



GTFS/RAS/198/ITA
**Support to the Regional Programme for Food Security in the Pacific
Island Countries**

FAO/ITA/CKI/01
Fruit Trees Development Project

TERMINAL REPORT

By

WILLIAM WIGMORE
Project Manager
Ministry of Agriculture
Rarotonga, Cook Islands

Executive summary

The extension phase of the project successfully expanded on the activities carried-out under the initial phase. Since the inception of the project in 2004 until the commencement of the extension phase, up to 35 species and 51 varieties of fruit trees, including a few aromatic roots -galangal and cardamom were introduced from Australia. At the same time, 10 varieties of Oranges, Mandarins, and Grapefruit were introduced from Kwan Nurseries in New Zealand. To-date, four mandarins and two grapefruit varieties have proven to thrive and yield successfully in the country. The mandarins are; Afourer Delite, Satsuma Miho, Satsuma Miyagawa, and Encore, and two grapefruits namely; Golden Special and Star Ruby. The Afourer Delite variety is seen to produce successive crops compared to normally one to two crops in most local citrus varieties. The introduction and cultivation of these varieties should see an extension to the supply of citrus fruit of 2-3 months from January to March before the main local varieties come into season.

Avocado is another important crop in the country for the local and visitor population. Although there are few good local varieties, they have certain disadvantages including reduced harvest duration of 2-3 months, soft flesh, relatively large size, and poor transport qualities. In June and December of 2008, 400 grafted seedlings of six varieties [Bacon, Ettinger, Fuerte, Hass, Reed, Zutano] were imported from Lynwood Orchards, New Zealand. These are proven commercial varieties in NZ with "Hass" being the most important making the bulk of avocado production not only in NZ but many other countries. The variety "Sheppard" was also introduced from Australia. Few trees of the Hass and the Fuerte varieties successfully grow and fruit in the country. The Hass variety has a harvest duration of 5-6 months from May to September, while Fuerte come into season earlier between February to May. With the introduction of these varieties, coupled with the selection of our proven varieties, we anticipate a 10-11 month supply of avocado fruits on the market. At the same time, there is a window of opportunity for export to the NZ market during the peak of the winter season.

A new variety of pineapples, known as the MD2 was introduced from Vitropic, France as tissue cultures. This particular variety has low acidity, high vitamin C content, high sweetness, and attractive golden flesh colour. At the end of the project in December 2008, approx. 5,400 plants were ready for field transplanting from an initial order of 5,000 plants. The bulk of the plants will be planted on the main island with 500 plants distributed to each of the islands of Aitutaki, Atiu, Mangaia, and Mauke. It is anticipated that this variety will become the most important on the local market in the next 3-5 years, with Mangaia and Atiu to be the major suppliers of fresh pineapples to the markets of Rarotonga. These islands were major producers back in the 1950 to 1980's when pineapples (var: Smooth Cayenne) was being processed into juice and slices for the NZ markets.

The Ministry of Agriculture will continue to develop commercial fruit production on the outer islands, particularly the islands of Atiu, Mangaia, and Mauke to supply the markets of the main island where large suitable areas of land has been taken-over by residential and tourist accommodation establishments. During the project cycle, the outer islands departments of agriculture were encouraged to increase the propagation of fruit trees to cater for the needs of the local population and for marketing to on the main island. Propagating fruit trees on the respective islands will also minimise the taking of plant materials from the main island thereby reducing the risk of introducing new pests to these islands. These islands were supported under the project through the provision of nursery and field supplies including tools to assist with their activities, and training on fruit production and management.

Although the extension project phase has achieved much success with the activities undertaken, much still remain in the development of fruit trees in the country. This is coupled with the fact that it generally takes between 1 to 8 years to realise the potential of fruit trees and crops. The Ministry of Agriculture is confident however, that it can continue to develop fruit tree production in the country to meet the local demands, and to explore overseas markets through the development of all potential fruits. Moreover, the expansion phase of the food security should see greater developments not only in fruit trees and crops, but other areas of agriculture including infrastructural developments to facilitate the transportation and improve the shelf—life of fruits through processing and value adding. It is hoped that the country can reduce the importation of fresh and processed foods particularly juices, dried products, chutneys etc. with the increasing production and supply of local foods.

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Introduction

The production of tropical and sub-tropical fruit trees and crops is not new to the Cook Islands. During the period from the 40's to the 70's, the country used to be a net exporter of processed Citrus and Pineapples, also fresh bananas. Large areas of the main island were put into citrus production while Atiu and Mangaia concentrated on pineapple production for the juicing and canning factory on Rarotonga. Mauke and Aitutaki were also involved in the production of citrus orange for the canning factory.

The fruit trees development project for the Cook Islands, being part of the Food Security Programme for the Pacific aimed at further developing the capacity of the country in the production of tropical and sub-tropical fruit tree and crops to cater for the needs of the local and visitor population. Over the years, the country has seen an increase in the number of visitors to our shores whilst at the same time, a decrease in the production of fruit crops, in-terms of area, species, and varieties. The project hoped at gradually increasing the production areas of main important species and varieties including; Avocadoes, Bananas, Carambola, Citrus, Mangoes, Papaya, Passionfruit, and Pineapples. Moreover, to increase also the propagation and production of less important species such as; Annona (Sweet and Soursop), Litchi, Guava, Malayapple, Pometia (Tava), Spondias (vikavakava), coupled with the introduction of new varieties and exotic fruits from Kerikeri NZ and North Queensland Australia including Abiu, Avocado, Barbados cherry, Chempadek, Citrus, Custard apple (African Pride), Dragonfruit (Pitaya), Durian, Grumichama, Jackfruit (Yellow and Pink flesh), Longan, Long Kong, Mangosteen (Purple and Sweet Yellow), Rambutan, Rollinia, Santol, and Sweet Tamarind.

The extension phase of the project which commenced in June 2007 saw the introduction of improved and superior varieties of Citrus, Avocadoes, and Pineapples from Kerikeri and Whangarei, New Zealand, and Montpellier France, respectively. The main activities of the extension phase included the development of a fruit trees database for the country, follow up visits to the outer islands, training for farmers and extension officers, expansion of the Aitutaki Agriculture Department nursery facilities to cater for the increasing propagation of fruit seedlings for the island, provision of nursery and field tools and supplies to the other southern islands, importation of avocado and pineapple plants, importation of plant fertilizers and chemicals, training of agriculture officers and farmers, fruit trees study tour to Thailand, supply of fuel and oils to facilitate the activities of the project, and the provision of materials and supplies for the construction of a propagation and storage on Rarotonga following the cessation of the leasehold on the land which the research station was established.

The extension phase continued to assist and facilitate the activities of the initial phase particularly the propagation, distribution, and maintenance of the various species and varieties introduced from New Zealand and Australia. More plant species and varieties were also distributed to the outer islands during this period.

Project Organization and Budget Arrangements

A steering committee was appointed to oversee the implementation of the activities of the project. This same committee was also responsible for overseeing the Secretariat of the Pacific Community project referred to as the Development of Sustainable Agriculture (DSAP) in Cook Islands. The committee was chaired by Nga Mataio in his capacity as the National Project Coordinator with the following representatives being: Mr. John Akavi (DSAP), Mr. Rau Nga (commercial farmer and Rarotonga Nita Growers representative), Mr. Anau Manarangi (semi-subsistence farmer and horticultural consultant), Mrs. Vereara Maeva Taripo (Cook Islands Association of Non-government Organization), Mrs. Nga Teao (Womens Division of Internal Affairs), and Mr. William Wigmore (Project Manager). During the extension phase, the committee met on three occasions during which the NPC and PM would report on the progress of the project and planned future activities. The Project Logical Framework (**see Annex 1**) was developed after the start of the extension phase outlining the goal, purpose, and activities to achieve the overall project objectives.

At the commencement of the project extension phase, a budget was allocated to each of the twelve activities. Throughout the project cycle, funds were utilized for the provision of supplies and services to

each of the activities (*see Annex 2*). Towards the end of the project some of the funds were re-allocated to other activities at the request of the NPC and PM. This re-allocation of funds was necessary to achieve the purpose under each of the activities. The majority of purchases were done through direct payment to the company while funding for outer island travels including DSA, Transport, Catering, Hire of Venue, and the Steering Committee Meeting was transferred through the project account.

Project Outputs

The project was divided into 12 main outputs or activities, namely; Database Development; Follow up Visits to the Outer Islands; Additional Importation of Fruit Tree Seedlings; Publicity; Market Study in New Zealand; Expansion of the Fruit Trees Nursery in Aitutaki; Acquisition of Nursery and Field Tools, Supplies, and Materials for the Outer Islands; Plant Nutrition Component; Farmers Training for Rarotonga and the Other Islands (Aitutaki, Atiu, Mangaia, Mauke, Mitiaro); Study Tour to Thailand; Administration and Communication Services, Fuels and Oils; and the Construction of a Propagation and Storage Facility in Rarotonga. The final Project Review Summary (*see Annex 3*) provides an indication of the achievements against the overall expected target. A review summary is provided for the periods June 2007 – June 2008, and July 2008 – Dec 2008.

Database Development: The electronic computer database was developed to provide adequate and updated information including the location, climate, environment, passport, nutrition, morphological characteristics, and pests associated with the various fruit trees and crops. Moreover, it provides information on the management activities carried-out on the trees and crops planted in different locations/islands in the country. Materials and supplies including a Toshiba laptop computer, Sony LCD Projector, and accessories were provided for the storage, management, and facilitation of information dissemination. A final report (*see Annex 4*) and a User/Operating Manual was prepared and submitted by the consultant at the end of the project.

Follow up Visits to the Outer Islands: The follow up visits were conducted by MoA research and extension staff associated with the project activities. All the inhabited islands of the Southern Group, namely; Aitutaki, Atiu, Mangaia, Mauke, and Mitiaro were visited to provide assistance, both to the agriculture officers, and farmers (subsistence and semi-subsistence) on fruit tree and crop nursery and field propagation and management aspects. During the visits, the officers were mainly involved in nursery and field activities involving budding, grafting, marcotting, pruning, and advising on pest management issues. Fruit tree pest-free propagation materials (bud- and scion-wood) and seedlings were taken to the islands during the visit. During the final visit to the island of Aitutaki, four research staff travelled to the islands to assist the agriculture officers with the cutting-back and pruning of mature citrus trees. In excess of 280, 30-36 year-old trees were cut-back. These trees, following proper management and fertilization should start to produce fruit in 2-3 years. There are >500 3-5 year-old trees growing on the islands and reviving these old trees will assist with increasing fruit production to meet the demands of the local population.

Additional Importation of Fruit Tree Seedlings: During the initial phase of the project, more than 40 and 50 species and varieties, respectively of fruit trees were introduced from North Queensland, Australia. These were introduced as either nursery seedlings or seeds including Abiu, Avocado, Chempadek, Dragonfruit, Durian, Longan, Long Kong, Mangoes, Mangosteen, Matisia, Rambutan, Sweet Tamarind, and Rambutan. In-addition, more than 2,500 budded citrus seedlings were also imported from Kwan Nurseries during the initial phase, with the last consignment received in March 2008 (*see Annex 5*). At the end of the extension project phase, in excess of 30,000 seedlings have been distributed to farmers, both subsistence and semi-subsistence, on Rarotonga and the southern islands (*see Annexes 3 & 6*). The extension phase of the project also saw the introduction of the well sought-after golden pineapple (variety: MD2) as tissue cultured materials from Vitropic, France in October 2008. The project manager initially became aware of this particular variety during a visit to North Queensland in March 2007. However, efforts were unsuccessful to purchase materials from commercial farmers in the area due to very high demands for such variety in Australia. This pineapple variety is fast taking-over from other varieties as the most important fresh eating variety on the world market. The low acidity, higher Vitamin A content, high brix (14%), golden flesh colour is some of the characteristics which has made this particular variety so popular. Avocado seedlings of six varieties (Hass, Fuerte, Reed, Bacon, Zutano, Ettinger) were also imported from New Zealand to widen the

span of fruit production and availability on the local market and to investigate into the export potential of fresh fruits to the NZ markets during their off-season. The Hass, Fuerte, and Reed varieties are the main varieties cultivated in NZ with excellent eating qualities and extended harvest periods ranging between three and seven months. The introduction of the various varieties of the most important crops in the country, we anticipate to increase the span of fresh fruit supply on the local market (**see Annex 7**). Some of the species and varieties introduced have also indicated their potential to perform well under our soil and climatic conditions. To-date, approximately 25% of the introduced species and varieties have fruited. It is anticipated that in the next 3-5 years, a further 55-65% would have fruited.

Publicity: The project management have continually promoted the activities of the project and the development of fruit crops and trees through the local media. Moreover, 25-min documentaries in the English and local Maori language are in the final stages of preparation for airing on the local TV network to extend on the efforts towards fruit trees production and development.

Market Study in NZ: Since 1974, the Cook Islands have exported fresh papaya to the NZ markets. However, for the past 4-15 years has seen some competition from Fiji and Philippines, respectively. The market study conducted in Auckland, NZ in February 2009 aimed to investigate the potential for fresh and processed fruit exports from the Cook Islands (**see Annex 8**). Two of the main issues affecting fruit production on the main island, which has direct air and sea links with NZ are limited agricultural lands and manpower. Future exports from the country may be geared towards niche markets and reduced volumes of high value fruits that may include fresh papaya, limes, avocado, and dragonfruit.

Expansion of the Fruit Trees Nursery in Aitutaki: The island is the second largest visitor destination in the country. Since the inception of the project, it has strongly increased its production particularly of citrus, mangoes, and avocado fruit crops. At the present time, there are more than 500 relatively young (4-5 year-old) bearing citrus trees on the island. These were introduced during the initial phase of the project. The expansion of the nursery is necessary to cater for the continued propagation of existing and new varieties of fruit trees including citrus, mangoes, avocados, passionfruit, dragonfruit, abiu, longan. Materials and supplies including a 14L capacity mistblower were provided to assist with plant propagation, field management such as pruning, nutrition and pesticide application, and the storage of tools and supplies.

Acquisition of Nursery and Field Tools, Supplies, and Materials for Other Outer Islands: The department of agriculture in the outer islands of Atiu, Mangaia, Mauke, and Mitiaro are deficient in tools (budding knives, pruning saws, shears) and supplies (budding tapes, planter bags) and hence the reason for the provision of such tools and supplies. The islands were provided with hand and power tools, nursery and field supplies and materials to assist with the current and future development programme for fruit trees and crops. These tools and supplies will also assist the activities of the project staff during their follow up and training visits, and future visits to the islands.

Plant Nutrition Component: Complete fertilizers, trace elements, soil amendments, and pest (insects, fungi, weed) management chemicals were imported through Taylor Built Ltd in January 2008. A second consignment was imported in September. These materials are important to providing the required nutrition for the fruit trees and crops under the programme on all southern group islands.

Farmers Training for Rarotonga and the Other Islands (Aitutaki, Atiu, Mangaia, Mauke, Mitiaro): A 3-day training in fruit tree/crop propagation, and field and post-harvest management was conducted on the island of Rarotonga. Likewise, two-day trainings were organised on each of the five outer islands. The training was attended both by subsistence (home-owners) and semi-commercial farmers, including the agriculture officers on the respective islands. During the training, both theoretical and practical sessions were conducted to provide the participants a better understanding of fruit crops propagation and management. A final report was produced for each of the trainings (**see Annexes 9 - 14**).

Study Tour to Thailand: The project manager and one of the project technician spend two weeks in Thailand to observe and gain a better understanding of the fruit crop and tree development activities in the country. Thailand is the biggest exporter of fresh and processed commodities of many tropical fruits including Rambutan, Durian, Mangosteen, Long Kong, Pineapple, Sweet Tamarind, Long Kong, and Longan to markets in Asia, EU, USA, Australia and other countries. During the visit in July we had the opportunity to visit various research and extension centres of the Ministry of Agriculture and Cooperatives,

rural government supported projects on fruit processing, and private farms. Valuable information and appropriate technology were learned during the tour. These were in various areas of nursery fruit tree propagation, field management, and processing (*see Annex 15*). Thailand has major financial and manpower investments in the areas of food processing and value adding in an-effort to facilitate transportation and movement between countries, also to extend the shelf-life of such perishable commodities.

Administration and Communication Services, Fuels and Oils: This activity is necessary to support the day-to-day activities of the project. The provision of communication services including e-mail, phone conversations is an integral part in the operation of the project between the MoA and FAOSAP, also between MoA and the Senior Agriculture Officers in the outer islands tasked with the management of the project activities in the respective islands. Fuels and Oils were provided to assist with the daily operation of vehicles for the activities of the project including providing fuel for machinery (tractors, mistblowers, chainsaws) and other power tools for the nursery and mainly field activities.

Construction of Propagation and Storage Facilities in Rarotonga: The expiration of the leasehold in June 2006 on the land which the research station was situated meant the re-location of plants and structures to a temporary location on the main island of Rarotonga. Funds were provided to construct a temporary propagation plastic-house, nursery, and storage facility on the island of Rarotonga. At the present time, the nursery is being used to house the new varieties of pineapples imported in October 2008. The storage facilities will be used to maintain machinery: tractor, nursery and field tools, also other materials and supplies such as fertilizers and chemicals for the activities of the project.

Major Issues and Concerns in Project Implementation

There were no major issues and concerns realised in the overall implementation of the extension phase of the project. However, some of the funds, particularly for the facilitation of the outer island travels arrived late such as the case with that required for the final follow-up visits thereby delaying the visits to some of the islands to the early part of 2009.

Conclusions

The extension phase of the project has managed to expand on the initial activities carried-out under the initial phase. Since the inception of the project in 2004 until the commencement of the extension phase, up to 35 species and 51 varieties of fruit crops and trees, including a few aromatic roots - galangal and cardamom were introduced from Australia. At the same time, 10 varieties of Oranges, Mandarins, and Grapefruit were introduced from Kwan Nurseries in New Zealand. To-date, four mandarins and two grapefruit varieties have proven to thrive and yield successfully in the country. The mandarins are; Afourer Delite, Satsuma Miho, Satsuma Miyagawa, and Encore, and two grapefruits namely; Golden Special and Star Ruby. The Afourer Delite variety is seen to produce successive crops compared to normally one to two crops in most local citrus varieties. The introduction and cultivation of these varieties should see an extension to the supply of citrus fruit of 2-3 months from January to March before the main local varieties come into season.

Avocado is another important crop in the country for the local and visitor population. Although there are few good local varieties, they have certain disadvantages including reduced harvest duration of 2-3 months, soft flesh, relatively large size, and poor transport qualities. In June and December of 2008, 400 grafted seedlings of six varieties [Bacon, Ettinger, Fuerte, Hass, Reed, Zutano] were imported from Lynwood Orchards, New Zealand. These are proven commercial varieties in NZ with "Hass" being the most important making the bulk of avocado production not only in NZ but many other countries. The variety "Sheppard" was also introduced from Australia. Few trees of the Hass and the Fuerte varieties successfully grow and fruit in the country. The Hass variety has a harvest duration of 5-6 months from May to September, while Fuerte come into season earlier between February to May. With the introduction of these varieties, coupled with the selection of our proven varieties, we

anticipate a 10-11 month supply of avocado fruits on the market. At the same time, there is a window of opportunity for export to the NZ market during the peak of the winter season.

The introduction of the low acid pineapple, variety: MD2 as tissue culture from Vitropic, France would be regarded as one of the high achievements of the project. The project management committed much time and effort into the procurement of this particular variety with unsuccessful initial attempts to introduce the variety from Australia. With the low acidity, high vitamin C content, high sweetness, and attractive golden flesh colour, this variety is fast taking-over as the most important fresh market variety. At the end of the project in December 2008, approx. 5,400 plants are ready for field transplanting from an initial order of 5,000 plants. The bulk of the plants will be planted on the main island with 500 plants distributed to each of the islands of Aitutaki, Atiu, Mangaia, and Mauke. It is anticipated that the islands of Mangaia and Atiu will be the major suppliers of fresh pineapples to the markets of Rarotonga. These islands were major producers back in the 1950 to 1980's when pineapples (var: Smooth Cayenne) was being processed into juice and slices for the NZ markets.

Although the extension project phase has achieved much success with the introduction of exotic and superior planting materials, development of database to assist with the management and development of fruit trees, importation of plant nutrition and soil amendments, provision of extension staff and farmers training including provision of nursery and field supplies and tools to the islands, and the expansion of nurseries and storage facilities to cater for the expansion of fruit trees and crop production for local and overseas market demands, much still remain in the development of fruit trees in the country. This is coupled with the fact that it generally takes between 1 to 8 years to realise the potential of fruit trees and crops. The Ministry of Agriculture is confident however, that it can continue to develop fruit tree production in the country to meet the local demands, and to explore overseas markets. Moreover, future fruit development in the outer islands is necessary as good agricultural lands on the main island become less available.

Recommendations

The following recommendations are being made to sustain the fruit trees development project and further improve fresh and processed fruit and crop production in Cook Islands

- Continue to propagate and expand field plantings of important including superior and proven species varieties of fruit trees. Both subsistence and semi-commercial farmers should be cater for.
- Continue to evaluate the various fruit species and varieties on Rarotonga and the outer islands.
- Determine the best location, by island and areas within islands for the growth performance and yielding potential for fruit trees and crops.
- Further introduce and evaluate tropical and sub-tropical species and varieties with potential under our soil and climatic conditions including: table type grapes, persimmons, sweet thai tamarind, citrus etc.
- Devise a certification system for both local and export farmers in order to determine production activities at the farm level that would impact on the safety of the farm produce. The Ministry of Agriculture should be responsible for monitoring the system including farm location, planting materials and seeds, land use practices, fertilizer and chemical use, harvesting and packaging of produce, and marketing.
- Develop and promote value adding and processing of fruit crops into juice, dried products, jams, chutney, particularly in the outer islands to minimize transport costs to the markets on Rarotonga, and to facilitate movement outside the country. This could be assisted through the Expansion Phase of the FAO Regional Programme on Food Security with expert assistance from countries with a proven record in food processing such as Thailand.

- Develop flower induction in the new low acid pineapples and mangoes for out-of-season fruit production.
- Support infrastructural development (land clearing, improved roading and transportation, inspection, packaging, and storage facilities) in the outer islands to facilitate fruit production initially to cater for the islands requirements and for marketing on Rarotonga and abroad.
- Promote the consumption of fresh fruits and commodities, and marketing to the local and visitor population.
- Develop and encourage the production and marketing of highly nutritious and pesticide free fruits and crops for the local and export markets.
- The Ministry of Agriculture continue to strengthen relationships with regional and international organizations and agencies for the betterment of agricultural development in the country.

Acknowledgements

The Ministry of Agriculture acknowledges the financial and technical support provided by the following organizations and personnel:

1. FAO SAP Representative for the Pacific and the Plant Protection Officer.
2. FAO SAP Regional Project Management Unit.
3. Fruit Trees Project Steering Committee members.
4. Jeff Daniells and Roger Goebel, South Johnstone Research Station for the wet tropics, DPI, North Queensland.
5. Metanee Sukontarug, Director General of the Ministry of Agriculture, Thailand.
6. Malcolm Hazelman, FAO Regional Office, Bangkok, Thailand.

Annexes

Annex 1: Project Logical Framework

FAO/ITA/CKI/01: Fruit Trees Development Project Extension Phase, June 2007 – December 2008

	Intervention Logic	Objectively Verifiable Indicators	Sources and Means of Verification	Assumptions
Goal	Improved and diversified local agricultural production for food security			
Project Purpose	Increased food crop production through extensive and improved fruit tree production	<p><u>Country Performance Indicators</u></p> <ul style="list-style-type: none"> a. Number of nurseries established and expanded or improved. b. No. of farmer (full and part-time) beneficiaries, incl. home-owners. c. Increase in area, number, and variety of fruit trees established. d. Increase in fruit availability at the local market and household level. e. Increase in local sales of processed fruit. f. Quantity and types/varieties of fruits exported. 	<ul style="list-style-type: none"> a. Ministry of Agriculture records. b. Local market (Punanga Nui) records. c. Growers Association records. d. Government Statistics Division export records. e. Project records and reports. 	<ul style="list-style-type: none"> a. Continuous commitment and support from government including relevant departments. b. Continuous support and commitment by the outer islands local government body, and island council. c. Favourable climatic conditions.
Outputs	<ul style="list-style-type: none"> 1. Database for fruit trees developed and maintained. 2. Agricultural Officers and farmers in the outer islands assisted and advised in nursery and field fruit tree management aspects. 3. Additional fruit tree seedlings imported incl. citrus, avocado, and pineapple. 4. Project promoted via the local media. 5. Market study in NZ on fresh and processed tropical and sub-tropical fruits carried-out. 	<ul style="list-style-type: none"> d. Fruit trees database effectively utilized and maintained. e. Agriculture Officers trained in nursery propagation and field management of fruit trees; farmers ability to properly manage fruit trees. f. Number, species, and varieties of fruit trees/crops imported. g. Number of documentaries 	<ul style="list-style-type: none"> a. Project records. b. Project reports. c. Outer Island follow-up visits. d. Nursery plant distribution records. e. Plant import records. f. Agriculture Officers and Farmers Training reports. g. Study Tour report. h. Quarterly reports. 	<ul style="list-style-type: none"> a. Highly suitable IT and market consultants successfully recruited. b. Relevant government Ministry support provided. c. Trained Officers in fruit tree propagation and field management maintained; no staff turn-over. d. Farmers commitment and interest maintained

	<p>6. Existing nursery in Aitutaki expanded to cater for increased volume of fruit tree seedlings.</p> <p>7. Tools and equipment acquired and distributed to the outer islands (Mangaia, Atiu, Mauke, Mitiaro).</p> <p>8. Fertilizers, chemicals, and trace elements procured.</p> <p>9. Farmers and extension/agriculture officers on Rarotonga and the outer islands trained.</p> <p>10. Study tour to Thailand conducted.</p> <p>11. Administration, communication, and fuel expenses covered.</p> <p>12. Propagation and storage facility on Rarotonga constructed.</p> <p>13. Progress and final reports submitted.</p>	<p>(English and Cook Islands Maori language), and fruit tree production and management leaflets produced.</p> <p>h. Market study on tropical and sub-tropical fruits completed, incl. list of potential export fruits produced.</p> <p>i. Aitutaki nursery expanded and operational.</p> <p>j. Number and types of tools, equipment, and supplies procured and supplied to the outer islands.</p> <p>k. Quantity and types of fertilizers, chemicals, and trace elements procured.</p> <p>l. Number of Agriculture Officers and Farmers trained in plant propagation and field management.</p> <p>m. Number of project staff involved in Thailand Fruit Trees Study Tour.</p> <p>n. Administration, communication, and services (fuels and oils) supplies procured.</p> <p>o. Fruit tree nursery and storage facility on Rarotonga operational.</p> <p>p. Number of reports submitted to RPMU, Samoa.</p>	<p>i. Final/terminal project report.</p>	<p>and continues.</p> <p>e. Inputs and supplies procured accordingly.</p> <p>f. Inputs and supplies for the Outer Islands available when required.</p> <p>g. Regular shipping schedule maintained to the Outer Islands.</p> <p>h. Favourable climatic conditions.</p>
Activities	<p>1. Development of database for fruit trees in Cook Islands</p> <p>1.1 Recruitment of IT consultant (Mr. Teotahi)</p> <p>1.2 database developed.</p>	<p>Inputs</p> <p><u>Human Resources</u></p> <ul style="list-style-type: none"> • FAO SAP Administration and Technical Staff. • National IT and marketing 	<p>Costs (US\$)</p> <p><u>Activities</u></p> <p>1. 8 000</p> <p>2. 12 000</p> <p>3. 15 000</p>	<ul style="list-style-type: none"> • Continuous support and commitment from Cook Islands Government and FAO.

	<p>1.3 Issuing of LPO's 1.4 Procurement of equipment and materials 1.5 Training of staff in use and maintenance of database.</p> <p>2. Visit Outer Islands (Aitutaki, Mangaia, Atiu, Mauke, Mitiaro). 2.1 Make inter-island airline bookings. 2.2 Technicians travel to each island. 2.3 Train Agriculture Officers in nursery plant propagation and field management. 2.4 Assist farmers and general public in field management of fruit trees.</p> <p>3. Importation of Additional Fruit Tree Seedlings. 3.1 Securing planting materials supplier. 3.2 Collecting quotes, freight, and clearance. 3.3 Issuing LPO. 3.4 Purchase certified (pest free) seedlings. 3.5 Propagation and distribution of seedlings.</p> <p>4. Conduct Awareness and Promotion 4.1 Sign MOA with media group. 4.2 Issuing LPO. 4.3 Development of documentaries on fruit trees in Cook Islands. 4.4 Airing of documentary for public viewing.</p> <p>5. Conduct Market Study in NZ on Fresh and Processed Fruits 5.1 Securing and hiring a suitable consultant. 5.2 Conduct of 2-week market study in Auckland, NZ. 5.3 Submit report to RPMU.</p> <p>6. Expand Nursery in Aitutaki</p>	<p>consultants.</p> <ul style="list-style-type: none"> National Agriculture Officers and nursery/field staff. Project staff – NPC, PM, and technicians. Island secretaries (outer islands) and island council. Mayor and district leaders. Selected farmers. <p><u>Material Inputs</u></p> <ul style="list-style-type: none"> Laptop computer. Digital camera. LCD projector. Avocado, citrus, pineapple planting materials. Fertilizers, chemicals, and trace elements. Nursery supplies (propagation bags and medium), hand tools (secateurs, pruning saws, wheelbarrows, knapsack sprayers) and materials. Power tools (mistblower, chainsaw, brushcutter). Administration (papers, pens) and Communication supplies. Fuels (petrol, diesel) and oils. 	<p>4. 10 000 5. 5 000 6. 10 000 7. 22 000 8. 60 000 9. 5 000 and 12 000 10. 15 000 11. 9 980 12. 10 000</p> <p><u>Total: 193 890</u></p>	<ul style="list-style-type: none"> Continuous support and commitment from project staff, agriculture officer (all islands), and farmers at all levels of production. Materials and supplies procured accordingly. No major natural disasters such as cyclones and drought.
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	<p>6.1 Preparation of construction plan. 6.2 Issuing LPO. 6.3 Procurement of tools and materials. 6.4 Shipping of tools and materials purchased in Rarotonga. 6.5 Completion of nursery expansion.</p> <p>7. Acquire Tools and Equipment for Outer Islands (Mangaia, Atiu, Mauke, Mitiaro).</p> <p>7.1 Issuing LPO. 7.2 Procurement of tools and equipment (inputs). 7.3 Shipping of inputs to outer islands.</p> <p>8. Procure Fertilizers, Chemicals, and Trace Elements.</p> <p>8.1 Secure supplier in NZ and submit proforma invoice. 8.1 Issuing LPO. 8.2 Purchase and shipping of materials to Rarotonga. 8.3 Distribute inputs to Rarotonga and Outer islands for nursery and field applications.</p> <p>9. Conduct Training for Agriculture Officers and Farmers</p> <p>9.1 Submit training proposal/programme. 9.2 Invite farmers. 9.3 Submission of request to Island Administration on Aitutaki, Mangaia, Atiu, Mitiaro, and Mauke for training. 9.4 Conduct training on Rarotonga and outer islands. 9.5 Submit training reports to RPMU.</p> <p>10. Conduct Study Tour in Thailand.</p> <p>10.1 Submit request for study tour to Ministry of Agriculture (MoA), Thailand. 10.2 Issuing proforma invoice from Thai MoA to RPMU.</p>			
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	<p>10.3 Payment submitted to MoA, Thailand.</p> <p>10.4 Technicians carry-out study tour.</p> <p>10.5 Submit study tour report.</p> <p>11. Procure Inputs for Administration, Communication, and Services.</p> <p>11.1 Secure supplier of materials.</p> <p>11.2 Issuing LPO.</p> <p>11.3 Procurement of materials incl. fuels and oils.</p> <p>12. Construct Storage and Propagation Facility in Rarotonga.</p> <p>12.1 Design storage and propagation facility.</p> <p>12.2 Submit proforma invoice from suppliers.</p> <p>12.3 Issuing LPO.</p> <p>12.4 Procurement of materials and supplies.</p> <p>12.5 Construct facility.</p> <p>13. Monitor and Evaluate Project.</p> <p>13.1 Monitoring and evaluation of project activities and performance.</p> <p>13.2 Submit 3-monthly Workplans.</p> <p>13.3 Submit quarterly reports.</p> <p>13.4 Submit final/terminal report.</p>			
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Annex 2: Project Budget and Expenditures

Activity	Budget US\$ (NZ\$)	Date	LPO or FPO #	Object	Name/Purpose	Total NZ\$
Database Development	8,000 (9,411)	09-06-2008	SAPA/08/125	Camera, digital	Cook Islands Printing	664.00
		22-09-2008	SAPA/08/216	Laptop	Computerman	2,065.50
		11-12-2008	0	Catering	Database Training	420.00
		23-12-2008	0	Consultancy	Adrian Teotahi, Consultant	4,658.50
		31-12-2008	SAPA/08/328	LCD Projector	Pacific Computers Ltd	1,600.00
						9,408.00
Follow up Visits to Outer Islands	12,000 (14,117)	0	0	DSA, Transport	Training	1,875.00
		21-01-2008	SAPA/08/009	Airfare	Air Rarotonga	1,846.00

		07-11-2008	SAPA/08/277	Airfare	Air Rarotonga	5,584.00
		0	0	DSA, Transport	Training	6,750.00
						16,055.00
Additional Importation of Fruit Tree Seedlings	15,000 (17,647)		SAPA/08/089	Avocado	Lynwood Orchards	5,611.95
		10-10-2008	FPO 6/- 00450	Pineapple, MD2	Vitropic, France	8,937.00
		26-11-2008	SAPA/08/293	Avocado	Lynwood Orchards	6,496.35
		02-12-2009	SAPA/08/303	Supplies	CITC Centre	13,250.00
						34,295.30
Publicity	10,000 (11,764)			Documentary (english and maori)	Cook Islands TV	4,562.50
						4,562.50
Market Study in NZ	5,000 (5,882)	0	0	0		5,882.00
						5,882.00
Expansion of Fruit Trees Nursery in Aitutaki	10,000 (11,764)	13-03-2008	SAPA/08/019	Cement	Maoate Contract	780.00
		13-03-2008	SAPA/08/020	Supplies	Judan Ltd	2,607.00
		13-03-2008	SAPA/08/022	Supplies	Maina Traders	281.00
		13-03-2008	SAPA/08/023	Roofing Iron	Oire Ureia	700.00
		13-03-2008	SAPA/08/024	Concrete blocks	R&R Maki	176.00
		13-03-2008	SAPA/08/025	Supplies	Aitutaki Alumin.	298.00
		13-03-2008	SAPA/08/054	Gravel, Sand	Isl. Admin.	240.00
		29-08-2008	SAPA/08/116	Knapsack sprayers	Motor Centre	320.00
		02-05-2008	SAPA/08/099	Freight	Excil Shipping	624.71
		03-09-2008	SAPA/08/216	Mistblower	Beco Ltd	2,300.00
		07-11-2008	SAPA/08/220	Supplies	CITC Building	4,305.90
						12,632.61
Acquisition of Tools for other Outer Islands	22,000 (25,882)	12-03-2008	SAPA/08/055	Knapsack sprayers	Motor Centre	1,040.00
		13-03-2008	SAPA/08/033	Supplies	CITC Building	13,112.80
		22-05-2008	SAPA/08/096	Freight	Taio Shipping	1,656.00
		03-09-2008	SAPA/08/216	Tools, power	Beco Ltd	10,713.00
		03-12-2008	SAPA/08/282	Freight	Taio Shipping	1,656.00
		02-12-2008	SAPA/08/301	Pole pruners	Beco Ltd	5,400.00
						33,577.80
Plant Nutrition Component	60,000 (70,588)	12-12-2007	SAPA/07/418	Fert., & chemicals	Taylor Built	28,121.62
		0	0	Fert., & chemicals	Taylor Built	41,514.04
						69,635.66
Farmers Training for Rarotonga	5,000 (5,882)	0	0	Stationery, Catering, Transport	Training	2,380.00
						2,380.00
Farmers Training for other Outer Islands	12,000 (14,117)	0	0	Stationery, Catering, Transport	Training	6,434.23
		19-05-2008	SAPA/08/096	Airfare	Air Rarotonga	3,908.00

						10,342.23
Study Tour in a Selected Asian Country	15,000 (17,647)	0	0	Airfare, DSA, Consultancy, Transport etc.	Thai MoA	17,647.00
						17,647.00
Admin. And Communication Expenses, Fuels and Oils	9,980 (11,741)	08-02-2008	SAPA/08/016	Fuels and Oils	Toa Petroleum	3,494.15
		09-06-2008	SAPA/08/126	Fuels and Oils	Toa Petroleum	1,868.49
			SAPA/08/302	Fuels and Oils	Toa Petroleum	6,479.37
						11,842.00
Construction of Propagation and Storage Facility for Rarotonga	10,000 (11,764)	04-02-2008	SAPA/08/015	Supplies	CITC Building Centre	7,560.20
		12-03-2008	SAPA/08/035	Readymix	Concrete Structures	1,800.00
		27-08-2008	SAPA/08/199	Supplies	CITC Building Centre	3,453.30
		02-12-2008	SAPA/08/303	Supplies	CITC Building Centre	16,727.00
						29,540.50
Steering Committee Meeting, Dec '2008					Catering	200.00
Total	US\$193, 890					258,000.60

Annex 3: Project Implementation Review Summary

Project Code: FAO/ITA/CKI/01	Project Manager: William Wigmore
Project Name: Fruit Trees Development (Extension Phase)	National Project Coordinator: Nga Mataio

Activities	Indicators	Overall Target	Outputs			Remarks *
			Jun 2007 - Jun 2008	Jul 2008 - Dec 2008	Total	
1. Develop database for fruit trees in Cook Islands	Consultant recruited	1	1	1	1	Database completed; training in Dec '08; Payment and procurement of computer, USB, accessories, and LCD projector
1.1 Recruit IT consultant	Database developed	1	1	1	1	
1.2 Develop database	Equipment procured	100%	25%	75%	100%	
1.3 Procure IT equipment and materials	No. of staff trained	3	0	3	3	
1.4 Train staff in use and maintenance of database						

2. Visit outer islands (Aitutaki, Mangaia, Atiu, Mauke, Mitiaro)							Final follow up visits to Aitutaki conducted in Dec 1-4; Due to late arrival of funds and flight being fully booked during month of Dec, visits to other 4 islands had to be delayed until early 2009; visits to Mauke, Atiu, and Mangaia done in Feb and March; Mitiaro island remaining; 210 farmers assisted either via advise of fruit tree production and/or planting material distribution
2.1 Visit outer islands	No. of visits conducted	10	5	4	9		
2.2 Train agriculture officers in nursery plant propagation and field management	No. of officers trained	13	13	13	26		
2.3 Assist farmers and general public in field management of fruit trees	No. of farmers assisted	180	200	10	210		
3. Importation of additional fruit tree seedlings	No. of certified seedlings imported	4,300	1,300	0	1300	500 tissue cultured low acid pineapple (MD2) plants planned to be shipped for planting on each of the islands of Aitutaki, Mauke, Mangaia, and Atiu, and 3,400 to be planted on Rarotonga. This to be done between April and May 2009.	
3.1 Organize the importation	No. of seedlings distributed	1,100	1,100	5,555	6,655		
3.2 Purchase certified (pest free) seedlings	No. of propagated seedlings distributed	25,000	23,148	10,955	34,103		
3.3 Propagate and distribute seedlings							
4. Conduct awareness and promotion	No. of documentaries developed	2	2	2	2	Cameraman and PM jointly preparing documentary. Editing of documentaries (English and Maori) should be completed and ready for airing in May 2009.	
4.1 Develop documentaries on fruit trees in Cook Islands	Minutes TV broadcast	30	0	0	0		
4.2 Broadcast documentary for public viewing							
5. Conduct market study in NZ on fresh and processed fruits	Consultant recruited	1	0	1	1	ToR approved by RPMU; market study conducted in Auckland, NZ; final report submitted in March '09.	
5.1 Recruit a suitable consultant	Market study conducted	1	0	0	1		
5.2 Conduct a 2-week market study in Auckland, NZ	Report submitted	1	0	0	1		
5.3 Submit report to RPMU							
6. Expand nursery in Aitutaki	Materials procured	100%	75%	25%	100%	Fully completed; last of materials and supplies shipped to Aitutaki in December.	
6.1 Procure tools and materials	Materials shipped	100%	50%	50%	100%		
6.2 Ship tools and materials to Aitutaki	Nursery expansion completed	100%	80%	20%	100%		
6.3 Complete the nursery expansion							
7. Acquire tools and equipment for outer islands (Mangaia, Atiu, Mauke, Mitiaro)	Tools and materials procured	100%	70%	30%	100%	All tools (hand and power) procured and shipped to each of the four islands (Atiu, Mangaia, Mauke, Mitiaro)	
7.1 Procure tools and equipment (inputs)	Inputs shipped	100%	70%	30%	100%		
7.2 Ship inputs to outer islands							

8. Procure fertilizers, chemicals, and trace elements 8.2 Purchase and ship materials to Rarotonga 8.3 Distribute inputs to Rarotonga and outer islands for nursery and field applications	Materials procured Materials shipped Materials distributed	100% 100% 100%	50% 50% 70%	50% 50% 30%	100% 100% 100%	Received container of ferts., chemicals, and trace elements, Oct 02 '08; distributed to fruit tree farmers and to each southern island
9. Conduct training for agriculture officers and farmers 9.1 Organize training programme 9.2 Conduct trainings 9.3 Submit training reports	No. of staff trained No. of farmers trained No. of training reports submitted	17 180 6	17 142 3	0 0 3	17 142 6	Invited 30 participants on 6 islands; 85.5% overall turn-out to training; 1 report for Rarotonga, Aitutaki, Mauke Atiu, Mangaia, and Mitiaro completed
10. Conduct Study Tour in Thailand 10.1 Organize study tour 10.4 Carry-out study tour 10.5 Submit study tour report	No. of staff sent on study tour Study tour report	2 1	0 0	2 1	2 1	2 project staff conducted tour; report submitted and cleared by RPMU
11. Procure inputs for administration, communications and services 11.1 Secure supplier of materials 11.2 Procure inputs including fuels and oils	Inputs procured	100%	50%	50%	100%	Materials and supplies communication and administrative purposes procured.
12. Construct storage and propagation facility in Rarotonga 12.4 Procure materials and supplies 12.5 Construct facility	Materials procured Facility completed	100% 100%	80% 50%	20% 50%	100% 100%	Payment of all materials and supplies. Structures fully completed and operational
13. Monitor and evaluate Project 13.1 Monitor and evaluate project activities and performance 13.2 Submit 3-monthly workplans 13.3 Submit quarterly reports 13.4 Submit final/terminal report	No. of work plans No. of quarterly reports Final report	4 6 1	3 4 0	1 2 1	4 6 1	All Workplans, quarterly reports, and final (terminal) report submitted to RPMU.

* Constraints, issues or problems if target not achieved; breakdown of training participants into men, women, youth; etc.

Annex 4: Database Consultant Report



GTFS/RAS/198/ITA
Support to the Regional Programme for Food Security in the Pacific Island Countries

FAO/ITA/CKI/01
Fruit Tree Development Project
Cook Islands

MISSION REPORT

By

Adrian Teotahi
Database Consultant

Rarotonga, Cook Islands

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EXECUTIVE SUMMARY

The main purpose of this project is to develop an electronic computer database to manage information pertaining to Fruit Trees in the Cook Islands. This is in support to the Food and Agriculture Organisation (FAO) Regional Programme for Food Security in the Pacific Island Countries.

Using the software Microsoft Access, a database was developed with appropriate Menu's, Forms and Reports. Firstly, the capability of the database being used in a multi-user environment was undertaken by splitting the database into two files to provide a Front-end and Backend architecture. Secondly, using appropriate networking hardware and software, the multi-user environment was extended to include many computers. This multi-user environment enables the access and also the maintenance/management of information by many users.

Active consultation at all phases of the database development was maintained with the Director of Research, Ministry of Agriculture (MoA). Not only were the input of his office invaluable, but also very crucial as this office manages a lot of information pertaining to the requirements of the project.

Not only a database was produced but access to it was configured in two environments, Standalone and Network, and a third was proposed in which the utilization of a Fileserver was presented to extend the Network proposal.

INTRODUCTION

BACKGROUND INFORMATION

The Cook Islands, with its sub-tropical and tropical climate, provides for a suitable environment for the production of a variety of fruit crops. The Cook Islands, particularly the islands of Rarotonga, Mangaia, Atiu, and Aitutaki had significant production of Citrus, Pineapples, and Bananas between the early 60's up until the late 70's. The significant export of citrus and pineapples saw the establishment of the fruit processing plant on Rarotonga known as Island Foods Ltd. During this period, the country became an important exporter of fruit juices and canned foods to the NZ markets, with exports worth NZ\$1.5 million in 1973. Sadly however, as a result of deregulation, the Cook Island lost its preferential treatment on the NZ markets and was exposed to competition. The production and export of these important crops embarked on a negative trend from the late 70's and the fruit processing plant was closed in 1973. Citrus export in 1991 was worth only NZ\$20,400.

As part of the fruit trees development project under the Regional Programme for Food Security which started in 2004, the country aimed to increase the production and improve management aspects of existing important fruit crops such as citrus, bananas, avocado, papaya, pineapples, mango, and passionfruit. The increasing production was not aimed to re-enter the export fruit market, but to cater for the increasing demand of fresh including processed fruits on the local market from increasing visitor numbers, in excess of 80,000 per annum. Moreover, the project also embarked on the introduction of other useful fruit trees and crops, including improved and superior varieties such as the low acid pineapples, sweet tamarind, and high yielding and extended tree-life avocado varieties. The increasing production and sales of fruits also caters for economic and health benefits for the general population of the country.

During the discussion and preparatory stage of the extension phase of the project, the need to develop a fruit trees database was recognized to assist the Ministry of Agriculture to maintain information on important aspects of fruit trees/crops including morphological, agronomic, and nutrition; maintain information pertaining to the location, by island and district/village of the various species and varieties of fruit trees and crops in an effort to facilitate future propagation, management, and distribution of such species and varieties.; and to provide information on the numbers, species/varieties, and to which farmers planting materials were distributed.

OBJECTIVE OF THE MISSION

In consultation with the National Project Coordinator (NPC) and the Project Manager (PM), develop an electronic computer database for the Fruit Tree Development Project for the Cook Islands.

DESIGN & DEVELOPMENT

1. Develop the database in Microsoft Office Access software.
2. Ensure that the database is user friendly with appropriate menus and forms that the end-user can use for the operation of the database.
3. Ensure that the database contains information pertaining to the Environment, Climate, Soil, Morphological and Agronomic parameters and any other information which is deemed necessary.
4. Allow the database to store photographs, images or pictures.
5. Work closely with the NPC and the PM during the development of the database to ensure that all inputted data and information is monitored.
6. Conduct actual demonstration of how the system operates and works once the database is established.

TRAINING

1. Develop a simple Operational Manual that will serve as a training guide for the staff.
2. Train up to three staff involved in the project on the use, operation and maintenance of the database.

SUPPORT

1. Provide assistance to the project NPC and PM on any technical and other problems that may arise concerning the use of the database for a period of up-to 4 months after the completion of this work.
2. At the end of the contract, prepare and submit report to the Project Manager who shall provide a copy of the same to the NPC and RPMU.

EXPECTED OUTPUTS

1. Microsoft Access database with multi-user capability produced. This is to be achieved by splitting the database into a frontend and backend architecture and with appropriate networking hardware and software, provide a network of computers to host the database.
2. User friendliness of the database is provided by the development of Menu's, forms and report forms.
3. User or Operational Manual is produced.
4. Appropriate Staff members of the Cook Islands Ministry of Agriculture is trained in the use and operation of the Database.

ACTIVITIES CARRIED OUT

DESIGN & DEVELOPMENT

The database was designed using the following statements;

- Each crop has many varieties
- Each variety has different Characteristics, Environment & Site, Passport, Field Management, Nutrition Management and Pest Management information.

- Each variety also requires multiple pictures or images to provide a distinctive visual difference and identification.

The table below presents a sample explanation to the comments above.

CROP NAME	BOTANICAL NAME	GENUS	SPECIES	VARIETY
Breadfruit	Artocarpus altilis	Artocarpus	altilis	Morava
Jackfruit	Artocarpus heterophyllus	Artocarpus	heterophyllus	Amoa Yellow Pink
Chempadek	Artocarpus integer	Artocarpus	integer	

Data Modelling

The data model indicates that;

- The main table that holds the Fruit tree crop names (*tbl3_CropName*) has a one-to-many relationship with *tbl1_Results*. The main table (*tbl2_VarietiesCultivs*) that holds the Variety, Genus and Species information has also got a one-to-many relationship with *tbl1_Results*. These two relationships indicates that for every crop or fruit tree, there are multiple varieties.

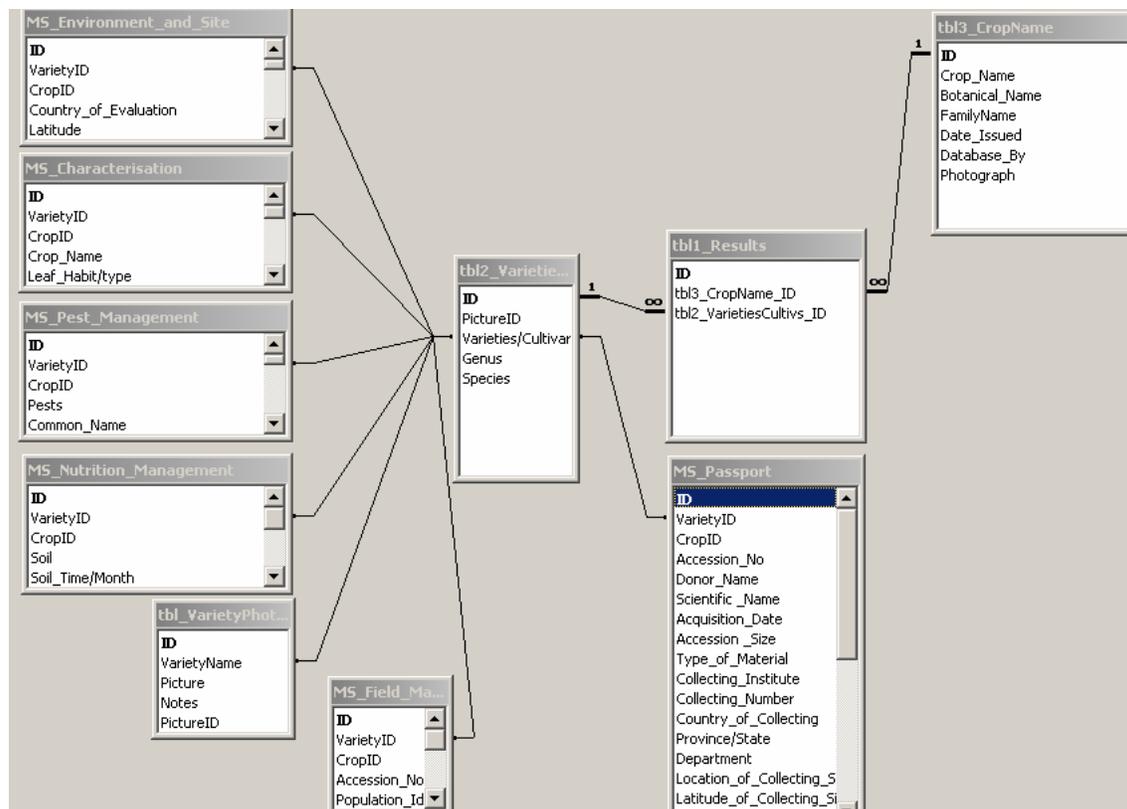


Figure 1: Data Model for the Fruit Tree Database

- The table *tbl2_VarietiesCultivs* has a one-to-many relationship with *tbl_VarietyPhotos*. This relationship indicates that for every variety, there are multiple photos/images for it.
- The tables *MS_Characterisation*, *MS_Environment_and_Site*, *MS_Passport*, *MS_Field_Management*, *MS_Nutrition_Management* and *MS_Pest_Management* all

have a one-to-many relationship with *tbl2_VarietiesCultivs*. This relationship indicates that for every variety, there are different information for each record.

Menu Structure and Available Forms

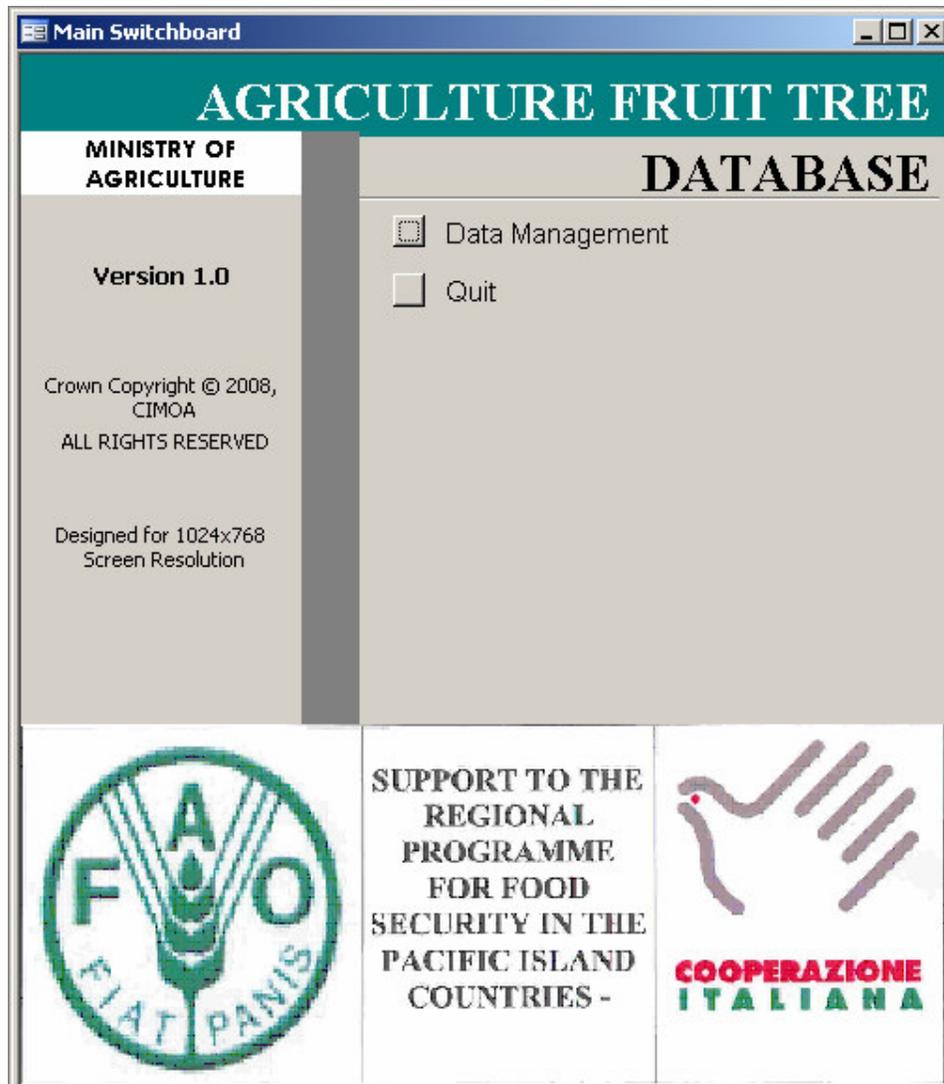


Figure 2: Main Menu

The Main Menu shows two menu's, one to Quit the database and the other to go to Data Management.

AGRICULTURE FRUIT TREE DATABASE

Record ID:

Crop Name:

Botanical Name:

Family Name:

Date Entered:

Database By:



Sample picture of the Crop

LIST OF CROPS AVAILABLE IN THIS SYSTEM

Crop Name	Botanical Name	FamilyName
Abiu	Pouteria caimito	
Acerola	Malpighia rubra	
Avocado	Persea americana	
Banana and Plantain	Musa spp.	
Black Sapote	Diospyros digyna	
Breadfruit	Artocarpus altilis	
Canistel	Pouteria campechiana	
Carambola	Averrhoa carambola	
Cashew nut	Anacardium occidentale	
Chempadek	Artocarpus integer	
Chestnut		
Citrus, grapefruit	Citrus paradise	

VARIETY SUBFORM

ID	GENUS	SPECIES	VARIETY / CULTIVARS	MANAGEMENT OPTIONS						IMAGE GALLERY
1	Pouteria	caimito	Z4	Characteristics	Environment	Passport	Field	Nutrition	Pest	Image Gallery
1			E4	Characteristics	Environment	Passport	Field	Nutrition	Pest	Image Gallery

Figure 3: part of the Data Management Form

- From this form a new crop or fruit tree can be added. Deleting crops at this stage has been disabled from within this form.
- A list (in yellow) is provided to allow the selecting/searching of fruit trees by alphabetical order.

In the "VARIETY SUBFORM" the following tasks can be undertaken;

- A new variety for a selected crop can be added
- Information relating to the six (6) management options can be added or reviewed
- And lastly, images or pictures can be managed using the Image Gallery icon.

CHARACTERISTICS FORM

Record ID:

Variety Name: <input type="text" value="MS-01, Pisang Caylan"/>	Fruit Moisture Content: <input type="text"/>
Leaf Habit/type: <input type="text"/>	Flesh Texture: <input type="text" value="Smooth"/>
Plant Height(m): <input type="text" value="3"/>	Taste: <input type="text" value="Sweet"/>
Plant Shape: <input type="text"/>	Number of Seeds in Fruit: <input type="text" value="0"/>
Duration to Flowering: <input type="text" value="10 months"/>	Number of Fruit: <input type="text" value="125"/>
Duration to Fruiting: <input type="text" value="11 months"/>	Weight of Fruit (kg): <input type="text" value="27.0000"/>
Duration to Harvest: <input type="text" value="14 months"/>	Fruit Pulp Thickness (cm): <input type="text" value="0.00"/>
Time of Flowering: <input type="text" value="Year round"/>	Fruit Colour: <input type="text" value="Creamy White"/>
Time of Fruiting: <input type="text" value="Year round"/>	Additional information: <input type="text" value="Similar eating to Ladyfinger (Tiki) variety."/>
<input type="button" value="Close Form"/>	

Figure 4: Fruit Tree Characteristics form

ENVIRONMENT & SITE FORM				Record ID: 4
Variety Name:	MS-01, Pisang Ceylan			
Country of Evaluation:	Rarotonga, Cook Islands	Topography:	Undulating	
Site:	Titikaveka	General Physiographic Features:	Valley	
Name of Evaluator:	William Wigmore	Soil Parent Material:		
Evaluation Environment:	Field	Stoniness:	Tillage unaffected	
Type of Planting Material:	Suckers	Soil Drainage:	Well drained	
Field Establishment:	100 %	Soil pH:	6	
Days to Establishment (days):	3	Soil Erosion:		
Planting Site in the Field:		Soil Texture Classes:		
Fertiliser:	NPK at 500g/mat	Soil Organic Matter Contents:	Medium	
Nutritional Effects:	Nil	Water Availability:	Rainfed	
Plant Protection:	Nil	Soil Fertility:	Medium	
Pests:	Nil	Climate of the Site:	16-30 C	
Planting Date:	23/10/2006	Harvest Date:	15/02/2007	
Latitude:		Longitude:		
Elevation(m):		Notes:	Area suitable for banana cultivation	
Close Form				

Figure 5: Fruit Tree Environment & Site form

PASSPORT FORM				Record ID: 5
Variety Name:	MS-01, Pisang Ceylan			
Accession Number:		Collecting Environment:	Research organization	
Donor Name:	CePaCT	Status of Material:	Breeders line	
Scientific Name:	Musa spp.	Type of Sample:	Tissue culture	
Acquisition Date:	15/05/2005	No of Material Collected:	5	
Accession Size:	5	Parts of Plants Used:	Fruit	
Type of Material:	Tissue culture	Plant Uses:	Food, ceremonial	
Collecting Institute:	Cook Islands Ministry of Agriculture	Local Vernacular Name:	Meika potopoto	
Collecting Number:		Growing Conditions:	Upland	
Country of Collecting:	Cook Islands	Preferred Growing Conditions:	Fertile, well drained	
Province/State:	Rarotonga	Cropping System:	Monoculture, intercropped	
Department:	Research Division	Seasonality:	Year-round	
Location of Collecting Site:	Titikaveka	Collectors Notes:	Important fresh eating variety	
Latitude:				
Longitude:				
Elevation:				
Close Form				

Figure 6: Fruit Tree Passport form

MS_Management

FIELD MANAGEMENT FORM

Record ID: 4

Variety Name:	MS-01, Pisang Ceylan	Planting Date:	23/10/2006
Accession No.:		Cultural Practices:	3 x 2 metres
Population Identification:		Plant Seedling Vigour:	Tissue culture
Field Plot Number:		Number of Plants Established:	5
Multiplication/Regeneration Site Location:	Regeneration	Notes:	Distribution of planting materials (suckers) to farmers and the outer islands.
Collaborator:	CePaCT, SPC		
Fertilizer Application:	NPK at 600gm per mat		

Close Form

Record: 1 of 1 (Filtered)

Figure 7: Fruit Tree Field Management form

MS_Environment_and_Site

NUTRITION MANAGEMENT FORM

Record ID: 4

Variety Name:	MS-01, Pisang Ceylan	SOIL TYPE		FOLIAR	
Time/Month:	Every 4-months	Time/Month:	Nil	Time/Month:	Nil
Type of Fertilizer:	NPK, Complete fertilizer	Type of Fertiliser:	Nil	Type of Fertiliser:	Nil
Rate:	600gm	Rate:	Nil	Rate:	Nil
Method of Application:	Broadcast by hand	Method of Application:	Nil	Method of Application:	Nil

Close Form

Record: 1 of 1 (Filtered)

Figure 8: Fruit Tree Nutrition Management form

MS_Management

PEST MANAGEMENT FORM

Close Form Record ID: 4

Variety Name:	MS-01, Pisang Ceylan	PESTS	Disease, fungal	CONTROL MEASURES	
Common Name:	Black Leaf Streak	QUARANTINE:			
Scientific Name:	Mycosphaerella fijiensis	CULTURAL:			
Damage/Symptoms:	Leafspots				
Crops Attacked:	Banana and Plantain				
PHYSICAL NOTES	BIOLOGICAL NOTES				
Remove dead and disease leaves. Variety is tolerant of the disease.					
INTEGRATED PEST MANAGEMENT					
		Chemical Trade Name:			
		Active Ingredient:			
		Rate:			
		Method Of Application:			
		Withholding Period:			
		Notes:			

Figure 9: Fruit Tree Pest Management form

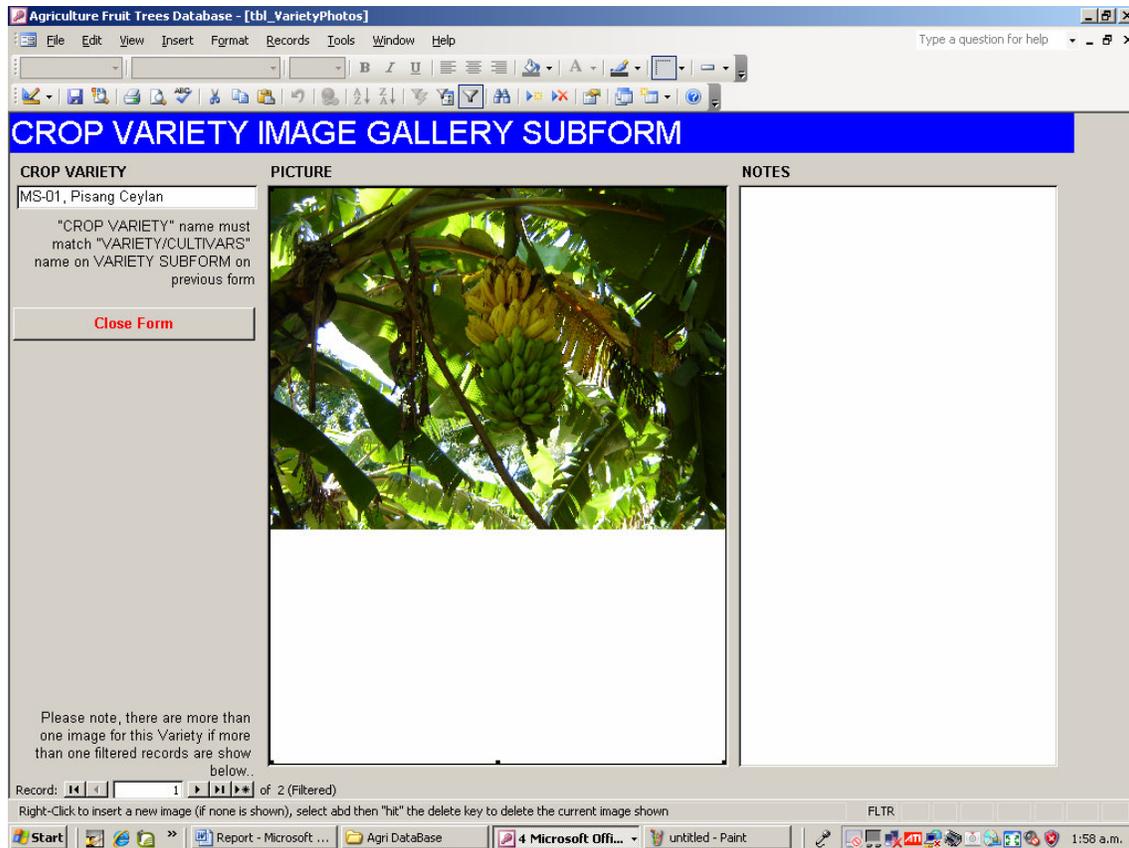


Figure 10: Fruit Tree Image Gallery subform

Computer Network Setup

The Local Area Network (LAN) consist of 3 Notebook Computers networked together using;

- An eight-port Hub
- CAT-5 Cabling
- Microsoft Client Networks software
- File and Printer Sharing for Microsoft Networks software
- A Workgroup configuration using the CIMOA group name

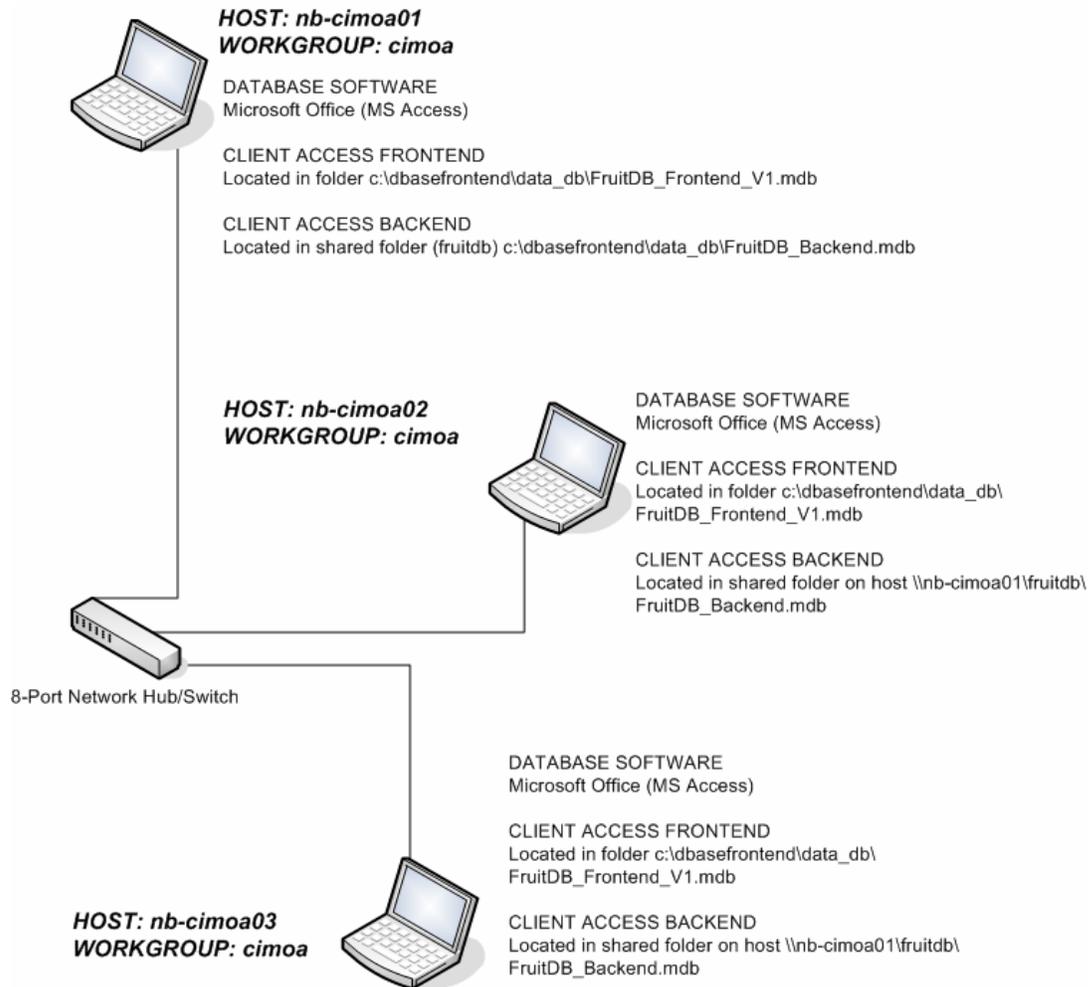


Figure 11: Local Area Network (LAN)

CONCLUSIONS AND RECOMMENDATIONS

The Ministry of Agriculture Fruit Tree Database was designed and created according to the Terms of Reference provided by the FAO Samoa Office. The Terms of Reference was completed and carried out with the guidance of the Project Manager. The success of this Database was based around the Project Manager and his staff in ensuring a very detailed and user friendly database environment that is tailor made for the purpose of the Fruit Tree Database.

Recommendation's for the enhancement of this database is detailed below which is the result of the discussions, design and planning of the Database:

File Server Database:

To-date, the Ministry of Agriculture does not have a File Server System which is a requirement for any Database set-up within any utility or company. The File Server will be the central storage facility within the ministry which allows for the purpose of multi users and access.

The Fruit Tree Database should be stored onto a Server within the Ministry of Agriculture with a Local Network capability and an External Internet capability will be of great advantage in accessing information for the public. Information can be hosted on the Ministry of Agriculture website and also linked to the Database.

The server can also be a great assistant to field staff when on the field in the outer Islands where they can access the database to monitor and check for any update information within the period of field work. This can also be a training tool for outer Island staff in the development of their skills where they can access the database in Rarotonga at the Ministry of Agriculture.

Propagation and Management System:

This system allows for the daily, weekly or monthly monitoring of the fruit tree programme. This is recommended to be an additional separate database that monitors the Fruit Tree Activities. These information is very useful for the Ministry of Agriculture research division, in particular, as it provides information for a better understanding of the performance of the various fruit trees species and varieties in the various locations. Such information in turn can be crucial for assisting farmers and growers determine the best type, species, and varieties for a particular location. Moreover, it also helps with the management aspects such as fertilization, pest management, and harvest information on the crop or fruit tree.

ACKNOWLEDGEMENTS

The FAO Samoa Office, and RPMU is acknowledged for the financial assistance towards the development of the fruit tree database. I also would like to acknowledge the assistance of the Ministry of Agriculture in providing the training venue and facilities. The assistance of the Project Manager for his continuous support to the development of the project in ensuring a very successful Fruit Trees Database.

LIST OF PERSONS MET

Mr William Wigmore	Director of Research
Mr Edwin Apera	GREa, DSAP SPC Project
Mr Tavake Manuel	Research Officer

MISSION ITINERARY

DATE	LOCATION	ACTIVITY
Tuesday, 9/12/2008	CIMOA Office, Arorangi	Opening of the workshop by the Director of Research, William Wigmore. Present were; FAO Consultants, - Timoti Tangiruaine & Adrian Teotahi CIMOA Staff, - William Wigmore, Edwin Apera & Tavake Manuel

MORNING

- A brief outline of the project was presented by William Wigmore.
- A brief outline of what is expected of the three days meeting was presented by the consultants.
- A development copy of the database was presented by the consultants from which feedback was sort from the Agriculture Officers.
- One significant feedback that was identified was the need to

modify the data modelling so that different Characteristics, Environment & Site, Passport, Field Management, Nutrition Management and Pest Management information can be recorded for each crop variety.

- A decision was made and agreed upon that data compilation for three well-known crops to be undertaken to provide some data entry/editing activities on the second day.

AFTERNOON

- Data compilation by the Agriculture Officers.
- Changes to the database was undertaken.

Wednesday,
10/12/2008 CIMOA Office,
Arorangi

- A review of the changes made to the database was undertaken in the morning.
- Data entry/editing commenced as a hands on exercise using a standalone Notebook.
- A review also was undertaken for the user friendliness of the system, and where appropriate changes were noted and made.

Thursday,
11/12/2008 CIMOA Office,
Arorangi

- Local Area Network (LAN) was introduced and configured. Initially, cabling problems were experienced, but these were sorted out and the benefits of working in a multi-user environment was soon realized and appreciated.
- A problem with the insertion of OLE objects was finally resolved. This was fully documented and included as part of the User Manual
- The rest of the day was spent working on the database using networked Notebooks.

Friday,
12/12/2008 CIMOA Office,
Arorangi

Final demonstration of the database was presented to William Wigmore as his staff.

Annex 5: Fruit Trees Introduced between April 2005- December 2008

Country, area	Name, common	Name, botanical	Variety
Australia, North Queensland	Abiu	<i>Pouteria caimito</i>	E4
	Avocado	<i>Persea americana</i>	Sheppard
New Zealand, Whangarei	Avocado	<i>Persea americana</i>	Bacon
			Ettinger
			Fuerte
			Hass
			Reed
	Zutano		
Australia, North Queensland	Barbados cherry	<i>Malpighia glabra</i>	
	Cardamom	<i>Elletaria cardamomum</i>	
	Chempedak	<i>Artocarpus integer</i>	
New Zealand, Kerikeri	Grapefruit	<i>Citrus paradisi</i>	Golden Special
			Star Ruby
Australia, North Queensland	Indonesian lime	<i>Citrus spp.</i>	
	Kaffir lime	<i>Citrus hystrix</i>	
	Custard Apple	<i>Annona spp.</i>	African Pride
	Durian	<i>Durio zibethinus</i>	Monthong
			Mild aroma
	Duku/Langsat	<i>Lansium domesticum</i>	Long Kong
	Fig	<i>Ficus carica</i>	Brown Turkey
	Grumichama	<i>Eugenia brasiliensis</i>	Brazilian cherry
	Guava	<i>Psidium guajava</i>	Thai White
	Jackfruit	<i>Artocarpus heterophyllus</i>	Berry (Crunchy Pink)
			J2
Pink			
Yellow			
	Kelidang	<i>Artocarpus hypargyreus</i>	
	Kwaimuk	<i>Artocarpus anisophyllus</i>	
New Zealand, Kerikeri	Lemon	<i>Citrus limon</i>	Lemonade
Australia, North Queensland	Longan	<i>Euphoria longana</i>	Chompoo
			Bien Kiew
	Lucmo Giant	<i>Pouteria nitida</i>	
	Lychee	<i>Litchi chinensis</i>	Tai So
New Zealand, Kerikeri	Mandarins	<i>Citrus reticulata</i>	Afourer Delite
			Encore
			Satsuma Miho
			Satsuma Miyagawa
Australia, North Queensland	Mango	<i>Mangifera indica</i>	Keow Sawoey
			Hoa Loc
	Mangosteen	<i>Garcinia mangostana</i>	
	Matisia	<i>Matisia cordata</i>	Ex. Columbia
	Meritan/Pulasan	<i>Nephelium mutabile</i>	
Mundu	<i>Garcinia dulcis</i>	Russell's Sweet	
New Zealand, Kerikeri	Orange	<i>Citrus sinensis</i>	Barnfield
			Blood orange
Australia, North Queensland	Pandan	<i>Pandanus amaryllifolius</i>	Sweet Thai Pandanus
	Passionfruit	<i>Passiflora edulis</i>	Panama Gold
	Passionfruit	<i>Passiflora edulis</i>	Panama Red
	Peanut Butter tree	<i>Bunchosia argentea</i>	
	Pitaya/Dragon Fruit	<i>Hylocereus undatus</i>	Red with white flesh
			Red with red flesh
			Yellow with white flesh
		<i>Selenicereus megalanthus</i>	
	Pummelo	<i>Citrus grandis</i>	K15
Purple mombin	<i>Spondias purpurea</i>		
Rambutan	<i>Nephelium lappaceum</i>	Jit Lee	
		Rong Rien	

	Rambi	<i>Baccaurea mottleyana</i>	
	Rollinia	<i>Rollinia deliciosa</i>	
	Ross sapote	<i>Pouteria campechiana</i>	
	Santol	<i>Sandocricum koatjape</i>	
	Starapple	<i>Chrysophyllum caimito</i>	DPI green
	Tamarind	<i>Tamarindus indica</i>	See Thong
		<i>Tamarindus indica</i>	See Chompu
		<i>Tamarindus indica</i>	Large Pods
		<i>Tamarindus indica</i>	Common sweet
		<i>Tamarindus indica</i>	Sweet, Dubai

**Annex 6: Plant Seedlings Distributed from the Agriculture Nursery on each Island:
June 2007 – December 2008**

Island	Name, botanical	Name, common	Name, variety	Number of Seedlings Distributed
Rarotonga	<i>Citrus reticulata</i>	Mandarin	Afourer delite	768
	<i>Citrus limon</i>	Lemon	Meyer	405
	<i>Citrus sinensis</i>	Orange	Rarotonga Seedless	515
	<i>Citrus aurantifolia</i>	Lime	Mexican, Persian	213
	<i>Citrus paradisi</i>	Grapefruit	Poorman	40
	<i>Citrus maxima</i>	Pummelo	K15	70
	<i>Persea americana</i>	Avocado	Local selection	315
	<i>Persea americana</i>	Avocado	Bacon, Ettinger, Hass, Fuerte, Reed, Zutano	200
	<i>Litchi chinensis</i>	Litchi	Kwai Mai	375
	<i>Passiflora edulis</i>	Passionfruit	Local purple	3, 882
	<i>Averrhoa carambola</i>	Starfruit	Kembangan	447
	<i>Carica papaya</i>	Solo	Waimanalo	18, 248
	<i>Musa spp.</i>	Banana and Plantain	Desert and Cooking	625
	<i>Mangifera indica</i>	Mango	Rapa, Oka, Ourepiho, Israel, Tinito, Mission	360
	<i>Punica granatum</i>	Pomergranate		50
	<i>Cocos nucifera</i>	Coconut	Local selections (tall and dwarf)	500
	<i>Annona spp.</i>	Custard apple	African pride	80
	<i>Ananas comosus</i>	Pineapple	MD2	2,800
		Total		
Aitutaki	<i>Citrus spp.</i>	Citrus	Oranges, mandarins, lemons	303
	<i>Persea americana</i>	Avocado	Local selection	49

	<i>Passiflora edulis</i>	Passionfruit	Local purple	120
	<i>Mangifera indica</i>	Mango	Oka, Ourepiho, Israel, Hoa Loc	296
	<i>Nephelium lappaceum</i>	Rambutan		2
	<i>Dimocarpus longana</i>	Longan	Bien Kiew	3
	<i>Pouteria caimito</i>	Abiu	E4	3
	<i>Hylocereus spp.</i>	Dragonfruit/Pitaya	Red/Red and Red/White	19
	<i>Nephelium mutabile</i>	Pulasan		2
	<i>Ananas comosus</i>	Pineapple	MD2	500
	Total			1,297
Atiu	<i>Citrus reticulata</i>	Mandarin	Scarlet, Afourer delite	68
	<i>Citrus limon</i>	Lemon	Meyer	24
	<i>Citrus sinensis</i>	Orange	Rarotonga Seedless	8
	<i>Citrus aurantifolia</i>	Lime	Mexican	2
	<i>Citrus paradisi</i>	Grapefruit	Poorman	2
	<i>Persea americana</i>	Avocado	Local selection	36
	<i>Passiflora edulis</i>	Passionfruit	Local purple	75
	<i>Dimocarpus longana</i>	Longan	Bien Kiew	1
	<i>Ananas comosus</i>	Pineapple	MD2	800
	Total			1,016
Mangaia	<i>Citrus reticulata</i>	Mandarin	Scarlet, Afourer delite	51
	<i>Citrus limon</i>	Lemon	Meyer	15
	<i>Citrus sinensis</i>	Orange	Rarotonga Seedless	170
	<i>Citrus aurantifolia</i>	Lime	Mexican	2
	<i>Citrus paradisi</i>	Grapefruit	Poorman	2
	<i>Citrus hystrix</i>	Kaffir lime		2
	<i>Persea americana</i>	Avocado	Local selection	26
	<i>Musa spp.</i>	Banana and Plantain	Desert and Cooking	18
	<i>Passiflora edulis</i>	Passionfruit	Local purple	50
	<i>Nephelium lappaceum</i>	Rambutan		2
	<i>Pouteria caimito</i>	Abiu	E4	1
	<i>Dimocarpus longana</i>	Longan	Biew Kiew	1
	<i>Ananas comosus</i>	Pineapple	MD2	800
	Total			1,140
Mauke	<i>Citrus reticulata</i>	Mandarin	Scarlet, Afourer delite	25
	<i>Citrus limon</i>	Lemon	Meyer	17
	<i>Citrus sinensis</i>	Orange	Rarotonga Seedless	33
	<i>Citrus aurantifolia</i>	Lime	Mexican	8
	<i>Citrus paradisi</i>	Grapefruit	Poorman	3
	<i>Persea americana</i>	Avocado	Local selection	32
	<i>Musa spp.</i>	Banana and Plantain	Desert and Cooking	12
	<i>Passiflora edulis</i>	Passionfruit	Local purple	55
	<i>Hylocereus spp.</i>	Dragonfruit/Pitaya	Red/Red and Red/White	5
	<i>Ananas comosus</i>	Pineapple	MD2	500
	Total			690
Mitiaro	<i>Citrus limon</i>	Lemon	Meyer	12

	<i>Musa spp.</i>	Banana and Plantain	Desert and Cooking	24
	<i>Persea americana</i>	Avocado	Local selection	8
	<i>Passiflora edulis</i>	Passionfruit	Local purple	23
	Total			67
Total for all islands				34,103

Annex 7: Projected future availability of important fresh fruits in Cook Islands

Species	Varieties	J	F	M	A	M	J	J	A	S	O	N	D
Avocado	Fuerte	■											
Avocado	Hass					■	■	■	■	■			
Avocado	Local, selection	■											■
Banana and Plantain	Dessert and Cooking		■	■	■	■	■	■	■	■	■	■	■
Carambola	Kembangan						■						
Citrus	Afourer Delite Mandarin	■					■						
Citrus	Satsuma Miho Mandarin	■			■								
Citrus	Scarlet Mandarin					■	■	■	■				
Citrus	Encore Mandarin				■	■		■	■				
Citrus	Rarotonga Seedless Orange			■	■	■	■	■	■				
Citrus	Late Valencia Orange			■	■	■	■	■	■	■	■	■	■
Citrus	Poorman Grapefruit			■	■	■	■	■	■	■	■	■	■
Citrus	Golden Special Grapefruit			■	■	■	■	■	■	■	■	■	■
Mango	Local (Oka, Ourepiho, Rapa etc)	■	■	■	■	■	■	■	■	■	■	■	■
Mango	Introduced (Keow Sawoey, Hoa Loc)					■	■	■	■	■	■	■	■
Litchi	Kaimana, others	■								■	■	■	■
Papaya	Solo Waimanalo and Sunrise	■	■	■	■	■	■	■	■	■	■	■	■
Passionfruit	Local purple and Panama Red					■	■	■	■	■	■	■	■
Pineapple	Ripley Queen			■	■	■	■	■	■	■	■	■	■
Pineapple	MD2			■	■	■	■	■	■	■	■	■	■

