts, breadfruits, mangoes, papaya, sour-sop, indian mulberry (noni) trees, vegetables, pandanus trees, and indigenous hardwoods such as the tomano.

Phosphate mining in the central plateau has left a barren terrain of jagged limestone pinnacles up to 15 meters (49 ft) high. At present, secondary phosphate mining of the pinnacles is being carried out. Mining has stripped and devastated about 80 per cent of Nauru's land area, and has also affected the surrounding Exclusive Economic Zone; 40 per cent of marine life is estimated to have been killed by silt and phosphate runoff.

There are only about 60 recorded vascular plant species native to the island, none of which are endemic. Coconut farming, mining, and introduced species have caused serious disturbance to the native vegetation. There are no native land mammals, but there are native insects, land crabs, and birds, including the endemic Nauru Reed Warbler. The Polynesian rat, cats, dogs, pigs, and chickens have been introduced to Nauru. There are no honey bees in Nauru, and pollination of fruit trees and vegetables is a key limiting factor to high yields of crops.

There are limited natural fresh water resources on Nauru. Rooftop storage tanks collect rainwater but the islanders are mostly dependent on three desalination plants housed at Nauru's Utilities Agency.

3.3 CLIMATE

It is extremely important to have a thorough knowledge of the climate as it has direct impact on the survival of humans, plants, animals and life on the island. It appears that Nauru's climate scenario has not been taken seriously in previous development plans and has thus resulted in the lack of sustainability and project failures.

Nauru's climate is hot and very humid all year-round due to its proximity to the equator and the warm ocean. Nauru has consistent monthly mean temperatures throughout the year. Daytime temperatures range from 26 to 35°C and night temperatures between 22 and 34°C.

The wet season usually starts in November and continues to April of the following year. During the wetter months, winds are generally from the west at 10-18 knots. During the drier months of May to November, the prevailing wind direction is generally easterly at 5-10 knots. There is a weak peak in rainfall during July-August associated with the northward displacement of clouds during the Southern Hemisphere winter.

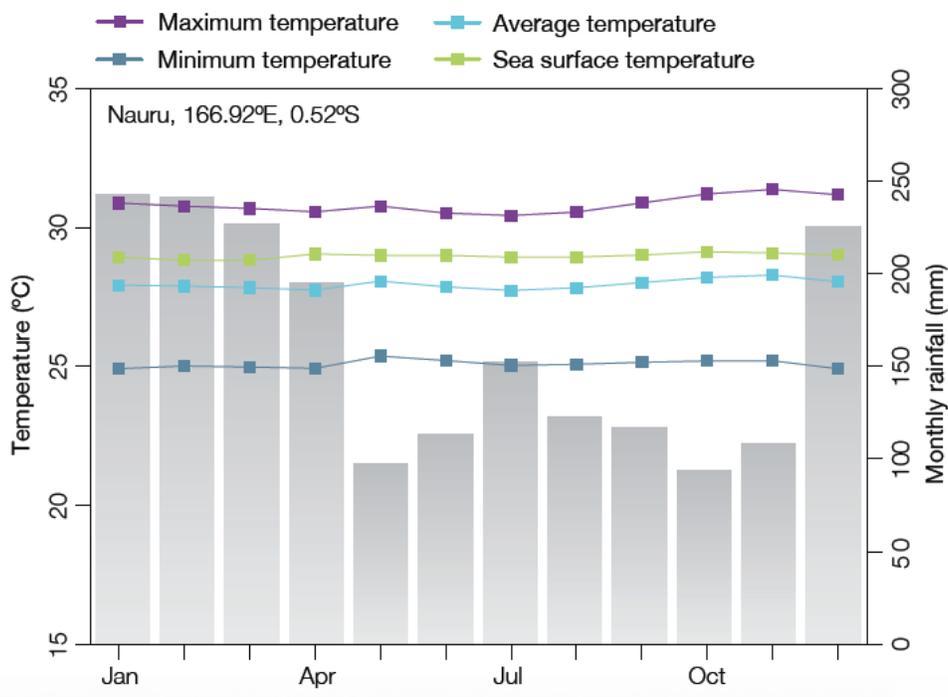


Figure 5: Mean monthly temperature and rainfall at Nauru (Pacific Climate change Science Project 2010)

The annual rainfall of Nauru has extremely high variability. This is a direct result of the strong El Niño Southern Oscillation influence. In some La Niña years Nauru only receives around 400 mm of rainfall while in El Niño years rainfall can be as high 4,500mm.

Nauru does not experience tropical cyclones due to its location near the equator, although it does experience strong winds and sea squalls. The main climate extreme experienced by Nauru is drought, which can be severe and lasts as long as 36 months. Droughts occur when La Niña events decrease the surrounding sea temperature, resulting in less cloud formation and rainfall. Prolonged dry spells diminish the underground fresh-water lens, resulting in water supply problems and severe stress on natural systems.

The annual rainfall of Nauru averages 2056mm per year with a range of 280 to 4590 mm from 60 years of data (1950 to 2010). Monthly rainfall data available for the period indicates a range of 0 to 746 mm, with 30% of months (for which data were available) having less than 100 mm of rain.

In contrast, during El Niño years rainfall is enhanced and can reach as high as doubling the average rainfall.

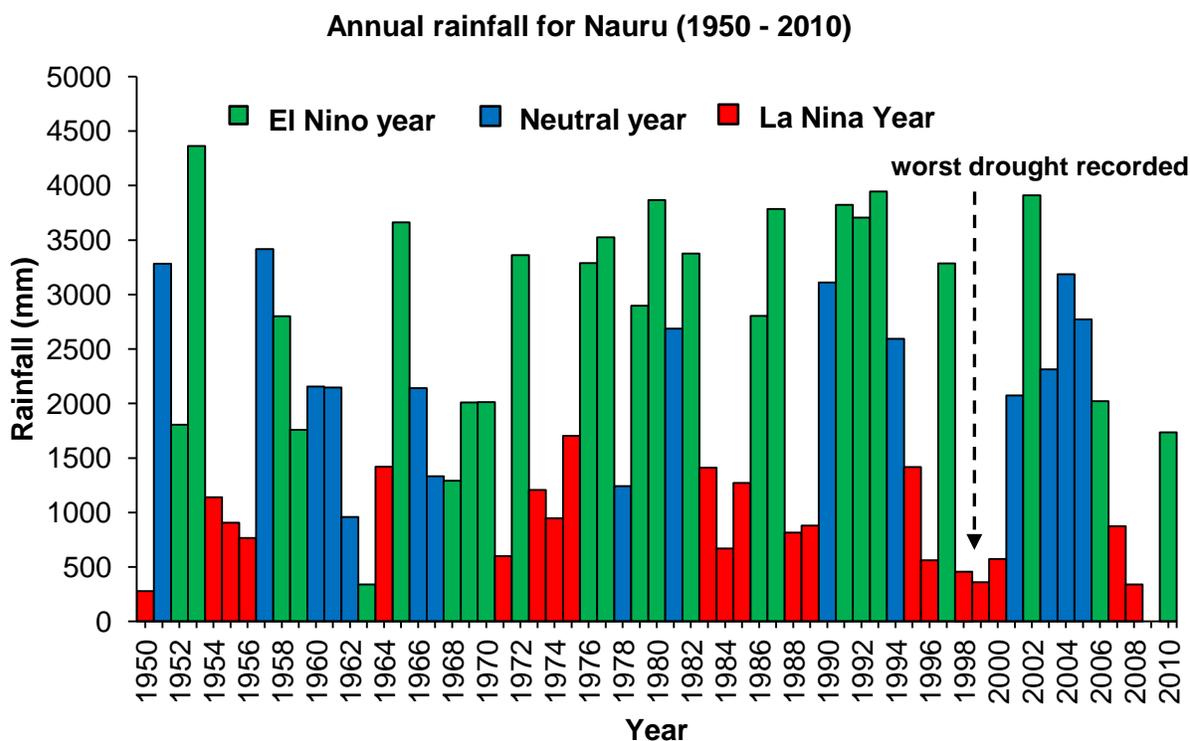


Figure 6: Nauru annual rainfall from 1950-2010 shows very low annual rainfall during La Niña Years.

During La Niña periods, Nauru experiences severe droughts which can last up to 3 years at a time. Whilst the average rainfall (from 1950 to 2010 period) is 2056mm, return periods of drought condition are as follows:

Year	Annual rainfall
1 in every 5years	1000mm
1 in every 10years	600mm
1 in every 20years	400mm

Table 5: Return periods for dry conditions at Nauru

During prolonged La Niña events, the return period for three consecutive years of severe drought conditions is about once every 15 years.

Since 1950 there have been four instances where three consecutive years of severe drought occurred; namely 1954-56 (average of 937mm), 1973-75 (average of 1285mm), 1983-85 (average of 1118mm), and 1998-00 (average of 463mm) with the most severe in the 1998-00, and there was an average of only 463mm annual rainfall throughout those 3 years. The lowest annual rainfalls on record were 278mm and 339mm in 1950 and 2008 respectively.

La Nina events versus dry spells in Nauru

Year	ENSO status	Annual rainfall recorded	Rank
1950	1950-51 La Nina	278mm	Driest on record
1956	1954-56 La Nina	766mm	9 th driest
1971	1970-71 La Nina	600mm	7 th driest
1984	1984-85 La Nina	671mm	8 th driest
1988	1988-89 La Nina	816mm	10 th driest
1996	1995-96 La Nina	561mm	5 th driest
1998	1998-2000 La Nina	457mm	4 th driest
1999	1998-2000 La Nina	360mm	3 rd driest
2000	1998-2000 La Nina	572mm	6 th driest
2008	2008-2009 La Nina	339mm	2 nd driest

Table 6: The 10 driest years on record at Nauru were all recorded during La Nina years

3.4 TOPOGRAPHY

The island is surrounded by a fringing coral reef between 120 and 300m wide. The reef drops away sharply on the seaward edge, at an angle of about 40°, to a depth of about 4000m. The land area consists of a narrow coastal plain or "Bottom side" (sometimes referred to by the Nauruans as "*coconut*" land, ranging from 100 to 300m wide. This is where most residential areas are located. Encircling the "Bottom side" inland is a limestone escarpment rising some 30m to a central plateau, known locally as "Top side" or "*pandanus*" land.

The coastal plain is composed of a zone of sandy or rocky beach on the seaward edge, and a beach ridge or fore-dune, behind which is either relatively flat ground or, in some places, low-lying depressions or small lagoons filled by brackish water where the surface level is below the water table (freshwater lens). The most extensive system of these landlocked lagoons is found near the border of Ijuw and Anabar Districts. Scattered limestone outcrops or pinnacles can also be found on both the coastal plain and on the inter-tidal flats of the fringing reef, with particularly good examples in the Anibare Bay area. The escarpment ranges in gradient from vertical cliffs to gradually sloping areas of colluvial soil (deposits that accumulate on and at the base of slopes as a result of movement by gravity) interspersed with limestone outcrops and pinnacles.

The raised central plateau or Topside consists of a matrix of coral-limestone pinnacles and limestone outcrops, between which lie extensive deposits of soil and high-grade tricalcic phosphate rock. This area covers approximately 1600 ha (over 70% of the island) and has been the focus of phosphate mining for over 80 years. Relative elevations on Topside vary generally between 20 and 45m above sea-level, with occasional pinnacle outcrops reaching elevations of 50 to a maximum of 70m above sea-level.

The topography remaining after completion of primary phosphate mining is a pinnacle- and pit relief varying between 2 and 10 metres from the top of the pinnacles to the bottom of the pits.

Buada Lagoon, a landlocked, slightly brackish, freshwater lake, and its associated fertile depression (about 12 ha in area), is located in the low-lying Southwest-central portion of the island at an elevation of about 5 meters above sea-level.

3.5 SOIL PROPERTIES: SOME GENERAL COMMENTS

A good knowledge of soils is a prerequisite requirement to the determination of any cropping systems to use.

The following information on soil properties in Nauru is presented for its overall relevancy to agriculture production.

3.5.1 Physical Properties

The soils of Nauru are dominantly coarse textured. Sands, sandy loams, and loams with various amounts of gravel, stones, and boulders are dominant. The soils generally have weakly to moderately developed granular or crumb structures in the surface layers, and subsoils are usually structureless or have only very weakly developed structures. The moisture-retention properties is related to the textures; moisture retention is generally low. Measurements of moisture retention against 1,500 kPa tension never exceeded 25% and were frequently less than 10%. Water retention against 30 kPa tension ranged from 8 to 26%, and estimations of plant available water were low for most Nauru soils. This is confirmed by the vegetation pattern, which shows the dominance of species able to tolerate some moisture stress. The soils are excessively well drained or well drained, showing that the heavy rains are rapidly moved away from the surface layers.

3.5.2 Chemical Properties

As with many Pacific Island soils, the influence of organic matter on other Nauru soil properties is critical. There is a very strong correlation of cation exchange capacity (CEC) with organic carbon ($r^2 = 0.9$). A significant correlation ($r^2 = 0.6$) was also found between water retention against 1,500 kPa tension and organic carbon. The disturbance of almost all the soils of Nauru as a result of mining, housing, or road construction and the resulting loss of organic matter is a major issue when considering possible future food production options. A suggested solution for the restoration of organic matter to Nauru soils to consider could be the introduction of fast growing leguminous cover crops such as mucuna or velvet beans and fruit trees. The restoration of organic matter on Nauru soil is essential for any successful crop cultivation.

3.5.3 Fertility

Before mining, the soils of Nauru were most likely more fertile than those of many Pacific atolls but overall fertility was limited. Concentrations of organic matter as measured by organic carbon contents were relatively high (often >5%) and the nitrogen content was high enough to maintain any subsistence cropping. Exchangeable potassium concentrations were generally low, and because the soils usually had free lime in the profiles potassium uptake by plants probably was inhibited by the excessive levels of calcium present. Phosphorus is obviously adequate for all plant needs except in some of the soils of the coastal areas.

Sulfate levels are moderate (phosphate extractable S ranging from 1 to 88 mg/kg) but are adequate for non-intensive farming. An important sustainable technique to consider is agroforestry systems with green cover crop combination.

3.5.3.1 Trace elements

No specific information has been obtained on the trace elements in Nauru soils. Data from analysis of “run of mine” phosphate rock show, however, that total concentrations of manganese (20-50 mg/kg), copper (5-20 mg/kg), cobalt (<1 mg/kg), and molybdenum (<1 mg/kg) are very low. Iron contents are around 0.3%, and zinc contents range from 500 to 1,000 mg/kg. Thus deficiencies in manganese, copper, cobalt, and molybdenum are to be expected. Added to this is the influence of soil pH. The soils of Nauru have high pH values (pH >6.5 generally). Under these conditions, elements such as iron, copper, zinc, and manganese are rendered unavailable to plants due to chemical immobilization. Thus trace elements problems are likely to occur in any intensive cropping system on Nauru soils.

Two other factors that should be considered in assessing the fertility of Nauru are physical in nature. First is the influence of the pinnacles or other large coral fragments. These obviously hamper any mechanical cultivation and have a marked influence on rooting. In many Topside areas the pinnacle influence is substantial, and cropping would have to be carried out between the pinnacles, as is done, for example, in Niue. The other factor is moisture. This would impose a major constraint to any crop production. In the wet years, when rainfall is abundant, the soils of Nauru have considerable potential. Droughts are common, however the soils have only a limited capacity to retain moisture. Therefore, any intensive cropping in the drier years in the absence of external water supplies (irrigation) is likely to fail. This, in part, may explain the historical dependence on coconuts, pandanus and other tree crops.

3.6 WATER RESOURCES

Nauru has very limited surface water. There is only the Buada Lagoon and the small brackish lagoons in the north (Anabar and Anetan) and southeast (Meneñg) of the island that sit on the saltwater base within the carbonaceous substratum of the island. There are no surface streams or creeks to create gullies or other landscape changes. Most of the island surface is very porous, consisting of carbonate reef material and unconsolidated phosphatic

material. Infiltration rates are high, and moisture retention in soils and other near-surface materials is low.

The sources of water on Nauru are rain water (62%), groundwater (22%) and desalination (16%). During El Nino years, the annual rainfall can reach above 4000mm, however the rainwater collection systems are not adequate enough to collect enough rainwater to sustain the island during times of severe drought. During droughts, household rain water tanks are often topped up with desalinated water to meet the household water demand.

The only significant permanent freshwater resource is groundwater in the form of a "lens" of often slightly brackish freshwater, hydrostatically "floating" on higher density saltwater beneath it. The height of the freshwater lens above sea level and the level of salinity vary in relation to rainfall, the distance from the ocean, and with the geological character and composition of the rock near sea level. Exploratory drilling shows that the groundwater is in permeable limestone rock which has fissures and caves.

Replenishment or recharge of the freshwater lens is dependent on rainfall and is about 38% of the annual average rainfall.

Seawater and non-potable well water (from shallow groundwater bores next to houses) are used by many for bathing. The need for reliable power supply to run the large desalination plant means that it has been out of action for several years.

Because most agricultural activity is rain-fed, water sources available for Agriculture during dry periods remain problematic and require special attention.

3.7 VEGETATION

A basic knowledge of the vegetation of Nauru is very important. This is critical information in the selection of crops species or cultivars that can survive in the country's climatic conditions and particularly during the frequent long drought periods.

The climate of Nauru has always been harsh with favorable periods of wet weather and frequent but long extended dry periods. Yet the early Nauruans (of Polynesian and Micronesian descent) survived for thousands of years before western influence on fish and other marine organisms, coconuts, pandanus, native fruit trees and herbs. Therefore, the surviving vegetation of Nauru today should be looked at, examined carefully for its merits, usefulness as living indicators of what would grow at various locations, soils, terrain and various climatic conditions. The following section is presented here for that purpose.

This vegetation on Nauru can be classified into four major types:

- (1) plateau limestone forest;
- (2) escarpment or pinnacle forest;
- (3) wetland and mangrove vegetation and
- (4) coastal/strand vegetation.

Data from a few small relict stands studied in 1980-1981 indicated that the forest of the upraised central plateau was fairly open and dominated by Beach Mahogany (*Calophyllum inophyllum*). Other components of the forest were Guettarda (*Guettarda speciosa*), Premna (*Premna serratifolia*), Tropical Almond (*Terminalia catappa*), and Guava (*Psidium guajava*) (included Beach Saltbush (*Scaevola taccada*), Beach Mulberry (*Morinda citrifolia*), Lantana (*Lantana camara*) (introduced species), *Polypodium scolopendria*, and *Nephrolepis biserrata*. In places, Nauruans planted cultivars of pandanus (*Pandanus tectorius*), mainly for its edible fruit.

On the escarpment and large emergent pinnacles, the dominant species was Pacific Banyan (*Ficus prolix*). These forests also contained a wide range of species including *Ochrosia elliptica*, *Barringtonia asiatica*, *Calophyllum*, *Terminalia*, *Premna*, *Derris trifoliata*, *Clerodendrum inerme*, and *Colubarina asiatica*. Except for Lantana (*Lantana camara*) and Guava (*Psidium guajava*), the limestone plateau forest and the escarpment forest were composed of species native to the Pacific Islands.

Surrounding Buada Lagoon, there are open areas of marshy vegetation and home gardens that grade into closed to semiclosed forests of mixed native and naturalized species. Common components of these forests are *Calophyllum*, *Terminalia*, *Ceiba pentandra*, *Adenantha pavonina*, *Mangifera indica*, and *Annona* sp. In Meneñ, Anabar, and Anetan Districts, small landlocked lagoons and ponds containing the mangrove *Bruguiera gymnorhiza*.

The coastal fringe vegetation has been modified by human activities and settlement such that this area now is a mosaic of natural, disturbed, and cultivated vegetation. The original outer coastal zone is characterized by the presence of salt-tolerant woody species such as *Tournefortia argentea*, *Morinda citrifolia*, and *Scaevola taccada* and the herbs *Vigna marina*, *Lepturus repens*, and *Ipomoea pescaprae*. Inland from the shore, the vegetation is composed of species found in more mesic conditions. In addition to species common to the plateau limestone forest, the vegetation contains *Hibiscus tilaceus*, Coconut (*Cocos nucifera*), *Hernandia nymphaefolia*, and many pan-Pacific herbs and food and ornamental species (many species now found in this inner coastal zone are not native to the Pacific Islands but were introduced into Nauru after European contact).

3.8 LAND AND TENURE SYSTEM

The land tenure system of Nauru is unique. All Nauruan's have certain rights to all land on the island, which is owned by individuals and family groups. Government and corporate entities do not own any land. They must enter into lease arrangements with landowners to use land. Non-Nauruan's cannot own land. Challenges arise from this type of setup with respect to land usage which often results in disputes. This makes it difficult at times for individuals and even the local Government to gain enough security to invest in development activities including agriculture.

3.9 DEPARTMENT OF AGRICULTURE

At present the Department of Agriculture is comprised of 1 Director, 10 Permanent staff, 10 Casual workers and 3 security officers. Though the staff have had no formal training in agriculture, they have attended short training programs and workshops in agriculture and livestock production, with most been directly involved in the implementation of development projects.

The present organizational structure of the DOA does not provide a favorable environment for an effective and efficient service delivery and engagement of local farmers. It is very much project driven and staff roles and programs of the Department are not clearly defined. There is no Corporate Division to manage the resources of the Department. Some extension work is described but not functional and the linkage with the 14 District Communities in Nauru is not clear. There is a connection between the Agriculture National Steering Committee (NSC) which comprises of District Leaders, and the DOA at the planning level but there is no clear indication of a DOA/Community cooperation at the implementation level. An effective DOA/Community link will help empower communities to drive agriculture production at the grassroots. Gender balance is of some concern as there is no clear indication of the involvement of women or youth groups in the development of the Agriculture Sector in Nauru. Improving the Extension arm of the DOA is essential to addressing these concerns. The DOA also lacks qualified staff and struggles to maintain staff numbers. Staff members are recruited and laid off at the beginning and at the end of projects. Others move on to other projects as they are assigned.

Figure 2 shows the current organizational structure of the Department of Agriculture at the time of this consultancy mission.

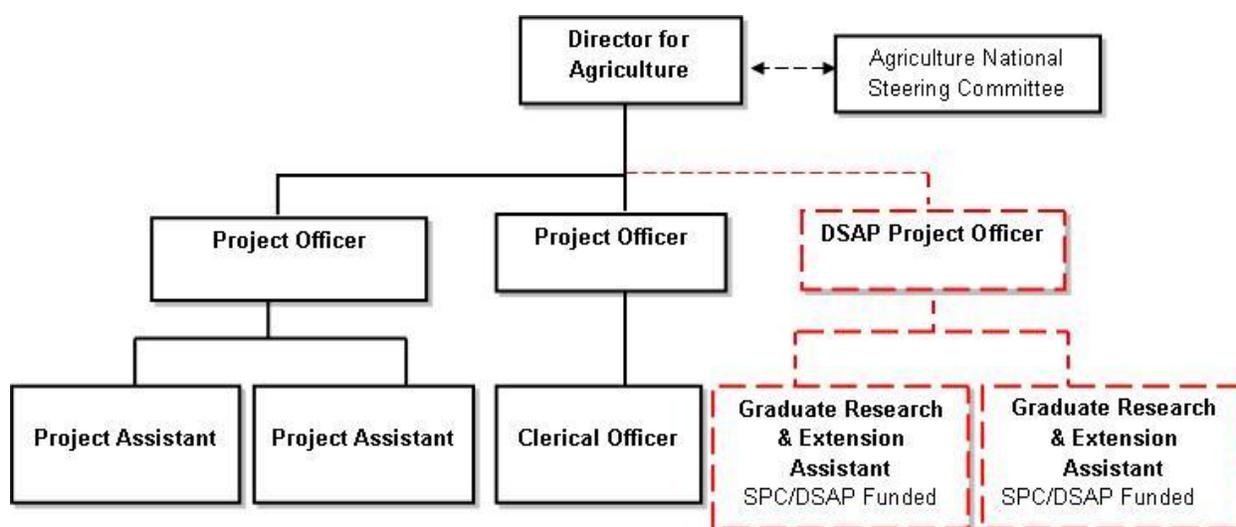


Figure 7: The current organization structure of the Department of Agriculture. Red boxes indicate staff that were dedicated to a DSAP Project but has recently completed.

In terms of the infrastructure, the DOA severely lacks the facilities it needs to function as an Agriculture authority. It does not have adequate training facilities and appropriate office, equipment, tools and transport infrastructure, to provide an enhanced service delivery to the farming community to improve and increase the local production of crops and livestock. There are no facilities dedicated to extension work and a poor transportation system means that community ground work and community outreach is restricted.

The training and research centre at the Horticulture farm in Buada is in serious need of renovation, new furniture, training facilities and small library. A new office building is also required for the implementation of a robust Extension and Women’s Centre. The Women centre is needed for training of women on nutrition and utilization of food crops for home consumption.

3.10 STATUS OF CROPS DEVELOPMENT

Primary production is confined to fruit and vegetable for domestic consumption, although Nauru is nowhere near self-sufficient in this regard. Coconuts, breadfruits, pandanus, bananas, pawpaw, mangoes, various fruit trees and few root crops are also grown on the coastal fringe.

The number of active farmers in Nauru is mainly those that have been able to participate in development projects where they have been able to access planting materials and water supplies to maintain crops. Moreover, the locals are able to farm if fertile land was available to them to utilize for farming purposes. The difficulties surrounding land ownership often restricts the yield a single farmer can produce due to the limited size of allotments available for agriculture. Most farmers in Nauru come from the Buada and Anabar regions. Many of the active farmers in Nauru are engaged in vegetable farming.

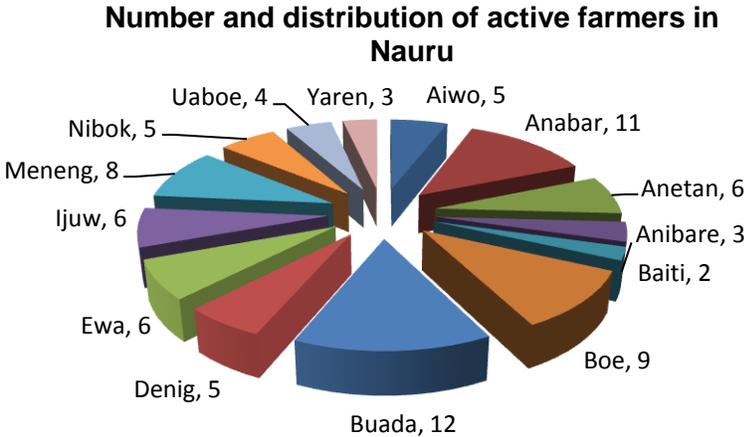


Figure 8: Number and distribution of active farmers in Nauru (Data source Dept. of Agriculture, May 2012)

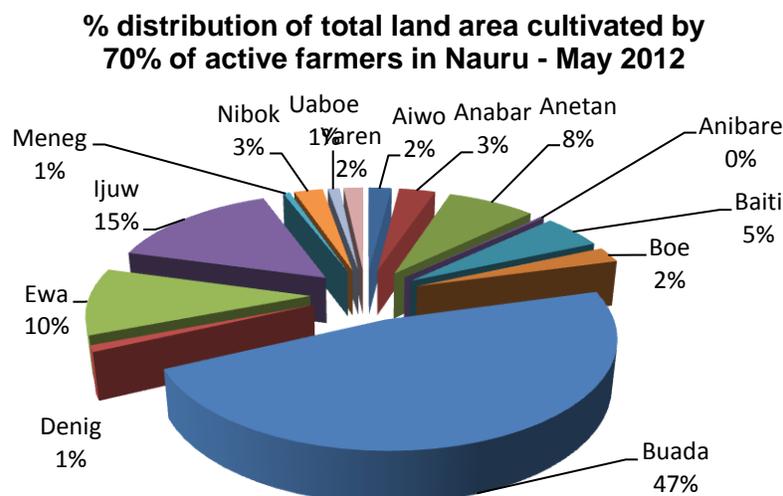


Figure 9: % distribution of land area cultivated by 70% of active farmers in Nauru (Data source Dept. of Agriculture, May 2012)

3.11 STATUS OF LIVESTOCK DEVELOPMENT

Apart from capturing, tagging and domesticating the Frigate Bird (*Frigata minor*) as a sport and sometimes for local consumption, all domestic livestock found on Nauru have been introduced through European contact.

There are local breeds of chickens on the island but not utilized by the local population for food but bred mainly by men for cock fighting. During the phosphate mining period, the exotic lifestyle of the Nauruan people meant that they moved away from labour intensive methods of food production such as raising livestock and fishing, to the consumption of imported foods. Chickens were imported by immigrant workers from Southeast Asia countries during the phosphate mining period and were raised for cock fighting. This leisure activity is still practiced today in Nauru by the locals. The local chickens are free range and roam freely among homes and bush surrounding households. They are not utilized by the people as a food alternative although female chickens are sold on regular basis to local Chinese for \$6-10AUD for their own consumption. Thus it is apparent from direct observation that most of the local chickens that are found roaming residential areas and immediate surrounding bushes appear to be more of roosters.

There is a Taiwan Technical Mission (TTM) project underway in Nauru. The TTM project started from 2010-2014 and aims at intensive poultry egg and swine production and vegetable production.. It involves collaborative efforts between the TTM, DOA and the selected 60-80 households. It is the expectation of the TTM project that there will be few farmers who will continue to produce eggs and pork commercially at the completion of the project. Due to the semi-intensive nature of the TTM project, selected participants are mainly farmers with a job or in business with funds available to spend on up-keeping and purchasing livestock feed.

This project has a desalination plant to supply water during dry periods to its vegetable, poultry and pig farmers. The TTM project does not appear to address directly the poor and low income or the most vulnerable households.

There is one household farmer who raises ducks at the Location Area, mainly to sell to the local Chinese population on the island and for own consumption. There is potential to raise ducks as a possible household resource, especially for residents residing near the land-locked brackish lagoons near Ijuw and Anabar Districts.



Figure 10: Taiwan Technical Mission (TTM) intensive production systems of poultry and piggery project

3.12 PAST AGRICULTURE SECTOR DEVELOPMENTS PROJECTS

Nauru has benefitted from a number of agriculture developments project both regional and national. The comments made below are limited only to those projects that the consultant had access to few progress reports.

Naruru is well known for its successful Fruit Flies Eradication Programme under the FAO/UNDP/AusAID/SPC Project on Regional Management of Fruit Flies in the Pacific whereby the Oriental fruit fly and Melon fly were declared eradicated in November 1999 and the Pacific fruit fly a year later in 2000. This was a major achievement unfortunately; the Mango fruit fly has not been eradicated and thus remains a point of concern in the development of fruit trees and vegetables. It is very important to maintain surveillance and monitor the status of fruit flies in Nauru

During farm visits the consultant noted significant coconut leaf damages from the Brontispa beetle on many coconut plants throughout the island. A FAO/TCP/VIE/2901 on Integrated Pest Management of Coconut Hispine Beetle (*Brontispa longissima*) was implemented in 2003 by introducing 468 parasitoids of *Asecodes hispinarum*. The outcome of this project is not known to the consultant, though the status of the brontispa beetle should be reviewed as coconut is a very important food crop for Nauru.

Nauru has benefited through a number of Telefood community projects (Aiwo, Yaren, Deing) in the areas of livestock development and in consultations with Community leaders, all requested continuation of Telefood programs to assist them on new community crop and livestock projects.

Nauru has also benefited through the Regional Program for Food Security, a trust fund project by the Government of Italy for the improvement of nutrition in Nauru through home gardening. A Home Gardening Manual for Nauru was printed in March in 2008 and used in FAO vegetable home gardening project. A remaining skill from this project is few farmers using boxes or containers for growing vegetables. However, these farmers are assisted at present by the Taiwan vegetable project in the way of seedlings and water. Sustainability may not continue at the end of the project due to lack of resources. Also a trust related project was supported by the Government of Japan for the improvement of coastal and aquaculture fisheries statistics.

Other technical assistance included direct national TCPs from FAO and various technical missions of experts to Nauru. Through the Food Security and Sustainable Livelihood Programme (FSSLP), a National Food Security Assessment was carried out through prioritizing and assessing the national food crisis in terms of the local food production.

A TCP/NAU/3101: Assistance to Small Scale Atoll Farmers in the Cultivation of Disease – Free Bananas for Food Security in Nauru was approved in 2006. During this consultancy, only two farmers were noted as remaining from this project, perhaps due to the long drought at the time of project implementation and the cumbersome technology used. Bananas (cooking types) are noted to survive well beside houses, perhaps having protection and water from the roofs. This is noted also for local papayas and citrus trees.

Other Regional projects included the SPC/Development of Sustainable Agriculture in the Pacific (DSAP) support for the development of root crops in Nauru. There is very little evidence of surviving root crops from this project, probably due to the recent long drought periods.

There is also current assistance for intensive household production of vegetable, poultry and swine by a Taiwan Technical Mission (TTM) working with the DOA and 60 to 80 households.

Whilst a considerable amount of progress has taken place in the agriculture sector in Nauru, the developments have not always had the desired impact to increase local food production. Figure 11 shows recent statistics of exports of frozen meats from Australia to Nauru. It indicates that the reliance on overseas meat products continues to increase. It is therefore necessary to reassess current agriculture sector strategies and activities to ensure that national targets are achieved.

Meat and edible offal (frozen) exported from Australia to Nauru from 2001 to 2010

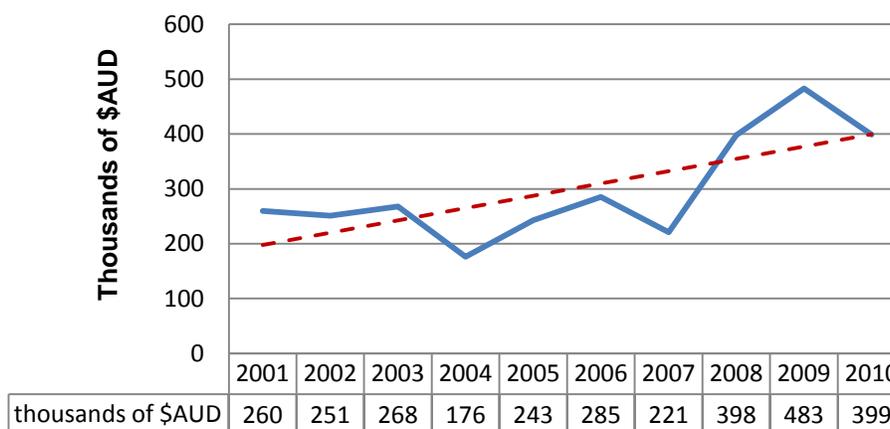


Figure 11: Frozen meat exports from Australia to Nauru shows a continual positive trend.

4. TOR 3: RECOMMENDATIONS ON HOW PLANNED CROP AND LIVESTOCK DEVELOPMENT ACTIVITIES AND PROJECTS SHOULD BE DESIGNED TO ENSURE THEIR EFFECTIVENESS, DEVELOPMENT IMPACT (ALSO WITH REGARDS TOWARDS IMPROVED POPULATION NUTRITION STATUS AND REDUCED FOOD IMPORT DEPENDENCY) AND SUSTAINABILITY BASED ON THE FINDINGS IN THE ABOVE ITEMS 1 AND 2 AND WITH REFERENCE TO;

- *Types of crops, livestock and agro-forestry to be promoted;*
- *Appropriate production systems to be promoted;*
- *Guidelines for selection of participants in crop and/or livestock development projects to be designed;*
- *Appropriate training activities to be undertaken;*
- *The numbers and status of likely beneficiaries (farmers, consumers);*
- *and, Identification of inputs and input sources and likely costs at point of use.*

4.1 FACTORS AFFECTING AGRICULTURE PRODUCTION IN NAURU

In assessing Nauru's national circumstances it is clear that recent efforts to revive the Agriculture sector as a way to improve the quality of life in Nauru, have not been successful. Household spending on imported food items such as rice, flour and meat remains high; obesity and related NDC's remains a problem; and income generated from Agriculture continues to be the lowest on the list of household income generating priorities. There is great potential for the agriculture sector to play a significant role in the local economy both in the short and long term. To achieve this, careful and intelligent planning is needed with much emphasis on sustainability.

Some of the factors that are affecting the sustainable development of the agriculture sector and the success of projects include:

(a) Project driven approach to agriculture development

The current approach of development projects driving the national agriculture program is unsustainable and not the correct approach. It is clear that the lack of government funding has led to this scenario; however, this can be addressed through careful consideration of priorities and the implementation of robust strategies. To get agriculture off the ground in Nauru, some funding (whether donor or local government) needs to be channeled into capacity building, both at the institutional and stakeholder level. It is envisaged that the sustainable development of the Agriculture Sector will come from the development of longer term programs. Projects should be viewed as a tool for implementing solid and carefully planned programs and initiatives. The program development approach will improve coordination and provide the platform for improving agricultural skills and knowledge, improved facilities, engagement of local farmers and sustainable financing.

(b) Little consideration of Nauru's local conditions

In the efforts to bring back agriculture to the people of Nauru, it is important to consider crops that are suited for the climate, soil types and geology of Nauru.

Recent unsuccessful crop production projects have been attributed to a tendency to promote high yielding hybrids crops and western type cropping techniques, with little consideration of Nauru's local conditions and historical data. Most importantly, land ownership and the availability of land continue to be a major concern as they discourage agriculture investment in the long term. This is an area that needs to be addressed at the National level in order to create a better environment for agriculture productivity.

(c) Lack of participation and engagement of communities

For the Agriculture Sector to improve sustainability in Nauru, the local people must be involved in production. Households must know how to engage in farming and raising of livestock as well as utilizing the produce for local consumption. Government must provide the appropriate resources to build the capacity of communities to empower them to engage in agriculture as a way out of economic recession and improving their quality of life. Robust stakeholder training and awareness campaigns should be directed at empowering the local community through direct involvement in the development and implementation of agriculture programs. Past agriculture sector initiatives in Nauru have failed due to the tendency to inform rather than to engage and empower. The Nauruans have been far removed from farming and most of the households have no farming tools such as a cane knife for cutting, digging hoe, digging fork and weeding hoe. They have to be taught how to use these tools, let alone the digging of planting holes, planting, weeding and care and maintaining of crops and also to be taught how to use these various crops.

4.2 RECOMMENDED PRODUCTION SYSTEMS FOR SUSTAINABLE AGRICULTURE IN NAURU.

Having considered Nauru's national situation and consultations with a wide range of stakeholders, two production systems are recommended to be promoted in Nauru:

(a) Recommendation 1: To introduce and develop integrated farming systems

Integrated farming is recommended as an ideal approach for Nauru. It is for sustainable farming of a variety of crops and/or livestock on a given land area. The benefits of such a system are that there are many outputs. At the same time, these multitudes of farming activities interact to provide sustainable biosystems. An example of an integrated system is the farming of vegetables, fruit trees, indigenous trees, nut trees, root crops and cover crops, all on one piece of land. The outputs would be the harvest of vegetables, fruits, timber for handicrafts, traditional medicine and root crops. In turn, large indigenous trees would provide good wind shelter and a good cover crop to improve soil structure and fertility, help hold soil moisture and improve organic matter. Integrated farming is also ideal due to limited land areas and for improving productivity.

(b) Recommendation 2: To promote household small scale farming systems

Due to the limited arable land available for farming in Nauru, the availability of funding and the status of existing knowledge base on agricultural production, it is recommended that agriculture production in Nauru be driven at the community household level. These household systems are small scale, easy to manage and are mainly intended for subsistence consumption. It is suggested that improving household gardening and raising of livestock would help decrease household spending on imported meat and cereals.

4.3 TYPES OF CROPS AND LIVESTOCK RECOMMENDED FOR NAURU

The types of crops and livestock recommended for Nauru depends on the natural conditions such as climate, soil structure and soil fertility, topography, land availability and the intent and ability to utilise output and produce.

The recommended local crops for propagation and development in Nauru include:

Recommended crops for propagation and development in Nauru		
Fruit Trees [Nauru name] (Scientific Name)	Photo	Crop brief and local use
1. Coconut [Ini] (<i>Cocos nucifera</i>)		Fruit for drinking and eating; coconut cream used in cooking various dishes; Leaves for weaving, coconut shells used as container and handicrafts; sap used as an alcoholic drink; fibre used in weaving ropes and nets; and timber for construction
2. Common Breadfruit [Deme] (<i>Artocarpus altilis</i>)		Fruit cooked as staple food; Sap as adhesive for canoe building and chewing gum; Leaves used for wrapping food for cooking and as traditional plates; Timber used in canoe making and Juice from shoots used as medicine for curing ear aches
3. Papaya [dadabaia] (<i>Carcia papaya</i>)		Ripe fruit eaten and juice; dried fruit for jam; green fruit in curry and also used to tenderize pork and beef; sap used as a cure for ringworm; flowers used as necklaces and leaf stalk used by children as pea shooters
4. Mango [damanko] (<i>Magnifera indica</i>)		Fruit eaten green and ripe; ripe use for juice, chutney, pickles; dried mangoes, jam; wood used as firewood and sap can cause an allergic rash
5. Banana [dabanana] (<i>Musa sp.</i>)		Fruit eaten ripe or cooked when green. Leaves used as food wrapping and for covering underground ovens
6. Soursop [dawatsip] (<i>Annona muricata</i>)		Ripe fruit eaten raw; juice, ice blocks. Chemical properties known to prevent cancer
7. Guava [Kuawawa] (<i>Psidium guajava</i>)		Fruit eaten green and ripe; wood as excellent firewood; young leaves used to treat diarrhea and stomach aches
8. Lime [Derem] (<i>Citrus aurantifolia</i>)		Fruit used green for making juice drinks and for marinating raw fish. High in vitamin C
9. Pandanus [Epuh] (<i>Pandanus tectorius</i>)		Ripe fruit eaten and high in vitamin A. Leaves used in weaving of mats and as roofing material; stem and stilt roots used in construction and as firewood; juice from stilts, mixed with coconut juice to cure constipation.
10. Sweetsop [Dawatsip] (<i>Annona squamosa</i>)		Ripe fruit eaten raw
11. Wild passion fruit [Oatamo] (<i>Passiflora foetida</i>)		Sweet tangy pulp and seeds, favorite among children

Recommended vegetable species		
1. Hibiscus spinach [Bele] (<i>Abelmoschus manihot</i>)		Nutritious slippery green leaves cooked as a green vegetable
2. Pig Weed [none] (<i>Amaranthus</i>)		Grows as a weed; leaves nutritious cooked as a spinach and can be mass produced and used as pig and chicken feed
3. Long Bean [Bin] (<i>Vigna sesquipedalis</i>)		Eaten cooked as a vegetable, high in protein and dietary fibre
4. Pumpkin [dabamakin] (<i>Cucurbita pepo</i>)		Fruit cooked as a vegetable, high in vitamin A
Recommended nut tree species		
1. Tropical Almond [Etetah] (<i>Terminalia catappa</i>)		Skin of fruit eaten when ripe; nut inside eaten when matured and fallen to the ground; timber used in light construction and woodcarving and roots used to prepare a cure for dysentery.
2. Red bead tree [Bin] (<i>Adenanthera pavonina</i>)		A nitrogen fixing legume excellent for improving soil quality. Red seeds used in handicrafts necklaces and eaten by children.
Recommended indigenous tree species		
1. Indian mulberry [Deneno] (<i>Morinda citrifolia</i>)		Ripe fruit eaten raw; fermented fruit juice cure for diabetes and various illnesses; roots and branches crushed and squeezed to cure rashes; fruit cooked and mixed with coconut syrup to make Nauruan pudding "dedangan"
2. Beach Mahogany [Iyo] (<i>Callophyllum inophyllum</i>)		Nut Fruits used in making body oil; burned as traditional Nauruan light and mosquito repellent; timber highly valued for construction, furniture making and canoe building
3. Beach cordia [Eongo] (<i>Cordia subcordata</i>)		Highly endangered indigenous tree. Wood used for wood carving, boatbuilding and furniture; leaves crushed and mixed with coconut milk to prevent baldness and flowers used for garlands
4. Leucaena [Bin] (<i>Leucaena leucocephala</i>)		Excellent nitrogen fixing legume to improve soils. Very high in protein for livestock feed especially pigs, cattle and chickens; timber used in wood carving and seeds used in handicraft making.
5. Milo [Itira] (<i>Thespesia populnea</i>)		Timber excellent for traditional house construction, furniture, wood carving and canoe outriggers
Recommended over crop/green manure species		
1. Centro [none] (<i>Centrosoma pubescens</i>)		A pasture legume and excellent nitrogen fixer and cover crop

2. Desmodium [none] (<i>Desmodium triflorum</i>)		A pasture legume and excellent nitrogen fixer and cover crop
Recommended livestock species		
1. Nauru local chicken [NA] (<i>unknown</i>)		Females sold to Chinese for local consumption; eggs and meat used as food by very poor families; roosters used in cock fights. Recommend new breed to upgrade local chicken and training locals to utilize eggs and meat for local consumption
2. Large white pig breed [NA] (<i>unknown</i>)		Meat high in protein.
3. Imported Duck [NA] (<i>unknown</i>)		Meat and eggs high in protein. Underutilized but has the potential as a commodity & recommended for introduction to swampy areas near Ijuu and Anabar Districts.

4.4 GUIDELINES FOR SELECTION OF PARTICIPANTS IN CROP AND/OR LIVESTOCK DEVELOPMENT PROJECTS

The ideal participant groups to implement the production systems recommended for Nauru are community-based groups and in particular, the households. The Government of Nauru has defined a household as: ***“sharing the means of subsistence, economic burdens and benefits whether living under the same dwelling or additions to the main dwelling whether attached or unattached”***.

Suggested guidelines for selection of the participatory households for small scale crop and livestock production include:

(1) Household size

There should be an adequate number of people in the household to implement expected project activities

(2) Availability of land

The household should have adequate land available or access to land that can be utilized during and after the project.

(3) Vulnerability

Priority should be given to vulnerable households. These include households with (a) one or no surviving parent; and (b) low income.

5. TOR 4: RECOMMENDATIONS ON APPROPRIATE TECHNOLOGY PACKAGES AND PRELIMINARY OUTLINE DESIGNS FOR CROP AND LIVESTOCK DEVELOPMENT ACTIVITIES TO BE PROPOSED FOR NAURU;

When developing appropriate technology packages for the development of agriculture in Nauru it is important to consider the local conditions and circumstances. Any agriculture activity carried out outside this limit will be at risk of failure through unsustainability. For Nauru's current situation, technologies introduced to enhance agriculture and food production should be: (1) simple and easy to use; (2) require little resources to maintain; (3) provide for high quality yield and good returns for resources allocated; (4) compatible with the local environment and (5) provide outcomes that will improve the quality of life of the Nauruans.

The following technology packages are recommended for Nauru:

TOR 4 Recommendation 1:

Introduction of an enhanced breed of chicken to upgrade the local Nauruan chicken for improved meat and egg quality.

This suggested technology package is to introduce an enhanced breed of chicken to breed with the local chicken to form a utility hybrid with enhanced meat quality and high egg productivity. This technology should provide for healthier food options, reduction in imported poultry products and income generation.

TOR 4 Recommendation 2:

Introduction of Indian Mulberry (Noni) Juice production technology

The Indian Mulberry (Noni) plant grows wild and are plentiful in Nauru. It is well documented worldwide and throughout the pharmaceutical industry that the juice produced from its fruits contains natural occurring elements that are valuable for human health. During the mission to Nauru, the consultant was able to introduce the basic processes involved in the production of Noni juice to the staff of the DOA but it is recommended for further work and for introduction to the local population as a mechanism for improving nutrition and general health.

TOR 4 Recommendation 3:

Introduction of a household agricultural information card

One of the problems encountered by the DOA in working with the local communities in Nauru is the absence and the unavailability of credible agriculture data. It is recommended that a household agricultural information card be developed by the DOA and implemented through its proposed Extension Division for the collection and tracking of household data for agriculture. This tool was introduced to the DOA by the consultant during the mission to Nauru but further work is needed to ensure its use on a routine basis and proper maintenance of this simple but effective information system.

TOR 4 Recommendation 4:**Introduction of plant varieties that produce higher yield**

The technology is to introduce higher yielding varieties of fruit trees that already exist in Nauru, as well as new species of fruit trees that are not found on Nauru but are successful in other Pacific Island countries, and would be suitable for Nauru's climate. The table below shows details of three nut-producing fruit trees that are high in protein and other natural occurring elements. These could provide a healthier dietary option for the people of Nauru in the long term.

Fruit Trees [Nauru name] (Scientific Name)	Photo	Crop brief and local use
1. Tropical Almond [Etetah] (<i>Terminalia catappa</i>)		Plant grows well and wild in Nauru, but the edible nuts are very small in size. Solomon Island has varieties with bigger nuts for eating is recommended for propagation in Nauru.
2. Tahitian Chestnut [none] (<i>Inocarpus edulis</i>)		Mature fruit cooked and eaten as an excellent source of protein and carbohydrates; bark used as herbal medicine and good wind break for coastal areas. Vava'u (Tonga) varieties are recommended for introduction to Nauru.
3. Canarium [none] (<i>Canarium harveyi</i>)		Mature black nuts eaten raw as a source of protein and very nutritious. Very strong tree and can withstand harsh conditions. Vanuatu varieties with bigger nuts are recommended for propagation in Nauru

Table 7: 1 new plant variety and 2 new plant species recommended for propagation in Nauru

TOR 4 Recommendation 5:**Introduction of honey bees to improve fruit production**

During the consultancy, it was noted that there are no honey bees present on Nauru. This could account for the visible low productivity of fruit trees. Pollination of plants is highly depended on the wind. The introduction of honey bees to the island would improve fruit production and high yields through enhanced pollination of plants. A secondary benefit of honey production would be a healthy and nutritious food for local consumption.

TOR 4 Recommendation 6:***Introduction of new plant speices (Mucuna or velvet bean) for improving soil fertility***

To improve the soil structure, fertility and moisture holding capacity it is proposed that the mucuna bean (*Mucuna pruriens*) be introduced to Nauru. The mucuna is a nitrogen fixing legume that has been successfully propagated in Tonga by SPC/DSAP as a cover crop for the improvement of soil structure, fertility and availability of organic matter. It is reccomended for trials in Nauru.



Figure 12: Velvet bean (*Mucuna pruriens*), an excellent leguminous cover crop recommended for introduction to Nauru.

6. TOR 5: PROVIDE RECOMMENDATIONS ON NECESSARY ACTIONS REQUIRED FOR SUSTAINABLE CROP AND LIVESTOCK DEVELOPMENT IN NAURU

With careful consideration of the general context of Nauru, the following recommendations are proposed for consideration on nessesary actions required for sustainable agriculture in Nauru.

TOR 5 Recommendation 1:***Enhancing the Institutional Capacity of the Department of Agriculture through restructuring of the organisation***

The current adhoc approach of trying to improve the Agriculture Sector through the implementation of projects is not sustainble. This quick fix approach does not allow for continuity at the end of projects; does not support building the capacity of staff of the DOA for the longer term; lacks strategic direction for achieving goals through planning; and no structured approach to resource mobilisation and management.

Proposed Action 1.1: That a program based organizational structure be adopted; established and implemented to clearly map out how the DOA will achieve its goals and align staffing with appropriate and clear job descriptions to carry out those programs.

It is suggested that robust Corporate, Research and Extension Divisions are created to manage resources more effectively, build capacity and effectively engage and empower the local communities in Nauru to increase the quantity and quality of local food production. There is also added value in transferring the country's Quarantine Services which is currently under the Ministry of Justice to be a Division of the DOA as is the normal practice in the region. This remains a decision of the local Government but is a point to consider.

It is also suggested that the membership of the NSC be revised for better representation of stakeholder groups involved in the agriculture sector in Nauru. An organization model has been suggested for Nauru after consideration of staff capacity, numbers and training requirements. It is noted that multi-skilling and multi-tasking of staff will be necessary.

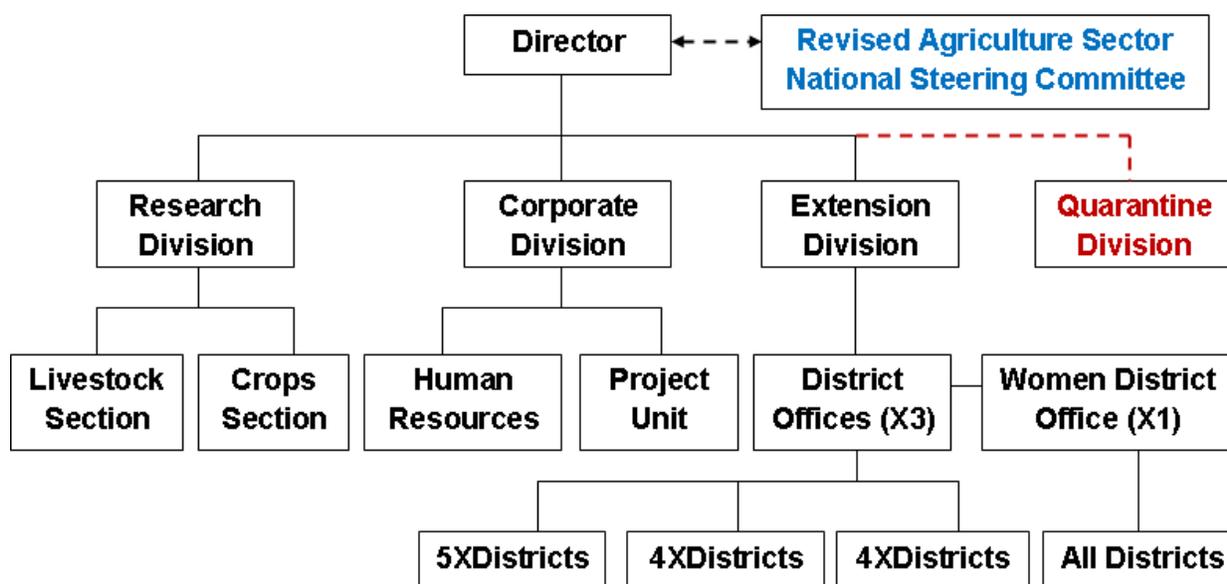


Figure 13: Model organization structure recommended for the Nauru Department of Agriculture.

Funding assistance opportunities exists through the FAO Technical Assistance.

TOR 5 Recommendation 2:

Introduction of sustainable water management systems for Agriculture

One of the factors that impedes agriculture production in Nauru is the limited availability of water during prolonged drought periods. A suggested source of funding is through bilaterals associated with climate change and adaptation.

Proposed Action 2.1: Upgrade of rainwater harvesting facilities through the introduction of appropriate building codes.

Proposed Action 2.2: Strengthen the institutional capacity of the DOA to provide reliable seasonal rainfall predictions through Agro-climatology training.

In particular, the ability to track the El Nino Southern Oscillation and provide competent advice to local farmers on predicted seasons of heavy rain associated with El Nino. This is crucial for rainfall harvesting and expected prolonged droughts brought about by La Nina for water restriction measures and for improved irrigation.

TOR 5 Recommendation 3:

Improving of sustainable financing for community based agriculture

Due to serious financial problems in-country, Nauru does not have a Bank or an available funding mechanism where households and communities can borrow for agriculture development activities. Utilisation of cheque accounts are not recommended.

Proposed Action 3.1: Government to establish a grass root fund through direct or donor funding to allow for community soft loans. A suggested source of funding is through the allocated Global Environmental Facility (GEF) Climate Change Adaptation fund for Nauru . Other funding opportunities include FAO through its Technical Cooperation Program (TCP) and IFAD.

TOR 5 Recommendation 4:

Improving of agriculture sector knowledge base

Building the knowledge base of the agriculture sector is vital for the development of agriculture in the country. It is vital for the DOA as a regulator and technical adviser on agriculture and food production matters to build the capacity of its staff. The urgent areas for training focus are: (1) corporate and management; (2) Professional Training e.g. plant pathology, nutritionist; and (3) technical and specialized training.

Developing and enhancing local expertise and skills is vital. This should encompass both traditional local knowledge in combination with secondary or tertiary training.

Proposed Action 4.1: Training and building the capacity of the DOA human resources. Funding for short and long term training of the DOA is suggested through bilaterals and scholarship schemes with development partners.

Proposed Action 4.2: Training and capacity building of stakeholders engaged in agriculture and/or food processing for improved production and nutrition. This training has many levels ranging from media awareness programs and workshops to field trials and pilot projects. Potential funding are the grass root assistance schemes on community resilience and risk management.

TOR 5 Recommendation 5:

Improving of agriculture support facilities

Improving the availability of agriculture facilities is essential for developing Agriculture in any country.

Proposed Action 5.1: Improving the training and outreach facilities of the DOA through upgrading its training and research centre and the establishment of a new Extension Division Office, including a food processing kitchen for women. Securing adequate transport facilities are also essential for ongoing community consultations and field work of the DOA. Possible funding for upgrading DOA facilities is through the FAO Technical Cooperation Program.

Proposed Action 5.2: Improving farmer access to farming and processing equipment and facilities, through the establishment of either: (1) a government department store to make available the purchase of agriculture equipment and supplies; or (2) establish an agreement with a private company or likewise, mechanisms for the procurement of the same.

TOR 5 Recommendation 6:

Improving of land availability for Agriculture

The development of agriculture in Nauru is often hindered by the unavailability of land.

Proposed Action 6.1: Government should recommend that as part of the review of the land tenure system, that unused land for over a number of years could be allocated and utilized for farming purposes.

7. TOR 6: BASED ON THE FINDINGS OF THE CONSULTANCY MISSION AND IF APPROPRIATE, DRAFT FAO TECHNICAL COOPERATION PROJECT PROPOSALS (TCPS) ON CROP AND LIVESTOCK DEVELOPMENT FOR NAURU;

From the findings and recommendations of the consultancy mission, three TCPs are proposed for the consideration of the Government of Nauru for increased agricultural production.

1. TCP for the Strengthening of the Institutional Capacity of the Department of Agriculture.
2. TCP for Nauru Household Integrated Agro-Forestry & Crop Utilisation
3. TCP for Nauru Household Small Scale Poultry Production

8. TOR 7: PREPARE A REPORT ON PRELIMINARY FINDINGS TO THE GOVERNMENT PRIOR TO THE COMPLETION OF THE MISSION, AND SUBMIT TO FAO/SAP A MISSION REPORT (INCLUDING A DRAFT TCP PROJECT PROPOSAL) FORMATTED IN ACCORDANCE WITH FAO STYLE IN MS WORD UPON COMPLETION OF THE MISSION FOR FORMAL SUBMISSION TO THE GOVERNMENT OF NAURU.

A verbal brief of preliminary findings were conveyed to the DOA at the completion of the mission. The full mission report is submitted here along with 3 draft TCPs attached as Annexes to this report.

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ATTACHMENT 1

Terms of reference for Consultant/PSA



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Terms of Reference for Consultant/PSA

Name:	Haniteli Fa'anunu		
Job Title:	International Consultant		
Division/Department:	FAOSAP		
Programme/Project Number:	TCP/NAU/3301		
Location:	Nauru		
Expected Start Date of Assignment:	17/04/2012	Duration:	35 days
Reports to:	Name: Vili A. Fuavao / Viliami Fakava	Title:	SRR / Plant Production & Protection Officer

General Description of task(s) and objectives to be achieved

Under the overall supervision of the Sub-Regional Representative for the Pacific Islands, and technical guidance from RAP Senior Plant Production Officer, SAP Plant Protection/Production Officer and in close consultation with SAP MDT, and the national authorities, the consultant will undertake the following tasks:

- 2) A brief review of past and current national policy and development plans and sector strategic plans relating to agriculture development and in particular sustainable development of crops and livestock in Nauru;
- 3) An assessment of the status and impact of past and present efforts to develop crops and livestock farming in Nauru on the Nauru communities including technical, economic, social, environmental and institutional aspects through collecting necessary information and data from government agencies concerned as well as stakeholders with reference to:
 - *Types of crops, livestock and agro-forestry traditionally grown and consumed, as well as, new ones with potential for comparatively higher productivity and food preference by the population and likelihood to improve nutrition status of vulnerable groups;*
 - *Arable land available and to which people have access for farming; Availability of water for rain-fed agriculture and for irrigation;*
 - *and, The numbers and status of likely beneficiaries (farming households, consumers) Likelihood to enable sustained reduction food imports.*

- 4) Recommendations on how planned crop and livestock development, activities and projects should be designed to ensure their effectiveness, development impact (also with regards towards improved population nutrition status and reduced food import dependency) and sustainability based on the findings in the above items 1 and 2 and with reference to:
 - *Types of crops, livestock and agro-forestry to be promoted;*
 - *Appropriate production systems to be promoted; Guidelines for selection of participants in crop and/or livestock development projects to be designed; Appropriate training activities to be undertaken;*
 - *The numbers and status of likely beneficiaries (farmers, consumers);*
 - *and, Identification of inputs and input sources and likely costs at point of use.*
- 5) Recommendations on appropriate technology packages and preliminary outline designs for crop and livestock development activities to be proposed for Nauru;
- 6) Recommendations on necessary actions required for sustainable crop and livestock development in Nauru;
- 7) Based on the findings and if appropriate, a draft TCP project proposal on crop and livestock development for Nauru;
- 8) Prepare a report on preliminary findings to the Government prior to the completion of the mission, and submit to FAO/SAP a mission report (including a draft TCP project proposal) formatted in accordance with FAO style in MS WORD upon completion of the mission for formal submission to the Government of Nauru.

Qualifications / experience: Postgraduate qualification in agricultural economics, rural development or related subject; at least ten years of previous experience in project preparation and management; proven track record in the Pacific Region; computer literacy ; knowledge of FAO's policy assistance, crop production and food security initiatives will be an advantage.

Key performance indicators

Expected Outputs:	Required Completion Date:
Successful completion of task	21 May 2012
End of mission report	

V2 09/10

ATTACHMENT 2

WORK PROGRAM AND CONSULTATION SCHEDULE FROM 2-23 MAY 2012

02/05/12 Wednesday	
PM	- International Consultant arrives in Nauru
03/05/12 Thursday	
AM	- Introduction of National and International Consultants & discussion on TORs and gathering of literature
PM	- Familiarisation tour of the island
04/05/12 Friday	
AM	- Meeting with Dr. Alani Tangitau of the Ministry of Health to arrange appointments with Health Officers
PM	- Meeting with Director for Quarantine, Mr. Tremain Dick
	- Farm visit with cucumber farmer, Mr Bom Jeremiah
	- Farm Visit with cabbage & tomato farmer, Mr. Norman Quadina
07/05/12 Monday	
AM	- Meeting with Erana Aliklik (National Consultant) to discuss Work Program and Logistics
	- Meeting with the Director for Department of Agriculture (DOA), Mr. Frankie Ribauw
	- Recapping & Literature Review
	- Meeting with the Director for Tourism, Mr. Ritchie Halstead
08/05/12 Tuesday	
AM	- Meeting with the Permanent Secretary for CIE, Mr. Russ Kun
PM	- Meeting with the Nutrition Unit of the Ministry of Health, Dr. Seta, Dr. Saung & Mr. George
	- Meeting with the Leader of the National Youth Organization, Mrs. Ann Hubert
	- Report writing, Reviewing & Recapping
09/05/12 Wednesday	
AM	- Meeting with the Agro-forestry Manager, Noah Teleni - Tour of the phosphate mining area, Pitt 6 site & NRC nursery
PM	- Meeting with Director for School Curriculum, Mrs. Corine Joram & Mrs. Lyn Teleni
	- Meeting with SLM Project Officer, Mrs Claudette Watson
	- Meeting with PACC Project Co-ordinator, Mrs. Mavis Depaune & IWRM Project Co-ordinator, Mr. Haseldon Buraman
10/05/12 Thursday	
AM	- Meeting with DOA Staff to discuss Organisational Restructure Planning
PM	- Meeting with Director of DOA & Consultants, Frankie Ribauw, Erana Aliklik & Ms. Marita Manley (GIZ/SPC)
11/05/12 Friday	
ALL DAY	VISITS TO ALL FARMS
AM	- Mr. Shane Detenamo (Boe) –cabbage, tomatoes, papaya & sugarcane grower
	- Mrs. Jocelyn – cabbage & tomato grower
	- Mr. Paula – cabbage, tomatoes, lemon grass & papaya grower
PM	- Mr. Aaron – banana, cabbage, tomatoes & bele
	- Narieta Harris (Uaboe) – Beginner farmer with adequate land
	- Mrs. SidaTimitsi (Uaboe) – owner of sapote tree (unique)
	- Mr. Godwyn Caleb (Ewa) – cabbage, bamboo & chicken farmer
	- Anetan Youth Community farm visit (Anetan)

	- Mr. Whip Scotty – cucumber, cabbage, custard apples, breadfruit, citrus, noni plants, coconuts & sour-sop grower
12/05/12 Saturday & 13/05/12 Sunday	
	- Literature Reviews and Report Writing
14/05/12 Monday	
AM	- Meeting with Mr. Lee, Technical Taiwan Mission (TTM) Team Leader
PM	- Visit Taiwan Livestock Project Farm – Mr. George Tagamoun (Manager) - Field visits of selected progressive Livestock Farms Mr. Porky Jeremiah-Poultry and livestock (progressive small commercial farming), Mr. Max Dowedia- Cabbage and Piggery
15/05/12 Tuesday	
AM	- Gathering of Literature for Review - Meeting with Mr. Monte Depaune – Acting CEO for Nauru Fisheries & MRA
PM	- Meeting with Nauru Congregational Church Leader Rev. Roger Mwareow - Meeting with NIANGO members Ms. Julie Olson & Ms. Gemma Adam
16/05/12 Wednesday	
AM	- Meeting with President of Community Leaders – Mr. Tyrone Deiye
PM	- Literature Reviews and Report Writing - Consultant demonstrating the making of Noni juice to 5 staff of the DOA - Meeting with the Women's Division Officer – Ms. Victoria Scotty
17/05/12 Thursday	
FULL DAY	PUBLIC HOLIDAY – CONSTITUTION DAY
18/05/12 Friday	
AM	- Meeting with Mrs. Fatima Teabuge Assistant Director for Culture
PM	- Visit Banana Farm at Denig with Mr. Cagni Scotty (adequate land area)
19/05/12 Saturday	
AM	- Visit the Women Combine Congregational Arts & Craft Display Competition at the Centennial Hall & met with local mat weaver Mrs. Lucy Botalenga - Visit the Local Market at the Civic Centre & meeting up with TTM/Agriculture staffs selling their produces
PM	- Visit Mrs. Fononga (Tongan living on Nauru) on experience in Nauru - Tour at the Location Area (Residents of immigrate workers in the past) - Visit the only Duck Farmer Mr. Keanun Amram at the Location Area - Visit Mr. James Mau's resident & taking photos of his banana plot
20/05/12 Sunday	
4:30PM	- Meeting with Mr. James Ma'u, Tonga resident in Nauru (experience & lifestyles in Nauru)
21/05/12 Monday	
AM	- Visit Culture Museum (Mrs. Morina Kepae) - Final Tour at the Pitt 6 Secondary mining & phosphate production site
PM	- Treating Pandanus Fruits at the Horticulture Farm in Buada, Review of Literature, Took measurements of compound, nursery & Training Centre
22/05/12 Tuesday	
AM	- Verbal presentation and preliminary report by the Consultant to the Director and Staff of the DOA on the findings of the mission - Meeting with Mr. Andrew Kaiurua ARMS Site Manager (Weather Station)
PM	- Meeting with District Leaders (Mrs. Sarah Adumar (Denig), Mr. David Dowiyogo (Baitsi), Mr. Tyrone Deiye (Ijuw & CBO President), Mr. Haseldon Buraman (Anetan), Mrs. Marjorie Taleka (Anibare) & DOA Staff
23/05/12 Wednesday	
11:45AM	End of Mission – International Consultant Depart Nauru

ATTACHMENT 3

CONSULTANTS TRAVEL ITINERARY



Retzlaff's Tours and Travel
Sanalele Complex
Saleufi
Apia
Telephone: +685 21724-5
Email: retzlafftravel@samoa.ws
APWWS3107

Itinerary for:	Mr Hanitele Ofa Faanunu
By:	Ella Schmidt-Ward
	retzlafftravel@samoa.ws
Date:	Wednesday April 18 2012

Tuesday May 01 2012	Nuku'Alofa - Nadi
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Flight: FJ0210 **AIR PACIFIC LTD**
Depart: Nuku'Alofa **16:50**
Arrive: Nadi **17:20**
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** BOEING 737-800
Duration: 1hr 30mins **Meal:**

Wednesday May 02 2012	Nadi - Nauru Island
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Flight: ON **AIR NAURU**
Depart: Nadi **10.00am**
Arrive: Nauru Island **1.00pm**
Cabin: Economy Class

Wednesday May 23 2012	Nauru Island - Brisbane
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Flight: ON **AIR NAURU**
Depart: Nauru Island **11.45am**
Arrive: Brisbane **4.50pm**
Cabin: Economy Class

Wednesday May 23 2012	Brisbane - Nadi
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Flight: FJ0922 **AIR PACIFIC LTD**
Depart: Brisbane **23:55** Terminal - International
Arrive: Nadi **05:25** Thursday May 24 2012
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** BOEING 737-800
Duration: 3hrs 30mins **Meal:**

Thursday May 24 2012	Nadi - Suva
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Flight: FJ0007 AIR PACIFIC LTD
Depart: Nadi 08:00
Arrive: Suva 08:30
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** AT5
Duration: 30mins **Meal:**

Friday May 25 2012	Suva - Nuku'Alofa
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Flight: FJ0271 AIR PACIFIC LTD
Depart: Suva 13:00
Arrive: Nuku'Alofa 15:45
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** AT5
Duration: 1hr 45mins **Meal:** Lunch

Airline Reference No:

AIR PACIFIC LTD 7DZZAD

View your itinerary online at www.checkmytrip.com | Your Amadeus Reference Number is: 7DZZAD