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BASELINE SURVEY

SOUTH PACIFIC REGION AGRICULTURAL DEVELOPMENT PROJECT

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UNIVERSITY OF HAWAII
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

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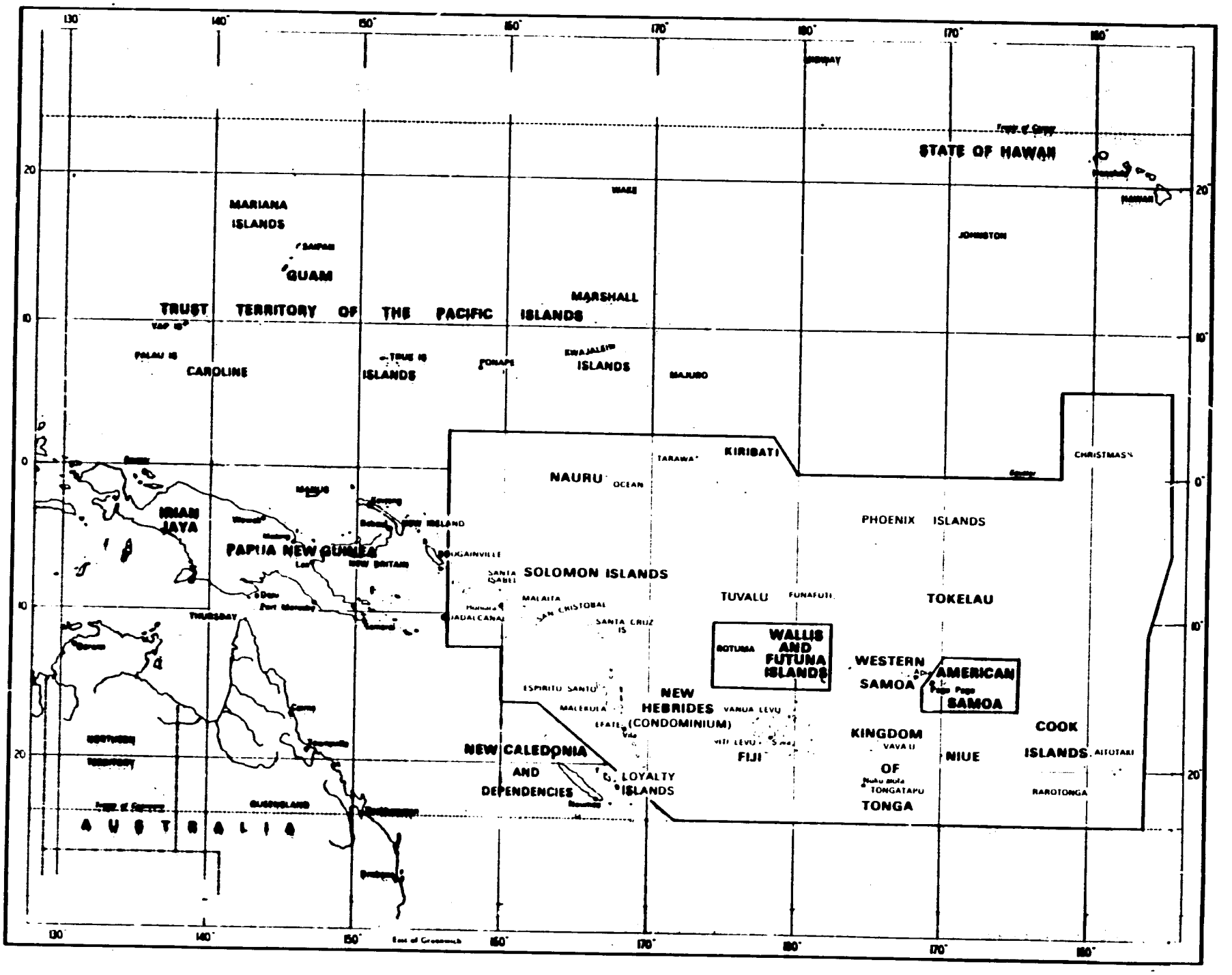
SPECIAL NOTE TO READERS

This report summarizes available reference material related to agricultural research, education, and extension in the South Pacific Region. Readers will note some unevenness in coverage, --information gaps, inconsistencies, and data which are several years old. Notwithstanding these weaknesses, the report has fulfilled its original purpose: to provide background information and documentation for the Project Paper.

Even though the report is not suitable for general distribution, it is hoped that its usefulness may go beyond the Project Paper. For this reason, it is made available to the various people associated with the South Pacific Region Agricultural Development Project. In their capacities as administrators, government officials, researchers, teachers, or extension personnel, perhaps they will find ways to expand and up-date the work which is represented in the Baseline Survey.


STATE OF HAWAII
MARIANA ISLANDS
GUAM
TRUST TERRITORY OF THE PACIFIC ISLANDS
MARSHALL ISLANDS
CAROLINE ISLANDS
KIRIBATI
NAURU
PHOENIX ISLANDS
IRIAN JAYA
PAPUA NEW GUINEA
SOLOMON ISLANDS
TUVALU
TOKELAU
WALLIS AND FUTUNA ISLANDS
WESTERN SAMOA
AMERICAN SAMOA
NEW HEBRIDES (CONDOMINIUM)
NEW CALEDONIA AND DEPENDENCIES
LOYALTY ISLANDS
FIJI
KINGDOM OF TONGA
NIUE
COOK ISLANDS
AUSTRALIA

INTRODUCTION

This baseline Survey reports on agricultural research, education and extension (REE)system in the South Pacific region. It has been based on the suggestions provided by the BIFAD methodological guidelines. In addition, expanded discussions are given outlining the country settings of the eleven nations which are included in the study region. This was considered important due to the general lack of information describing widely differing situations which influence agriculture in this large area.

The time and expense requirements, plus the impact of another survey team on many of the small agricultural departments of some of the nations in the region, argued for this Baseline Survey to be compiled from existing information. Some travel within the region was necessary to collect recent reports; this also has allowed 'spot checking' of specific items. Where possible, information has been included only if it is no more than ten years old.

The specific AID-related events which led to this project began in the Spring of 1977 when the USAID team of Imus and Gulick compiled a list of development projects which reflected the desires of the governments of the South Pacific region. One of the priority items in this list was support for the development of increased regional agricultural capabilities through the strengthening of the University of the South Pacific's School of Agriculture at Alafua, Western Samoa (USP-SOA)

The following Spring, 1978, a USAID-funded team from the University of Hawaii visited the region to develop recommendations for a long-range institution development program for the USP-SOA. Revisions to their recommendations were made in Spring, 1979, following discussions with AID/Washington and further regional meetings with USP administrators. These revisions included a greater focus on the scope of support and increased emphasis on USP-SOA research, education and extension capabilities.

In the Fall of 1979, in response to an AID/Washington request for an expression of interest in the project, the University of Hawaii at Manoa (UHM) and six other American universities provided statements of qualifications to work in the South Pacific and tentative project directions. The UHM was selected to initiate the design of the Project Paper and Baseline Survey. Work on these activities began in April, 1980.

OVERVIEW OF THE REGION

A. THE GEOGRAPHY, ENVIRONMENT AND SOCIAL CONTEXT

There are eleven nations in the South Pacific which support the University of the South Pacific. These nations are: the Cook Islands, Fiji, Kiribati (formerly Gilbert Is.), Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu (formerly Ellice Is.), Vanuatu (formerly New Hebrides) and Western Samoa.

The general geographic, demographic and economic characteristics within the region (as can be noted in Table 1) vary greatly from nation to nation. There are more than 620 islands and atolls in this region which covers an ocean area (including the 200 mile EEZ) larger than 11 million square km., an area slightly larger than the entire United States. The combined land mass of these nations is small, with a total area of approximately 64,000 square km., about the size of West Virginia.

There are approximately 1.3 million people residing in the South Pacific region. Fiji has the largest population, some 607,000 (or 48% of the total in the region). In contrast, some nations have very small populations, such as Tokelau, with some 1600 persons. The five largest countries contain approximately 92% of the total population.

The geographic region is wholly within the tropics although it ranges over some 25 degrees from just north of the equator down almost to the Tropic of Capricorn. As a result of this range of latitude and the effect of oceanic circulation patterns, air temperatures in the coastal regions are usually between 20 and 30 degrees Celsius (68-86 degrees F). The higher elevations in the southern part of the region experience a more temperate climate.

Rainfall is generally high throughout the region, often with more than 2500 mm (100 inches) per year. There are exceptions, however, such as Nauru which regularly experiences drought-like conditions of 200 mm per year or less. High rainfall amounts are also associated with high cloudiness and a corresponding decrease in solar radiation. This is an important factor in controlling crop productivity.

Cyclones occur with high frequency in a number of nations, primarily those in the south-west portion of the region. In particular, the Solomon Islands, Vanuatu, Fiji and Tonga expect one or more cyclones each year.

The eleven nations come from the three major ethnic and geographical areas of the South Pacific. the Polynesian ('Many Islands') nations are the Cook Islands, Niue, Tokelau,

Table 1. Characteristics of the Nations in the South Pacific Region

Nation	Total land (sq. km)	Largest island (sq. km)	Population (1978)	GDP per capita ($US)
Cook Islands	240	65	18,500	892
Fiji	18,272	10,390	607,000	1,203
Kiribati	684	38	56,000	718
Nauru	21	22	7,000	20,203
New Hebrides	11,880	3,947	101,500	826
Niue	259	258	3,700	276
Solomon Is.	28,530	5,650	214,000	361
Tokelau	10	5	1,600	N.A.
Tonga	699	260	93,000	377
Tuvalu	26	6	7,400	N.A.
Western Samoa	2,935	1,820	153,000	310

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Tonga, Tuvalu, and Western Samoa. The associated Melanesian ('Black Islands') countries are Fiji, Vanuatu, and the Solomon Islands. Kiribati and Nauru are situated in the area identified as Micronesia ('Little Islands'). These differences present a rich mix of possibilities since agricultural practices are inextricably bound to the social systems, the variety of historical, cultural, environmental and political systems occurring in this region.

In addition to the major physical and demographic differences noted earlier, there is little homogeneity in kinship nets, leadership structure, work role definition, function of women in agriculture, language, land tenure, or any number of issues that must be considered in the development of agricultural projects. Most of the Polynesian countries were colonized earlier and have a longer history of religious, political and economic interventions; they are generally more Westernized than the other countries. Polynesians also tend to have a stronger group identification, based partially on their extended kinship nets and historical ties through pre-colonial contacts. In contrast,the other countries have been more isolated and have tended to develop greater tribal independence, to the point that the Solomon Islands boasts 87 different languages and Vanuatu has 70.

Politically, all of the countries except Tonga (an historical kingdom) have been under colonial influence. Most are newly independent; two are internally self-governing states in free association with New Zealand (the Cook Islands and Niue). In contrast to Tonga which traces its royal lineage back to 950 AD, some of the countries are so recently independent and have such limited political experience, that they lack the sense of identification as a single political unit necessary for national pride and a coordinated development program. Generally, however, the countries possess a strong national identification and robust cultural pride.

Throughout the region, the population growth rate generally is high. Vanuatu and the Solomon Islands both have annual increases of 3.2% or more. In countries, where there are relatively easy possibilities of migration, there may even be an annual population decrease, such as is found in Niue and the Cook Islands. Population densities vary considerably throughout the region, from a low of 8 per square km. in the Solomon Islands and Vanuatu to over 333 per square km. in Nauru. These values compare with 53 per square km. in Hawaii and little more than 2 per square km. in the US as a whole. Of course, not all of the people are equally dispersed within a country. In particular, urbanization is a relatively recent phenomenon which is having a particularly profound inpact. Nearly 30% of the population now live in or near urban centers and there are at least ten centers which have ten-thousand or more people.

The largest proportion of the labor force throughout the region is engaged in agriculture and fisheries. While this proportion has been declining for some time, it is still a very large part of the cash-economy of all of the countries (except Nauru). The level of employment ir subsistence agriculture is also thought ot be large, but is not as easily measured. In the aggregate, there are more than 120,000 persons engaged in agriculture in the region. As a general comparision, approximately 57% of the male workforce is found in the agriculture and fisheries sector, followed by 20% in the governmental sector. It should be noted that there are many cases of overlap between these types of categories. In Niue, for example, virtually all government employees (some 74% of the total workforce) are also subsistence farmers. This is such an important part of the structure of the economy of Niue that the workday has been adjusted to allow sufficient time for gardening.

The general enployment situation in the South Pacific region is similar to many developing countries. In particular, there is widespread unemployment in urban centers, especially among the youth. Governments are generally concerned with finding suitable employment opportunities particularly for the unskilled. In Tonga, Western Samoa, the Cook Islands and Niue, there has been migration of the young to metropolitan countries (mainly New Zealand) from which they provide remittance incomes. This is not done as a direct government policy, but provides higher income to both the individual and relatives in the home country. Serious social consequences have resulted foom the loss of such a large part of the young workforce.

B. ECONOMIC CONTEXT

Agriculture provides over 57% of the income for the region. In all the countries, except Nauru, agricultural development is the basis of the economic development. Differences in physical and social environments, and past patterns of development, direct each nation to its own path of economic development. Some nations are very well off, in the sense of overseas earnings. Nauru is a case in point, where its wealth from phosphate mining and investments made abroad from past income provide it with the world's highest per capita Gross Domestic Product ($20,203). Yet it is a country which is entirely dependent on phosphate with no other natural resources. Other countries have miniscule overseas income. Small, atoll nations, in particular, have problems of economies of scale, and face a future which will allow no economic growth. Development programs, properly planned and executed, hold some promise for improving the ability of some countries to maintain their standard of living when recurrent foreign aid is withdrawn. Even the atoll countries will experience benefits from well designed development projects which put emphasis on promoting semi-subsistence activities.

Shortage of skilled labor is an important factor in the region. There is often direct competition for labor between the agricultural and non-agricultural sectors, with the labo force shifting to the sector which offers the higher standar of living. In many parts of the region, there are differences in the division of labor between the sexes. While a consideration of this point is reserved for later discussion, it must be noted that such differences sometimes determine the labor availability in a country and, therefore its development potential.

Foreign trade, principally in a few agricultural commodities such as sugar, coconut products, cocoa and palm oil, are major cash earning activities in many of the nations of the region. Such activities also have an impact on national economies through their import activities and the infrastructure required for their maintenance. Where diversification of export products has not been made, the economy of a country is particularly susceptible to the relatively volatile world commodities markets.

Diversification of the economy is a particular problem for many of the nations of the region. Not only are production possibilities limited in the smaller countries, but quarantine restrictions, access to markets, and transportation are but a few of the more obvious problems. In some cases, diversification may assist in the replacement of items, including foodstuffs, which are now imported. Careful consideration is necessary, however, in the evaluation of the economic viability of plans to replace staple grain crops, for example, given the resource limitations in most of the countries. Better opportunities appear to exist for the replacement of the dairy products, fish, vegetables and fruits which are now imported.

An important element in the budgets of all of the countries of the South Pacific is foreign aid. This averages $78 (1977) per person per annum in the region and is particularly high in the smaller counties, such as Niue where it is $923 per person. While the level of aid has been increasing, there are direct indications that such support will be discontinued by some large donors to particular countries during this decade. As described earlier, this may not be possible for the very small nations. A continuing general goal appears to be the provision of aid support to develop activities which will reduce long-term dependence on donor nations.

THE AGRICULTURAL CONTEXT

The economies of the nations of the South Pacific region are primarily based on agriculture and are likely to remain for the foreseeable future. Agricultural products are the major exports of many nations ($178 million annually) and, increasingly, are becoming an important factor in the import trade as well ($99 million annually).

The agricultural resource endowments of the various nations are quite different. The small, atoll nations have limited resources for either quantities or a diversity of agricultural products. They are also most susceptible to disruption, generally remote from markets, and least able to support research to improve their situation.

The nations which occupy larger, more topographically varied islands, have a greater number of agricultural environments and larger areas in which production may take place. They are also more resilient to short-term perturbations, such as in water supply during a drought, as compared to the atoll environments. Soils are better developed and lands are generally extensive enough to allow intermittent cropping with fallow periods, rather than requiring continuous production as might be the case with extreme land shortages.

There are three types of agricultural systems which have developed in these regional environments: self-contained subsistence systems, mixed subsistence and cash crop systems, and plantation or estate enterprises. Self-contained subsistence systems are centered around the production of starchy staple crops (often root crops), indigenous tree crops, domesticated fruits, poultry, pigs and fishing. In some situations, relatively permanent gardens are established while in other places, the garden plots are shifted periodically. In Polynesia, such gardens are usually tended by the men, while in Melanesia, it is the task of the women.

Mixed subsistence and cash crop systems incorporate many of the above elements but also have the addition of commercial corps such as coffee, cacao, vanilla, cattle, and artisinal fisheries. Market demands often require greater technical sophistication in the crop production systems, especially in the quality, quantity and timing of the products. Additional processing is often required as is access to markets. A much smaller variety of crops are utilized in cash cropping than in subsistence farming which reduces the production seasons, places greater strain on the ecosystem, and increases vulnerability to major pest infestations. In Melanesia, men often dominate the cash-crop portions of this system. Where nearby prime land is relatively scarce, it is devoted to the cash crops, forcing the women to travel to the more remote marginal lands for their subsistence gardens.

The plantation or estate enterprises are usually capital intensive, have centralized management, wage and labor arrangements, and control large tracts of land. In addition, they are often likely to use agricultural chemicals and mechanization. Timber, coconuts, oil palm, cattle, cacao, and industrialized fisheries are examples of this type of agricultural system. Such agriculture generally provides the export commodities which form the economic base of the countries.

The marked changes in food habits within the island societies since World War II have created some significant shifts within traditional agricultural systems. Plantation laborers are provided with diets consisting of imported starches, including wheat, rice, canned meat and fish. Increasing urbanization has also led to a greater consumption of such imported crops. This greater utilization of these nontraditional foods has increased their prestige value, as well as emphasized their relative convenience and availability, and further increased the demand for them, even into regions which can be adequately supplied by subsistence agricultural practices. Adoption of such diets has resulted in an increase in cash cropping to pay for such imported commodities, further reducing the availability of subsistence gardening. When kept in a proper balance, a mixed traditional and imported food diet is nutritionally sound; but in too many cases, severe nutritional inbalances have resulted. Also, dietary changes have resulted in the stagnation of the production of some traditional foods, such as yams, taro, banana and breadfruit.

This brief characterization only hints at the complexities of these agricultural systems as integrated activities which are bound up in the social, economic and environmental fabric of the communities in which they are found. Agricultural development programs which do not adequately consider and meet the requirements for integration are unlikely to have a substantial or lasting impact on their intended beneficiaries. Only in the larger countries does there begin to be a sufficient number of trained people to work together to find solutions. As a result, there is considerable expectation that this may be done most effectively by a regional institution.

THE EXISTING REE SYSTEM IN THE SOUTH PACIFIC

There are a number of agricultural research activities in the South Pacific region. The amount of research, the level at which it is carried out, and the specific focus depends on the resources available in each particular country. In the aggregate, there are more than 500 active agricultural research projects covering the range of crop production, pest and diseases, weed control, soil fertility, livestock and

pastures. The relative distribution of activities between these areas can be seen in the accompanying table. It is clear that the large countries, as would be expected, have the most comprehensive programs while the small countries tend to focus on a few commodities of particular relevance to ttheir economy.

Little has been done in a substantial way in the South Pacific region to unify the research efforts of the various countries. Current activities to provide coordination are relatively weak. There are, however, a number of examples of attempts to provide such coordination. There are the annual meetings of the Directors of Agriculture from each country. The South Pacific Commission conducts periodic surveys of the research which is underway in the region (done twice in the last decade). Consultants report on needed mechanisms for coordination, such as the recent report for the EEC by Payne. Donors and lenders conduct agricultural surveys; the most recent study of the agricultural sector was done by the Asian Development Bank and it recommends the establishment of a regional research enter for root crop and coconut research. In addition, there are periodic meetings of specialists from throughout the region discussing specific problems such as the recent meeting on atoll agriculture held in Tahiti.

Coordination which goes beyond the current activities appears to be desirable. There is both a large enough research effort in the region and enough common interest in and attention given to the same commodities and production bottlenecks that benefits would be expected from an organized regional effort. This coordination would allow better use of the relatively scarce resources which can be devoted to agricultural research.

There are probably no more than 120 qualified agricultral researcher in the region. Many of these have only the minimum qualifications and are not working at the level assumed in developed countries. Small countries, such as Niue, now has a single qualified researcher. In contrast, Fiji had, in 1974, some 26 researchers. There is often a large support staff associated with these researchers; Fiji had some 250 assistants and support personnel associated with its research program. A large proportion of the most qualified researchers, perhaps as many as 90%, are expatriates. This presents a problem relative to an understanding of the agricultural systems and the constraints to development since there is generally a high turnover of such personnel.

Extension activities in the region are carried out as a function of the agriculture departements. In many cases, this is the largest function in the department. As with research, the overall effort varies in proportion to the size of the country. Tuvalu has only two extension workers. Niue

RELATIVE RESEARCH EMPHASIS (rankings within a program of a country)

1972

	Fiji	Solomon	Tonga	W. Samoa	N. Heb.	Cook Is.	Kir.-Tuv.	Niue
Coconuts	3	3	1		3		3	2
Root Crops	1	1	2	2	3	1		
Other Fruits	2	3	1	1	1	2		
Vegetable	3	1	3	1		2		
Bananas	2		3	3		2		
Cocoa	3	3		1	1			
Citrus	1			1	2	3		
Spices	1	3	1	1				
Other Oil Crops		2			1			
Other Cereal/Pulses	1		2					
Sugar	3							
Coffee/Tea	1							
Pastures	3	2	2	3	3			3
Diseases and Pests	3	3	3	3	1			
Livestock	3	1	2	3	2			1
Soil Fertility	1	2	2	3	2			
Weed Control	2			2				1
Rodent Control	1	1	2					
Farming Systems	1			1				

(3=high, 1=low)

has eight. Kiribati maintains at least one agent on each island, with the larger islands having two or three agents. Western Samoa had a permanent extension staff of 27 in 1972.

There is a general need for increased training for the extension personnel so that they will be better qualified to assist the agricultural activities. While a large country such as Fiji is able to satisfy its own training needs through the Fiji College of Agriculture, the smaller countries must send their workers to other countries if they are to receive comprehensive training Sometimes special training programs are established which give a minimal level of information to the extension staff. An example is the Staff Training Center in Tonga which offers a one year, post-secondary on-the-job training course for agricultural extension workers.

The two most comprehensive post-secondary agricultural programs in the region are offered through the USP School of Agriculture (Alafua, Western Samoa) and the Fiji College of Agriculture. The USP-SOA has 149 students and the Fiji COA has 115.

In addition, there are a number of technical and vocational schools which offer agricultural training. In Fiji, besides the Fiji-COA, there are some 29 other institutuions. The Solomon Islands (in 1974) had 21 District secondary and nine secondary schools which offered agricultural courses. This pattern is repeated throughout the region.

PROJECT IMPACT ANALYSIS

A. SOCIAL ANALYSIS

Careful consideration must be made of the social impact of the proposed USAID project on the island communities of the South Pacific, since agricultural development programs generally induce some social change as well as providing economic benefits. Likewise, because of the great diversity of cultural groups in the region, project planners must be aware of the unique cultural heritage, environmental, economic technological, and socio-political factors that can mitigate against successful program development.

In general, the USP region of influence can be divided into two regions: the Eastern Pacific or Polynesia, and the Western Pacific or Melanesia (plus isolated states in the Northwest Pacific or Micronesia). This broad division differentiates some common kinship practices, basic ethnic classifications, language types, and assorted cultural traditions such as land use, sex roles in the division of labor, and village political structures. However, it is not efficiently sensitive to the numerous similarities and differences among the eleven countries of the region to be of appreciable assistance.

The one heritage common to all the Pacific Islanders is their rural upbringing. Most of the people in the region still live and work in small traditional villages, often at considerable distance from the "urban" centers of the country. It is estimated that 70-80% of all Pacific Islanders are "employed" in the rural sector. Subsistency farming and minimal cash cropping are still the primary means for villagers to earn a livelihood throughout the region.

Understanding the traditional social organizations of the villages and the adaptations that are occuring in the rural sector due to modernization is paramount for the development of appropriate agricultural intervention programs.

All Pacific Island communities face the same general situation of rapidly changing social systems. Widely occurring challenges to traditional political systems, communal ties and patterns of settlement and land use are evidenced as communities are finding it more and more difficult to achieve new economic and socio-political goals within the traditional social organizations. Many contemporary island farmers have found that they are unable to meet the requirements of "Western" commercial agriculture because of obligations to traditional systems. Although the nucleated village model is common throughout the region, several patterns have developed in the sexual division of labor and labor allocation, as well as major differences in leadership and resource distribution. Nonetheless, farming labor generally is mobilized based on kinship or village group patterns under the direction of a group leader or chief. This leadership structure, coupled with traditional land tenure and community pressures on time allocation, influences the types of tasks performed and range of crops grown within the community.

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It is common for Pacific Island farmers to be caught between the demands of modern agriculture for regular and long labor inputs and the continuing social demands of family, church, or traditional leader for participation in group tasks or ceremonies. Regional agricultural planners must recognize that such social systems organized on non-monetary value systems determine the perceived benefits and costs of labor allocation to agricultural and other activities. To increase agricultural production within the region, the agricultural development projects should be designed to fit with local work patterns, time allocations, and social and administrative organizations rather than imposing Western standards of labor use and productivity. Depending on the social organizations involved, planners may stress individual, family group, or large community group activities.

With the recent and increasing emphasis on commercial agriculture, there has been a shift in many communities away from large group subsistence activities and central nucleated villages. Instead, individual homesteads on consolidated holdings with specialized crops are becoming more prevalent. This is seen in Fiji, for example, where there has been a marked increase in the number of individual homesteads and dispersion of families from traditional rural villages as commercial agricultural opportunities have increased and urban centers have begun to offer many of the social needs of the traditional villages.

Major movements of villagers to urban centers has been commonplace among the islands, with resulting strain on the food availability in towns, and a gradual shift from traditional subsistence or barter economies to more monetary systems. To support an expanding demand by consumers for technical goods and canned foods, island communities have had to make major adjustments in their traditional social organizations. In several countries, the export of youth to foreign countries has been fostered, partially because the islanders view this as a most effective avenue for social advancement, but also since the remittances returned to the family form a major source of income for the community.

While social change has been rapid in all of the Pacific Islands, change in traditional leadership and land tenure patterns has been uniformly much slower. In most of the island communities, the overwhelming proportion of lands is held and used under some form of "customary" tenure. The percentage of land designated as "customary" varies from 73% (Tonga) to 88% (Solomon Islands) in the larger countries. Post-colonial changes have put severe legal restrictions on the use of this land, often resulting in extremely difficult procedures required to change land use in response to new needs such as population increases, changing consumer demands, and new agricultural practices.

Since much of the earlier commercial agricultural activity has been toward long-term cash cropping, there has been an accelerating shift away from traditional systems of individuals having temporary use of kinship or customary land to a desire for more exclusive rights for longer defined periods. The process of individualization of land tenure has gone farthest in Fiji with its large population of tenant farmers of Indian descent. However, other countries have continued to follow the traditional use of customary land worked under the leadership of village chiefs

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or group heads. In the Cook Islands, for example, members of "drinking groups" will work as teams harvesting taro from each farm in turn. In Tonga, farmers have revived semi-traditional work groups of kin and friends for yam cultivation. In the Solomon Islands, there has been government support of kinship groups to purchase and revitilize decaying expatriate plantations. In Western Samoa, the village chiefs (matai) can still muster a sizeable workforce through the traditional chiefs' structure. Careful consideration will be given throughout this project to the most appropriate system for improving agricultural production within the various social organizations and land tenure systems of the countries. Traditional patterns will change, but such changes should be controlled by the people themselves. A greater understanding of and desire to work with traditional social organizations rather than exclusively fostering the individual entrepreneur, will provide the region's communities with a choice of alternative approaches to best fit their social and agricultural systems.

One of the major problems facing the USP project is the continuing low status of agriculture. A large percentage of young islanders desire to leave the village and the farming profession for more rewarding occupations found in the urban areas. Throughout the region, schooling is viewed as the means for children to increase their wealth, status, power and opportunity for social and economic advancement. Generally, to achieve this has meant to leave the village agricultural activities.

There has been a strong commitment by the nations to literacy and formal education. While the Solomon Islands report only a 13% literacy rate (as compared to Western Samoa's 98%), the Solomon Islands have 55% of their children enrolled in elementary or secondary schools. Several countries report better than 90% enrollment (Niue, Tokelau, Nauru, Fiji). Education is used by parents to free their children from the hard physical labor and poor economic returns associated with farming, which has very low status throughout the region. Attempts to change the status of agriculture will not have an effect unless they are directed at increasing profitability and reducing the heavy labor costs of farming. This means that considerable emphasis must be placed on providing extension training and appropriate technologies so as to increase the lot of the village farmer, and to communicate the advantages of farming as an occupation through the school system.

The important role which women play in agriculture throughout the South Pacific region is recognized. In Melanesia, women perform the traditional tasks in the house while having responsibility for planting, weeding and harvesting subsistence gardens and the husbandry of pigs. In Polynesia, more agricultural work tends to be done by men. However, women are particularly active in animal husbandry, maintaining dairy cattle, and engaging in pig and poultry raising. Many are also engaged in maintaining small garden plots both for subsistence and cash.

Savings in time and labor from the introduction of more efficient techniques and tools have not accrued to the women. Almost all agriculture extension work to date has been done by men, for men. That sexual taboos limit communication between women and male strangers is one explanation of

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the gap. Another explanation is that women are unaware of how to take full advantage of the few opportunities that present themselves.

To enhance the contribution of rural women to the development process, more precise knowledge of women's contribution to the island economies is needed. Studies underway at the University of the South Pacific Center for Applied Studies and Development and other USP units will assist in the improvement of agricultural extension, adult education and family planning/health services for rural women. Increasing the enrollment of women in USP agricultural education and agricultural science programs also is underway to raise the regional awareness of the potential for women in agriculture.

In summary, notable social change has been recorded throughout the islands, resulting in appreciable changes in community and family living patterns and in individual behaviors. The impact of such changes on the social and economic fabric of fragile ecosystems has been severe, and the implications for the agricultural sector are quite serious. SPC reports summarizing the social breakdown in most parts of the region have noted that most of the South Pacific islands face some or all of the following social problems:

1. Increasing migration to urban centers with substandard living conditions.

2. Loss of rural agricultural manpower to the lure of cash wages.

3. Rising unemployment in urban areas due to lack of training and jobs.

4. Rising volume and cost of imported foods for which substitution could be made.

5. Separation of family wage earner seeking urban jobs leading to marital discord, neglected children, extramarital affairs.

6. Population increasing faster than family resources can support.

7. Breakdown in traditional patterns of family care of aged and handicapped.

8. Rise in juvenile delinquency and adult crimes.

9. Growing dependency on foreign aid.

10. Increasing consumption of alcohol and accompanying trauma to families and loss of human resources.

11. Cultural erosion due to heavy foreign media influx, including films, magazines, school texts, religious tracts, and music.

12. Undermining of the customary social value systems through commercialization of ceremonies, creative arts, and traditional hospitality.

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The countries of the South Pacific are challenged with meeting these problems, and must examine the costs of continuing economic growth at the expense of rapid social change. To counter these problems there is a great need for increasing the supply of local foodstuffs to the urban centers, for social redistribution of income and political power to the rural sector from the urban elite, for developing and enriching village life, for supporting communal lifestyles sensitive to the resource limitations of the islands, and for developing new employment opportunities for the rural sector. Agriculture is the most promising sector to address these needs, and the establishment of socially-sensitive agricultural REE capabilities in the region appears to be the best way to start.

B. ECONOMIC ANALYSIS

It is problematic how long many of the countries will be able to sustain the growth which has marked their economies over the last few decades. The strategies available to economic planners is, of necessity, constrained by the limitations the natural and human resources of the countries. The Pacific Island countries, in general, are too small to command the amount and variety of resources necessary to continue rapid economic growth.

The Pacific Nations differ greatly in structure and revenue derived from export trade, taxes, government services, tourism, remittances and foreign aid. The export trade for the region in 1977 amounted to $312 million, with agricultural commodities accounting for 57% of this total. Nauru's phosphate exports were 22% of the region's total, with all other commodities accounting for only 20% of the total.

Two commodities dominate the agricultural export trade, with sugar providing 62% and coconuts 28% of a total $178 million in 1977 exports. Three other commodities (cocoa, palm oil and ginger) account for almost all the remaining agricultural export trade.

The Pacific Island nations are all dependent on one or two major export crops. Fiji exported $110 million worth of sugar in 1977, and $11 million worth of coconuts. Western Samoa's major crops were cocoa ($8 million) and coconuts (million). Niue had $100 thousand dollars in vegetable exports and $80 thousand in coconuts. For the remaining seven countries (excluding Nauru which has no agricultural exports), coconuts were the only export commodity of any significance (total value $32 million), and it is subject to rapidly fluctuating world market prices. For example, the 1976 copra price in the region was approximately one-half that in 1977.

The importance of taxes, government activities and tourism in the economies of the countries is quite different. Taxation accounts for less than 15% of the total revenue raised in some countries (e.g., Cook Islands, Kiribati, Western Samoa, Tonga). Taxes account for 50% of revenues in Fiji. The Solomon Islands derives 75% of its revenues from taxes, and is the only country to levy an export tax (which provides 64% of the taxes).

An important source of revenue for some of the smaller countries (Cook Islands, Tonga, Western Samoa) is derived from such government activities as the sale of stamps and coins, electricity, etc. In some cases up to 30% of government revenues have been reported from these activities.

Tourism is still a fledgling industry in the South Pacific. Only Fiji derives high revenue from tourism, and that has not increased as rapidly as anticipated. The Cook Islands, Tonga and Western Samoa have also begun active tourism industries. Facilities and transportation in the other countries are minimal.

Remittances, private transfer of money into the country from individuals temporarily or permanently working outside, are important in several countries. Tonga and Western Samoa have tacitly supported the export of their youth, primarily to New Zealand, to maintain the $6 to $10 million each country annually receives through the mail.

Foreign aid support allows many countries to balance their budget. Budgetary aid primarily from the United Kingdom, New Zealand and Australia has been appreciable, but will eventually be reduced or phased out in some countries. Foreign grants still support most development programs in the region, particularly in the Solomon Islands, Tonga, and Western Samoa. Per capita official development assistance in 1977 varied from none in phosphate-rich Nauru and $36 in Fiji to $712 in Tokelau and $923 in Niue. Recent analyses of the impact of reduction in this aid have predicted that such a change must be met with drastic curtailment of present expenditures for government services, or a major expansion in other income-producing sectors to meet the costs of government services and the rising costs of imports.

The ability of many island nations to meet their balance of payments without outside assistance is problematic. The 1977 value of imports to the region was approximately $425 million, or 136% of the $312 million earned from exports in the same year. Food imports into the region amounted to 24% of the total import value, with an average of $79 per capita. Again there was a wide variation in the country statistics; Nauru averaging $259 per person for food and the Solomon Islands averaging only $22 per person.

Since the agricultural sector employs most of the islands' workers, and accounts for most of the export earnings needed to pay for the increasing imports of food machinery and energy needs, strengthening agricultural capabilities will have a major impact on the economic health of the region. Presently there is a need for improving the productivity of the agricultural sector, since its share of gross domestic product is usually much less than its relative share of the human and natural resources in the region. Because a large percentage of farmers are engaged in subsistence agriculture, rather than productive commercial agriculture, only about 40% of the total monetary output of most countries is produced by the agricultural sector. In some countries, such as Fiji, large scale commercial ventures provide a better economic return for their share of the labor pool, but even here there has been a sharp fall in total output due to a drop in the number of people actively farming.

From 21% (Cooks Islands) to 80% (Solomon Islands) of the labor force is reported to be engaged in agricultural activities. However, in the decade ending 1976, sharp declines in the percent of economically active laborers engaged in the agricultural sector had been recorded in Tonga (a drop from 74% to 51%), Fiji (drop from 54% to 44%) and Cook Islands (45% to 21%). In Western Samoa, this fall has been less pronounced, and in some countries, such as the Solomon Islands, there appears to have been an increase in the agricultural labor force due to new commercial ventures.

Employment problems in the various countries are often quite different. Generally, there is not widespread and persistent unemployment, although this is increasingly the case around urban centers as immigration from rural sectors increases. In the past, the surplus of urban youth has often been reduced by substantial out-migration from the Cook Islands, Niue, Tonga and Western Samoa. In some cases there is actually a labor shortage in the rural areas, where there may be insufficient manpower to initiate a development scheme. Some of the countries (e.g., Solomon Islands and Kiribati) have limited opportunities for new jobs, requiring that new labor force entrants be absorbed in the rural semisubsistence agricultural sector. Assistance is required in the creation of new jobs in both rural and urban areas, and in the provision of training for unskilled workers.

There are few sources of potential employment in the region outside of government, manufacturing, tourism and agriculture. Already in many countries government spending for services is difficult to maintain without foreign budgetary aid. With a surplus of urban labor, there is potential for increased manufacturing (which is presently between 2% and 11% of total output), but with a lack of other resources, only the processing of agricultural products appears feasible on a large scale. At the present there is relatively little processing of agricultural products in the region (the exceptions being sugar processing, extraction of coconut oil and canning of fish) and it is questionable whether the region is capable of increasing its agricultural processing capacity sufficiently to counter the increasing demands for import foods and manufactured goods. However, research and consultation to increase agricultural processing should be supported.

Any input in the agricultural sector must consider the importance of subsistence production as part of the overall economic picture. While few villages operate on a purely subsistence level, most mixing cash with subsistence cropping, a substantial percentage of farm labor operates without monetary incentives. Agricultural assistance brought into the region must take this into consideration, and seek to increase the efficiency of subsistence agricultural practices. At the same time, some attention must be drawn to the importance of supporting cash cropping, since it is through this sector that surpluses can be generated to provide exchange for imported consumption and investment products that the small island economies cannot efficiently produce.

Additionally, the regional agricultural sector needs to expand to cover the costs of increasing governmental and social services and to provide investment capital for new production.

Recent economic surveys of the region have not been optimistic about the ability of the agricultural sector to provide substantial new revenues without substantial assistance. Even with the most optimistic view of the possibilities for increasing capacity in fisheries and traditional crops such as coconuts, continued economic growth in the smaller countries of the region appears to be impossible. The region desperately needs substantial support in the agriculture sector. USP appears to be the most viable regional institution to affect change across the several island nations. USAID input to build regional agricultural capacity appears to be essential if the countries are to avoid either of the two most probable options that they face: Acceptance of a no growth state or permanent dependence on foreign aid.

C. ENVIRONMENTAL ANALYSIS

The range of environmental conditions and constraints in the South Pacific region parallels those described in the social and economic analyses. The resulting agricultural systems are varied both in their composition and the management practices which are applied.

Traditional subsistence agricultural systems, when not subject too many pressures for expanded production, are relatively stable and do not present any appreciable concern for environmental disturbance. The types of agricultural programs promoted by the University of the South Pacific School of Agriculture are expected to reinforce the viability of such subsistence systems and reverse (or at least stabilize) the potential environmental disruption which might be caused by exploitive development activities. The actual field manipulations expected to be performed in this project in the development and testing of such new methodologies are relatively small scale and will be done on existing experimental plots.

An example of an effective methodology which will be promoted by this project is the use of an adapted "Benchmark Soils" network where agrotechnology transfer is based on a thorough analysis of the soils and the application of practices developed for the specific soil characteristics. This will help minimize current problems of erosion, for example, by providing a large body of relevant information of optimal management techniques from experiments conducted elsewhere. This approach is environmentally efficient since it minimizes redundant experimentation and allows a focus on those items most in need of study.

Likewise, the promotion of adapted technologies for low-input farming systems, such as the utilization of Biological Nitrogen Fixation systems, is expected to make use of available knowledge and have an early impact on enhancing the field environments of subsistence agriculture. This may result in less land being needed (or it can be rotated in and out of production more slowly) and still achieve equivalent production levels.

It is expected that information will be provided on the utilization of what are now considered marginal agricultural lands, such as might be defined by either poor soils or a poor or inferior quality water supply. With the greater use of these marginal lands, it is expected that some pressure on the prime-quality lands will be removed and they may be better

preserved for long-term production. A variety of new or adapted practices are available which might be considered for use.

There are a number of natural hazards to agriculture which can influence the long-term success of development projects. Many of these hazards can have their effects minimized with the appropriate selection of plant material, farming practices or the use of appropriate technology. For example, the proper choice of crops will minimize disruption caused by high winds (or cyclones), some farming systems are particularly resistent to prolonged drought, and particular plant varities are better adapted for disease and pest resistance.

The USP project can make a number of contributions to the enhancement of the agricultural systems of the South Pacific region with the appropriate selection and adaption of many existing technologies. The programs must be fully integrated, by a consideration of all of the aspects of the farming system, if they are expected to be successful. Success in this region must consider the maintenance and enhancement of the environment. This is an achievable goal and the activities of the USP project are expected to provide the capabilities on which such decisions may be made.

RECOMMENDATIONS

A project is needed which contributes to the overall sector goal of promoting agricultural productivity and improving the socio-economic well-being of rural inhabitants within the South Pacific region. The process of arriving at this focal point has involved the comprehensive analysis of the economic and environmental factors within the region and the unique social systems which together determine the patterns and quality of life in the South Pacific.

Such a project would strengthen the University of the South Pacific's commitment to the region in agricultural research, education and extention by:

a. systematizing and reinforcing the human resource skills needed for agricultural programs in the region which will promote equitable social and economic development, and

b. test, perfect and disseminate practical, cost effective technologies through a viable outreach system with the respective national institutions into the region.

A project which works toward this goal would support the development objectives of the USAID South Pacific Regional Development Office as outlined in the Country Development Strategy Statement (CDSS).

An aggressive, long-term commitment to agriculture by the respective island countries is central to the economic development of the South Pacific region. As the major industry within the region, agriculture contributes the larger share to the gross domestic product, provides the major exports and employs the majority of the labor force. National leaders acknowledge that political and economic self-reliance will require increased investments in the agricultural sector. What differs are the strategies offered by the various countries to address agricultural concerns. However, all recognize the need to generate the appropriate resources and skills to serve their agricultural communities and all have made commitments to support USP agricultural initiatives.

The University of the South Pacific has been mandated to promote research, education and training activities in agriculture which are responsive to the well being and needs of the island communities within the South Pacific region. At present, the University of the South Pacific is unable to fulfill many of these vital services. Instructional staff, research activities, and the scope and quality of the agricultural curricula are limited and do not provide the necessary resource base to address the many complex development issues of the region's agricultural sector.

The agricultural outreach systems of the University of the South Pacific are not yet organized to adequately assist enough people involved in agriculture throughout the region. The USP program must be expanded, if it is to serve and support the diverse needs of the respective national agricultrral programs.

A strategy must be developed to strengthen the agricultural program at the University of the South Pacific. It must be able to provide appropriate, cost-effective, technological information to the region which addresses concerns in productivity, income, employment and such 'quality of life' elements as nutrition and home and community improvement in rural areas.

A project addressing these concerns is viewed as a long-term undertaking, extending up to 15 years. It would be primarily an institution building effort which would support USP's stated commitment to develop and use its research, education and extension capabilities in order to assist the nations of the South Pacific address their agricultural development concerns.

Several observations were made during the Baseline Survey which provide additional guidelines for the development of such a project:

a. Any enhancements to the REE system must be part of a comprehensive process which seeks integrated solutions to problems of improving agricultural productivity and meeting consumer needs.

b. Care should be taken to ensure that a critical mass of trained people is available to develop and maintain the institution which will provide the major assistance necessary to find solutions to the agriculture development problems.

c. The research programs should emphasize applied activities which lead to cost-effective, practical solutions. These must fit the technology appropriate to the region and be compatible with its environmental constraints.

d. The REE system must develop a vigourous outreach (extension) program which makes the most effective use of the people available to carry out this function. The outreach program must have the capacity to be refined and fine tuned to meet the variety of conditions found within the different nations.

e. The long-term utilization of the REE system will be enhanced if its value can be demonstrated in a relatively short period of time, and it can be shown to be relevant to the needs of the region.

f. The US collaborative institutions must be able to demonstrate their technical and administrative competence

as they are used to backstop the REE system. The proposed project activities must be delivered by a project which is reasonable cost effective and which demonstrates a sensitivity to the social, economic and environmental conditions of the region.

The University of the South Pacific, through its School of Agriculture - and its new Institute for Research, Extension and Training in Agriculture (IRETA), is in a key position to assist in the agricultural development of the South Pacific region. It has acquired the facilities and staff necessary to teach a basic curriculum with is relevant to the general agricultural needs of the region. It is now in a postion to expand, in a carefully determined way, to take a more active research and outreach role, and more fully realize its mandate as a regional institution.

The facilities of the School of Agriculture are in the process of expansion and the current construction program is expected soon to provide the basic buildings for a regional agricultural program. Only a few specific facilities, such as faculty housing (which is not available in the area), need to be supplied. The current faculty, now numbering 19, must devote most of their attention to teaching because of the demands of the curriculum and numbers of students. The addition of a limited number of faculty, staff and support personnel will allow both the current and new members to increase the breadth of the curriculum in the few areas where there are known deficiencies, take on new research projects which have high regional priority, and begin a systematic outreach program to transfer appropriate agricultural technology into the region. In addition, of course, appropriate support such as regional travel and specific equipment and supplies are also needed for the new activities.

The expanded agricultural program will have lasting benefit when it is integrated into the recurring programming and budgeting of the University of the South Pacific. Before this can happen, it will be necessary to educate and train a cadre of new faculty and staff to serve as replacements for the expatriate faculty who will provide the initial support for the expanded School of Agriculture activities. Over the life of the assistance proejct, this is expected to lead to increasing USP support for the new activities.

In addition to the on-campus activities, it will be necessary to transfer agricultural skills to the communities of the region. This requires more opportunities for students to attend the School of Agriculture and to make their eduction even more relevant to their countries' priority needs.

The provision of a small group of Agricultural Outreach Agents into the region will facilitate the full range of programs and serve as a direct link for the two-way flow of information between the campus and the countries.

Six major program areas have been identified as having the highest priority for subject area expansion or addition.

AREA 1: AGRICULTURAL EXTENSION

Purpose- To strengthen and further develop agricultural extension/communication activities to provide USP with appropriate skills and technology to support agricultural extension programs in the region and improve the capacity of the island nations' extension programs to serve their rural communities.

This activity should address the following objectives:

a. Development and teaching of courses in agricultural extension and basic communications methods and practices for diploma and degree level students.

b. Development of program linkages through training with the USP Extension (adult and continuing education) Program, including the use of the satellite facilities.

c. Organization and implementation of workshops, short courses and seminars for in-service training of extension workers within the region in cooperation with subject-matter specialists.

d. Preparation of technical agricultural information and materials for use by extension workers in the region, by assisting subject matter specialists.

e. Implementation of a staff development program for sustaining the agriculural extension effort with indigenous personnel.

f. Creation of a network of in-country agricultural outreach agents who are able to assist in the rapid and efficient implementation of programs.

At the end of the project, this activity should have:

a. Incorporated up to 2 courses in agricultural extension methods and practices, and 1 course in basic communications in the USP curriculum for diploma and degree level students.

b. Created a functional program linkage with the overall USP Extension Program, including the use of the satellite facilities.

c. Implemented up to 12 regional or country in-service training programs, supported by subject matter specialists, for up to 100 agricultural extension workers for up to 700 person days of training.

d. prepared and disseminated functional agricultural materials and information from an operational facility at USP to serve agricultural institutions and organizations of the South Pacific region.

e. Trained at least 1 indigenous extension person who may be placed at USP for continuing the programs in agricultural extension/ communications.

f. Established a network of up to 8 in-country agricultural outreach agents.

AREA 2: AGRICULTURAL EDUCATION

Purpose - To develop and establish new teacher education programs at USP which will reinforce and expand capabilities of vocational agriculture in the public/private schools and continuing education activities of the region.

This activity should address the following objectives:

a. Development of a curriculum for diploma level education and short term training in agricultural education.

b. Introduction and teaching of agricultural education courses which will be included in the general agriculture curriculum.

c. Preparation of curricula and teaching aids for use in vocational agricultural courses at public/private schools and continuing education programs.

d. Development of an in-service training course for use in countries throughout the region to upgrade existing agriculture teaching.

e. Implementation of staff development plans and programs for sustaining this activity with indigenous personnel.

At the end of the project, this activity should have:

a. A functional, diploma-level agricultural education program at USP providing up to 20 student graduates per year.

b. Incorporated up to three specialized agricultural education courses in the diploma program.

c. Prepared up to 6 manuals (guidelines) with appropriate teaching aids for use in vocational agricultural courses at public/private schools and continuing education programs.

d. Developed a functional, in-service teacher training course which is offered up to 2 times each year for 30-40 vocational agriculture teachers from the region.

e. Trained a teaching staff of up to 3 indigenous professionals through appropriate programs in the USP countries of the region.

AREA 3: AGRICULTURAL ENGINEERING

Purpose- To strengthen and reinforce the applied agricultural engineering programs at USP and develop skills in the outreach programs whereby appropriate, cost-effective technologies, based on basic agricultural engineering principles, can be used in rural communities throughout the region.

This activity should address the following objectives:

a. Development of new courses and reinforcement in existing courses in applied agricultural engineering at the diploma level.

b. Incorporation of basic laboratory/vocational instruction in engineering and manual skills for such areas as mechanics, carpentry, metal work, welding, electrical skills, and plumbing.

c. Development of program linkages with which the vocational agricultural engineering skills are provided to outreach workers in formal instruction or through workshops and in-service training programs.

d. Adaptation of basic technologies using agricultural engineering skills to assist extension workers with problems on farms and in the rural communities.

e. Establishment of cooperative arrangements with the agricultural disciplines at USP to provide technical services and maintenance for applied research and demonstration programs.

At the end of the project, this activity should have:

a. Instituted up to 3 new agricultural engineering courses for diploma and degree programs at USP and enhanced the workshop/classroom curriculum in up to 2 existing courses.

b. Introduced instructional programs for up to 6 new areas such as carpentry, mechanics, metal work, welding, electrical skills and plumbing.

c. Developed a functional program linkage between agricultural engineering and the agricultural education and extension training and outreach activities and participated in up to 10 regional or in-country workshops, short courses or seminars that involve agricultural engineering interventions.

d. Applied technologies which have been developed for farms and homes as domonstrations in 3 areas such as structural, mechanical, processing, storage and shop engineering.

e. Produced an operational support system for other USP disciplines to assist in equipment adaptation, use and maintenance.

AREA 4: CROP PRODUCTION AND SOILS

Purpose - To strengthen and further develop programs at USP and in the region which will provide better crop varieties, improved agronomic practices, and more adequate programs of agrotechnology transfer and the capability to do laboratory analyses of soils and crops for diagnostic purposes.

This activity should address the following objectives:

a. Development of new units for introduction into the curriculum of diploma and degree level students.

b. Expansion of field experiments on crops which hold promise for increasing agricultural productivity, reducing the need for chemical inputs, improving the availability of nutritious foods, and substitutes for imported commodities.

c. Preparation of technical agricultural information and diagnostic services on agronomic practices which may be used in outreach programs and the organization of workshops, short courses and seminars for in-service training of extension workers.

d. Establishment of updated baseline information for the region on agricultural environments, crops, productivity, and agronomic practices and the introduction of systematic planning programs which will enhance the sharing of appropriate agricultural technologies for small scale farming systems.

e. Expansion of existing soil and crop analysis capabilities to provide diagnostic services to the region.

f. Implementation of staff development plans and programs for sustaining this activity with indigenous personnel.

At the end of the project, this activity should have:

a. Incorporated new materials into the existing crop and soils curricula.

b. Selected and tested up to 10 crop varieties for use in the region and distributed propagative materials for regional evaluation.

c. Instituted a functional program linkage between the crop production and soils and the agricultural education and extension training and outreach activities and participated in up to 10 regional or in-country in-service training programs and seminars.

d. Produced up to 2 review reports on the status of agriculture and research activities in the region which may function as the basis of setting research and outreach priorities.

e. Utilized a systematic planning process to evaluate the bottlenecks to achieving production and utilization goals in up to 3 commodities.

f. Established an operational facility which is providing regualr diagnostic advice to the region on soils and crop problems.

g. Trained at least 3 indigenous personnel in crop production and soils who may be placed at USP.

AREA 5: NUTRITION AND FOOD TECHNOLOGY

Purpose - To introduce and develop nutrition and food technology instruction, research and practical outreach programs at USP which will provide appropriate skills for improving the utilization of the food resources in the region.

This activity should address the following objectives:

a. Development and teaching of courses in nutrition, food sanitation, and food technology for diploma level students.

b. Assist in the development of improved food processing activities appropriate to families, small farmers, food processing and service entrepreneurs, and local industries intent on increasing import substitution and appropriate export commodities.

c. Implementation of a program of staff development so that USP may assume the training and appropriate research to

address food and nutrition problems of the South Pacific countries.

d. Introduction of a system which will help indentify human resources capabilities for outreach activities, assess bottlenecks in the delivery of nutritional information and provide in-service training needs.

At the end of the project, this activity should have:

a. An operational nutrition/food technology unit at USP with appropriate laboratory and instructional programs to support training at the diploma level and capable of providing training to meet the subject area needs within the region.

b. Trained a core of up to 2 indigenous nutritionists and food technologists for placement at USP.

c. Developed up to 3 courses for inclusion in the USP curriculum in the areas of nutrition,food sanitation, food technology and preservation.

d. Created a functional program linkage to the USP Agricultural Extension program.

e. Completed up to 8 extension in-service workshops or short courses in nutrition or food technology areas for outreach workers in the region.

AREA 6: LIBRARY SERVICES/HUMAN RESOURCES DEVELOPMENT

Purpose - To enhance the institutionalization of the agricultural REE activities at USP by developing appropriate in-house skills to address the social, cultural, and economic issues and concerns within the region as they relate to agricultural development and strengthening the agricultural library facilities and services.

This activity should address the following objectives:

a. Development of programs at USP to perform needs assessments, impact analyses, development evaluations, and socio-economic research relative to agricultural REE.

b. Strengthen the applied research/outreach programs and related training activities with appropriate socio-economic inputs.

c. Development of an increased awareness of the role of women in agriculture and the initiation of programs to address the special needs of women farmers and entrepreneurs.

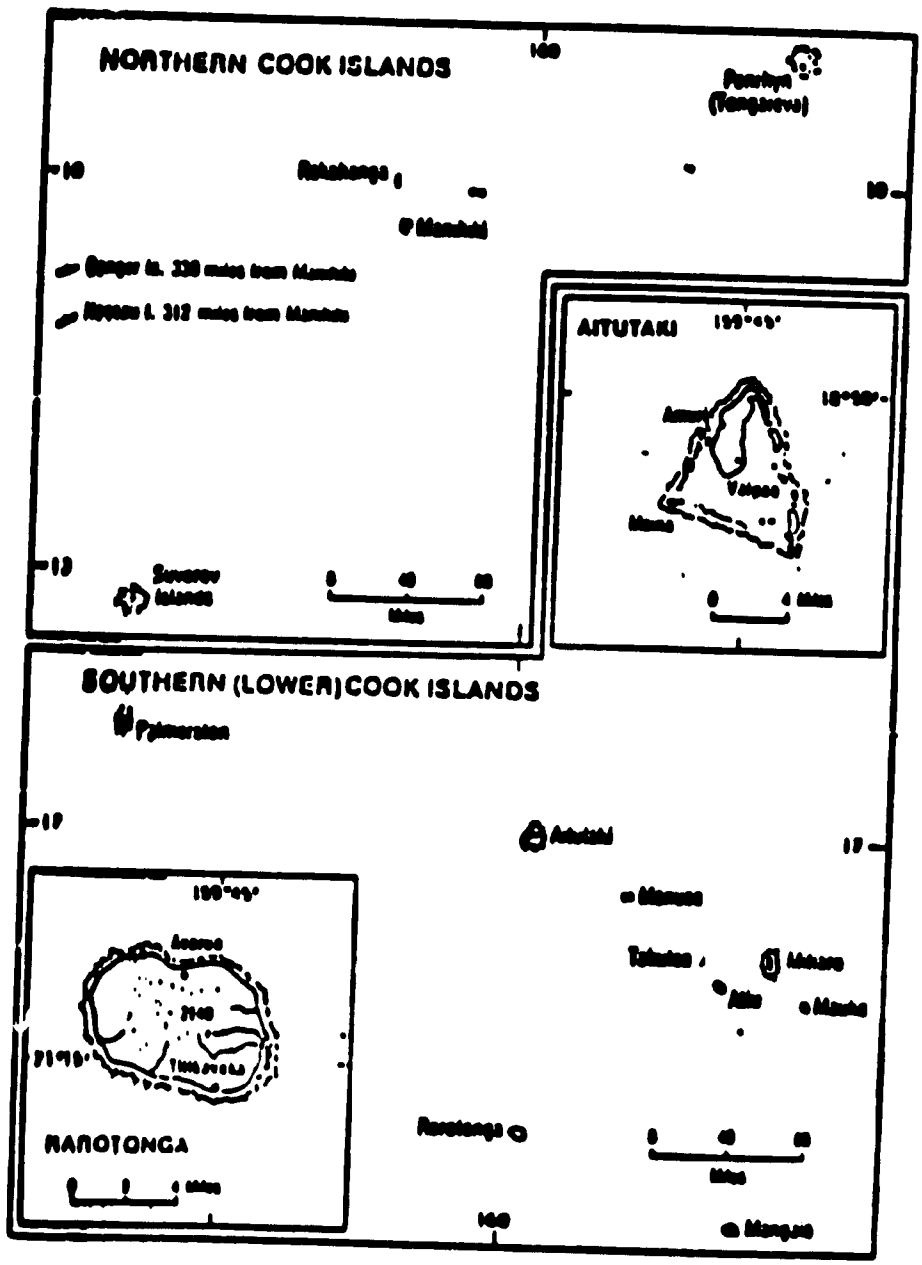
d. Expansion of library resources, response capabilities, and information retrieval and dissemination services in agriculture.

At the end of the project, this activity should have:

a. A functional capability within USP to address the relevant socio-economic elements relative to agricultural REE.

b. An adequate agricultural library with a trained staff capable of providing relevant resources and services appropriate to the professional staff, students and local, national and regional institutions.

COOK ISLANDS



PEOPLE

Population: 18,500 (mid 1978)
Net Annual Growth Rate: 0.7% (1973-78)*
Ethnic Groups: Cook Island Maori 92%, Maori/European 3%, Maori/French Polynesian 1%, European 3.5%.
Languages: English and local dialect
Literacy:
Life Expectancy: 63 years**

GEOGRAPHY

Land Area: 240 sq. km.
Capital City: Avarua
No. of Islands: 15
Terrain: low-lying atoll, some volcanic.

ECONOMY

GDP: $A 14.3 million (1977)
GDP per capita: $A 776 (1977)

TRADE

Export: $A 2.1 million
Partners: New Zealand 98%, Other 2%.
Imports: $A 15.3 million
Partners: New Zealand 83%, Japan 5%, Others 9%.

POLITICAL STATUS

*Net figure, Annual Population Growth Rate less emigration.

**Average for Polynesia, UN Secretariat "Selected World Demographic Indicators" 1970-75.

COOK ISLANDS

OVERVIEW

The Cook Islands are composed of fifteen islands scattered over 2,200,000 square km of ocean. Rarotonga is the largest island (67 square km) with 54% of the total population of 18,500 persons. It is also the most developed of the islands with the largest share of buildings, roads, utility services and schools.

The islands are divided into two main groups. The Northern Group consists of seven islands of coral formation. They are largely coral atolls at sea level, each enclosing a lagoon. The Southern group is comprised of larger islands of volcanic origin which are generally more fertile.

Agricultural products account for about half the export capacity of the islands and about 14% of GDP. In 1976, however, only 22% of the labor force was employed in agricultural activities and only 5.3% as a full-time occupation.

Agricultural production appears to be declining in both absolute and relative terms for the entire Cook Islands as the work force seeks employment in the service sector or in New Zealand. Strategies for expanding agriculture would have to incorporate the shortage of personnel as a key consideration. To attract personnel, wages need to be competitive with New Zealand and capital intensive methods of production would be required to replace labor intensive forms of production. For successful agricultural development labor might have to be brought in

from other islands. The cost of such an approach would be significant and the emphasis on capital intensive methods might exclude the smaller islands from participation (ADB 1979:350).

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

In 1970 the first agricultural census was mandated to determine both the level of activity and resources. This resulted in a major census effort on the main island of Rarotonga in 1975. Surveys of the other islands remain to be taken.

Climate

As a group the islands lie within a hurricane zone which produces storms every five to ten years. The climate otherwise is generally mild and modified by ocean trades.

Soils/Land

The Northern Islands are primarily atolls with reefs, and the soil is composed of loose deposits of limestone rubble and sand. Ranked as "low fertility" (ADB 1979), the potential for agriculture is extremely limited.

The Southern Cooks tend to have plateaus or terraces between the coast and central highlands, making them more suitable for agricultural activity. The higher and steeper slopes are now being cultivated and there is danger of erosion from some of this activity. Table 1.1 indicates the proportion of land suitable for annual or tree crops on two of the major islands.

Table 1.1 Land Area Suitability in the Southern Cook Islands

	Suitable For Annual and Tree Crops	Suitable for Tree Crops	Hilly/steep land Severe limitations
Rarotonga	22%	9%	68%
Mangaia	8%	41%	n.a.

Source: ADB 1979:5.

Water

Rainfall is distributed fairly evenly throughout the year, with a yearly average of 200. There are a number of streams on the island of Rarotonga; however, water can be a problem for the smaller islands.

Minerals

The country lacks mineral deposits except for a potential exploitable ocean-based industry in maganese nodules.

Crop Production

This discussion will distinguish between agricultural activity on Rarotonga and Mangaia.

In absolute terms, agricultural output has declined since 1960. Today, it is less than fourteen percent of GDP. A major factor in the decline in productivity has been the heavy migration of the workforce to New Zealand. In addition, the labor force has shifted from agricultural to service-oriented activities. Figure 1.2 indicates the relative decline in the proportion of the labor force engaged in agriculture.

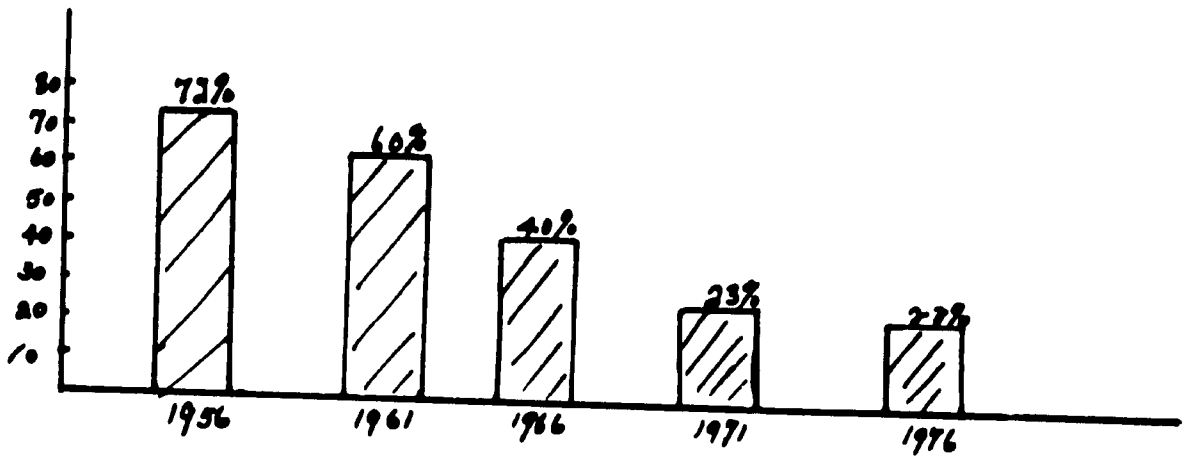


Figure 1.2 % Labor Force in Agriculture

Source: Government of the Cook Islands 1976b.

Major export crops include processed citrus juice (60% produced on Rarotonga), pineapple (from Mangaia), bananas, copra and papaya. Figure 1.3 shows the relative proportion of export value in each.

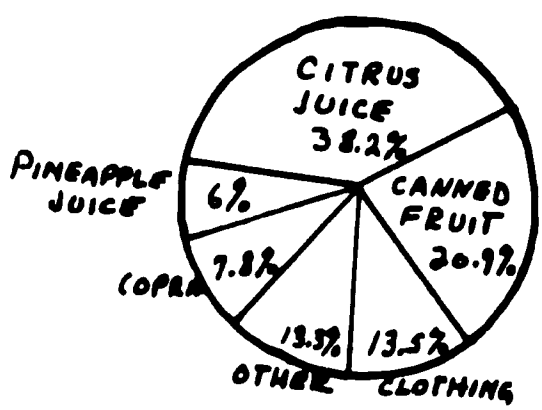


Figure 1.3 Proportion of Exports from Agriculture

Source: APRU 1977.

The Islands produced an average of 11,000 MT of rootcrops annually between 1961-76, 11,000 MT of coconut between 1974-76, and 1,000 MT of copra annually between 1961-76. Production has remained at this consistently low level for the past decade (Yang 1978).

There are 5,731 hectares under coconuts much of which is found on the coral atolls. As present yields are very low, there is a need to replant these with higher yielding varieties (ABD 1979). Figure 1.4 indicates the current pattern of land use by major crop.

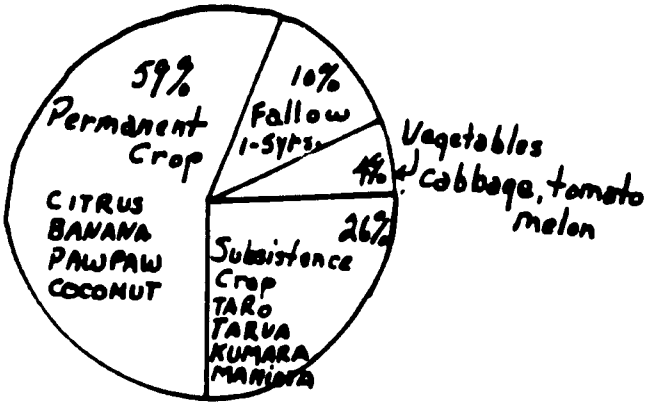


Figure 1.4 Land Use for Crops
(Total acres: 2,390)

Source: Government of the Cook Islands 1976a:z.

Citrus in Rarotonga

Rarotonga is a densely populated island and land is a continual source of tension among the people. There are 5,206 persons per square km of arable land in Rarotonga, fully 20% greater density than in the Cook Islands as a whole, and 84% greater density than in Fiji, by contrast. Agricultural holdings run to an average of 0.9 hectares, ranging from 0.3 to 1.6 hectares. In 1975 Rarotonga had only 0.1 hectares of agricultural land per person (Government of Cook Islands 1976a). The 1,543 land holdings in Rarotonga comprise 50% of the holdings in the Islands. Of this number, 68% are in agriculture.

Agriculture is a part-time rather than full-time occupation and is generally done to supplement both income and food supply. For example,

70% of the citrus orchards are on plots of less than 0.5 hectares. The average gross income per hectare is approximately $NS 425 (ADB 1979:351).

Treecrops are grown both on plantations, planted in a random fashion, or propagated naturally, and protected. There are more than 50,000 citrus trees, with 88% deliberately planted in citrus orchards and the remainder scattered on agricultural holdings. More than 50,000 coconut trees occur on the island with half on plantations and half scattered (Government of the Cook Islands 1976a).

Pineapple on Mangaia

Mangaia farmers are considering expanding the pineapple production to accommodate New Zealand's demand for fresh pineapples. Until 1978 the bulk of the pineapple crop was sent to Rarotonga for canning. Since the completion of the Managaia airstrip in 1978, farmers prefer to share in the higher prices that can be obtained by exporting fresh pineapple.

There are some problems with the pineapple industry which could threaten its survival. Pineapple production is heavily subsidized with New Zealand aid which provides fertilizers, chemicals, tractors and planting stock. These subsidies compromise the apparent profitability of the industry.

Mangaia also faces severe erosion problems resulting from present cultivation practices. The Asian Development Bank survey (1979) warned that soil conservation measures need to be taken to correct this situation. Taro represents a cash crop alternative to pineapple, as markets exist in Rarotonga and New Zealand, and Mangaia has considerable land area suitable for it (ADB 1979).

Livestock

The livestock population on the 3,033 Cook Island land holdings have been tabulated as follows, for 1976: 15,374 pigs (with 5.1 per holding), 2,684 goats, 267 cattle, 849 horses and 63,600 chickens (Government of the Cook Islands 1976b). It appears that the Cook Islands could achieve self-sufficiency in poultry if smallholder production were encouraged (ADB 1979:266).

Forestry

There are about 24,000 ha er natural forest cover, an area ranked as "not significant" in commercial terms (ADB 1979:276). There are only 5,730 ha cultivated with coconut, and it appears that the land resources will not support plantation efforts. The Cooks are now completely dependent on imports for wood products. Development of coconut stem, the only wood resource available, could result in a reduction of that import dependence (ADB 1979:288).

Agricultural Credit: No Information Available

Land Tenure: No information Available

RESEARCH, EXTENSION AND EDUCATION IN AGRICULTURE

Institutional Capabilities

In December 1975, the Government reorganized the existing Department of Agriculture into the Ministry of Agriculture, Marine, Scientific and Industrial Research. The Ministry is also known as the Ministry of Economics, Services and Natural Resources. The activities of the Ministry are carried out within seven departments and are described below.

In 1976/77 69% ($NZ 782,311) of the total estimated capital expenditure was allocated to agriculture. Rarotonga received 57% of the agricultural allocations. The Outer Islands Division received 35% and Marine Resources Division the blanace. There appears to have been no money allocated for research.

Ministry of Agriculture, Marine, Scientific and Industrial Research

The structure of the Ministry is illustrated in Figure 1.5. Briefly, the activities of the seven divisions are:

The Research, Planning, Promotion and Advisory Division conducts research and formulates plans. It is responsible for research on pesticides and fertilizers as well as providing plant protection and quarantine services. The Director of this Division has a MSc from the University of Hawaii in Agronomy and Soils. His assistant has a Diploma in Horticulture. In addition there is a plan protection officer (Diploma in Horticulture), an Assistant Plant Protection Officer (DTA-Alafua) and 4 Plant Quarantine Officers. In total, there were 8 staff in 1975/76 (Government of the Cook Islands 1977).

The Division of Central Administration provides clerical, accounting, recordkeeping, secretarial and other services for the Agriculture Department. There are branches in Atiu, Altutaki and Mangaic. The Division includes an Information Section which prepares agriculture materials for the press, radio, and bulletins. Staffing consists of 1 Chief Administrator, 2 account/clerks, 1 cashier, 2 persons responsible for filing, 1 typist, 1 information officer, 1 assistant officer, 1 driver, 1 senior store officer and his assistant and 3 paid laborers for the store. There are a total of 12 regular staff and 3 paid laborers (Government of the Cook Islands 1977).

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Staffing for the Division of Marine Resources included a Director (Diploma in Fisheries Management-UK), a Fisheries Officer (Certificate in Tropical Agriculture-Avele, W. Samoa), a skipper, an accountant, a chief engineer, an assistant engineer, 6 paid laborers and 2 consultants from UNDP and SPC.

The Division of Land Resources is subdivided into 4 Sections (Government of the Cook Islands 1977). The Citrus and Bananas Section is responsible only for Rarotonga, and is run by the Director of this Section. A nursery to provide seed stock for all the islands is also run by the Citrus and Banana staff. There is one Senior District Officer for each of the three districts of Rarotonga. In the Avarua District the officer that holds this position has a Disploma in Horticulture from Massey University. He has an assistant and a spray gang to work with him. The officer in Takitumu District has a school certificate from Teroora College and also has an assistant agriculture officers. The third District has a Senior officer and 2 Inspectors. There are a total of 8 staff in this subsection.

The second section is Market and Garden Crops and includes a marketing subsection run by the Marketing Director (trained overseas with 10 years of experience) and a District Extension Office subsection. The Section is responsible for vegetables, fruits and subsistence crop produced only on Rarotonga.

The responsibilities of the Livestock Section extends to all the Islands. The Director of Livestock has a Dipoloma from Massey University and 8 years of experience in the field. There is also an Animal Health Officer trained at Alafua, A Production and Management

Specialist, Beekeeper and a Cattle Farm manager. The Lifestock Section has 5 staff members and a number of paid laborers.

The fourth section, the Outer Islands Section is responsible for all activities on the outer islands. The section is headed by a Director and there are division officers and staff on ten other islands:

Aitukaka -	Division Officer Citiculturist Staff Spray Expert Coconut Toddy Specialist	Copra Officers on the following: Pukapuka/Nassau Penrhyn Rakahanga Manikiki Palmerston Island
Atiu -	Division Officer Pineapple Agronomist Citrus Specialist	

Citrus

A fertilizer application trial on citrus is underway to determine efficiency relative to soil conditions.

Extension Activities

The Market and Garden Division provides advisory work on plant propogation and conducts trials on vegetable crops, ornamental plants and fruits, with the exception of citrus, banana, pineapple and copra. They also provide advice on air freighting and marketing of fresh fruit and vegetables. There are three positions in each of the District Extension offices. Only one is filled by a Diploma Graduate from Alafua the other two are vacant. In addition to the staff are six paid laborers (Govt. of the Cook Islands 1977).

There are two other ongoing projects, one involving the SPC focused on the development of "Outer Reef Fisheries" and one involving the UNDP to develop commercial fishing industry.

Pig breeding for market rud taro production appear to be other areas of major interest.

RELATED SOCIAL AND ECONOMIC FACTORS

Exports/Imports

The Cook Islands have a trade deficit pattern similar to that found in many other Pacific Island nations. The country is unique in that it has a special relationship with New Zealand which reduces the impact of such a trade deficit condition on the social and economic welfare of her people. These islands are within New Zealand's monetary area so it is not affected by the internal balance of trade deficit. There are no restrictions on Cook Islands' trade with New Zealand. Finally, New

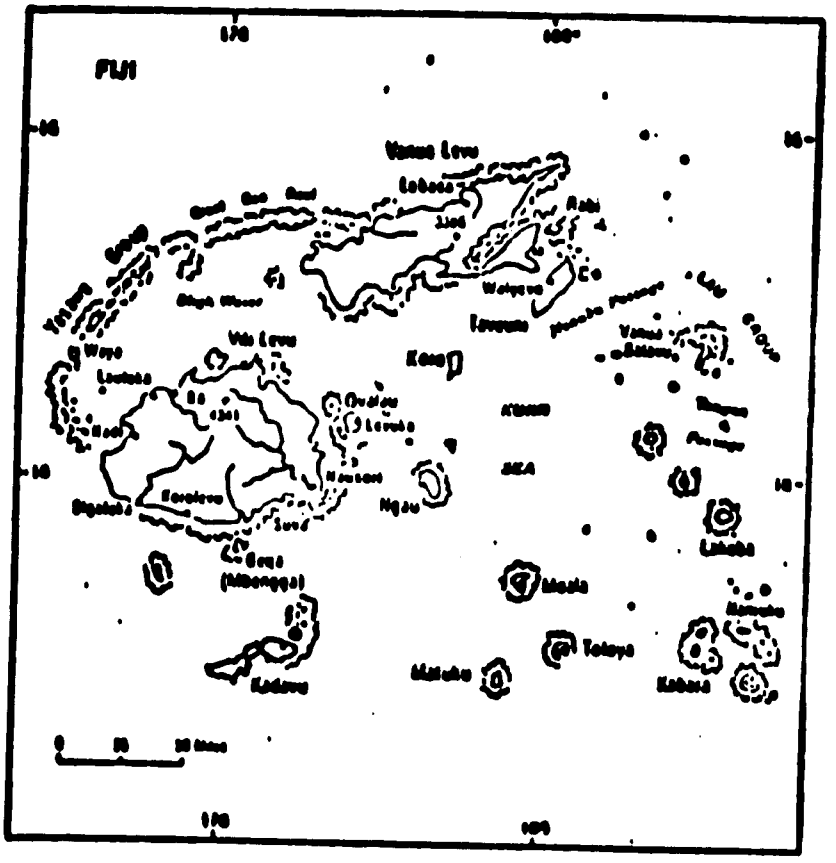
Zealand subsidized much of the cost of the Cook Islands' government, social services and production investment. Nonetheless, the Gross Domestic Product has been in a steady downward spiral with an average decline of 4.2% between 1970 and 1977.

Exports in 1977 were valued at $A 2.093 million, imports $A 15,348 million leaving a deficit of $A 13.255 million, three times larger than the 1975 deficit. Agriculture represented 47% of all domestic exports in 1977 and was valued at $NZ 1.73 million or approximately 16% of the total Gross Domestic Product (ADB 1979).

Official development assistance is one of the major means by which the deficit is balanced. In 1977, total assistance was valued at $A 6.78 million. It was 44% of imports and 47% of GDP. New Zealand's share accounted for 79% of the total.

Remittances from abroad and tourist earnings are also important balancing items. The number of tourist earnings are also important balancing items. The number of tourists visiting the Cook Islands in mid-1978 topped the 6,000 mark, and was much higher than the number of arrivals in 1977 (Govt. of the Cook Islands 1979).

FIJI



PEOPLE

Population: 612,000 (1978)
Annual Growth Rate: 1.8%
Ethnic Groups: Fijian, Indian, European, Rotuman, Chinese
Language: English (official), Fijian, Hindustani
Literacy:
Life Expectancy: 70 years

GEOGRAPHY

Land Area: 18,319 sq. km.
Capital City: Suva (Pop. 65,000)
Island Type: Volcanic; No. of Islands: 332

ECONOMY

GNP 177 million; Per Capita Income $1,100 (1977)

TRADE

Exports: 134 million
Imports: 261 million
Trade Partners: Australia, Japan, U.K., New Zealand, U.S.

POLITICAL STATUS

FIJI

OVERVIEW

Fiji is made up of 332 islands which vary in size from 10,000 square km to only a few meters in circumference. The two largest islands, Viti Levu and Vanua Leva, comprise 87% of the total land area. Fiji's population of approximately 612,000 inhabit only one-third of the islands. In addition to its land area, Fiji has declared an exclusive economic zone (EEZ) which increases its sovereignty by including a sea equivalent of 1,290,000 square km.

Agriculture plays a key role in Fiji's economy. The two primary commercial crops, sugar and corpa, together account for more than 70% of the total commodity export. Agricultural diversification is a major emphasis in Fiji's Development Plans. The Ministry of Agriculture and Fisheries oversees research, extension and training programs in a wide variety of crop and livestock areas. The Navuso Agriculture School, the Fiji College of Agriculture and the SPC Community Training Center provide local opportunities for tertiary training in agriculture and related activities.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

Southeasterly trade winds are predominate and temperatures vary little on a day to day basis. The daily maximum temperature range is from 30°-32°C (Dec. thru March) to 26°-28°C (July thru Aug). The corresponding minimums are from 22°-24°C to 19°-21°C respectively.

Rainfall is frequent and plentiful on the windward slopes, particularly from November to April. The protected leeward areas have a definite wet and dry seasons and receive between 18mm of rain (in the Nandi - Lautoka area) to 35mm (in the Suva area).

Land

Compared to most other Pacific Island nations, Fiji has a higher proportion of its total land area in plains or rolling hills. Thirty-two percent of Fiji's land area has been classified as flat or rolling land with slopes under 19 degrees. Sixty-eight percent is steep and hilly. Within the interior of the main islands; Viti Levu and Vanua Levu, high peaks rise to above 1,000 meters. These slopes and other environmental conditions prevent the planting of "temperate" crops in these areas. The potential arable land is restricted to discontinuous alluvial terraces and colluvial slopes along the river valleys. Thirty percent of the total land area is suitable for agriculture with little or no improvements; however, as of 1968 only 8% was under cultivation.

Water

Minerals

Crop Production

Farming produces crops for both local consumption and export markets. Plantation crops include sugarcane, rice and some bananas which are planted on the best land and sold in local or national markets. The main crops for local consumption are rootcrops, various native and introduced vegetables, rice and tree crops, e.g., banana, plantain, coconut and breadfruit.

Sugar exports account for more than 70% of Fiji's total commodity export. Sugar milling is the largest manufacturing industry and sugar farming is the largest single source of commercial agricultural employment, involving some 3,600 persons. Recently, good weather and expanded milling operations combined to produce 30% more sugar than 1978 (450,000 tonnes). Sugar receipts between January and March 1979 were $8,189,229.

Approximately 18,500 small independent farmers grow cane. Fiji has had 50 years experience with small holder production within the plantation mode. The original large colonial sugar estates were converted to a small holder industry with overall managerial services by 1920. Fiji-Indians were crucial in this process and were the first to lease lands for sugar under this system of production. They now grow approximately 90% of the country's sugarcane. Under this scheme, the government-owned Fiji Sugar Corporation provides assistance to the farmers and carries out the milling and processing of the cane grown by the independent farmers. After deducting processing costs the FSC shares the proceeds with the growers on a 70:30 basis.

Coconut products are the second major export earner in the agricultural sector. The industry has been fairly static during the past decade and is plagued with a variety of problems. Wide fluctuations in market prices as well as hurricane damage, irregular shipping, marketing and transport services, poor management, reduced quality standards and pests have resulted in a decline in production. Copra production in 1976 was 29,000 mt. The government has introduced price supports and subsidized replanting schemes to stabilize the industry and hopes to

increase the value of the crop by further processing into coconut oil and oil cake.

Agricultural diversification is a major emphasis in Fiji's Development Plans as both major crops, sugar and copra, represent a narrow economic base which is very sensitive to world market price fluctuations. Rice, ginger and tobacco production are being encouraged. Ginger production in 1977 was 1,815 tonnes valued at F$1,416,000. Other food exports include passion fruit juice and molasses.

The strategy is also aimed at reducing food imports, particularly of such staples as rice and flour. Import substitution strategies include improved production of root crops, local rice production and import control. There are difficulties with each of these. For example, intensification of root crop production on a commercial basis increases the likelihood of damage from pests and other diseases. However, there has been a fair degree of success with rice production in Fiji and the prospects for expansion are good.

Livestock

During the 67th Development Plan (1970-1975) beef production actually decreased. High killing rates of beef stock combined with hurricanes and floods were contributing factors.

Dairy production dropped from 937.2 tonnes of butterfat in 1971 to 371 tonnes of butterfat in 1975. The industry is primarily situated in the very wet southeast region of Viti Levu leading to difficulties in management.

Although Fiji is self-sufficient in egg production, increasing costs have forced some farmers out of business and production fell slightly during the 6th Development period.

Forestry

Forty-five percent of Fiji's land is under forest cover. Fiji is actively expanding its forestry potential. The Pine Scheme plantation program begun in 1972 is expected to provide substantial woodchip and softwood timber for local use and for export during the 1980s.

Fisheries

In 1977, Fiji harvested 5,498 tonnes of fish and was ranked second in the region behind the Solomon Islands (18,600). Tuna from Fiji is exported to Japan, the U.S. and Western Europe. In addition to its own catch, Fiji is one of the largest importers of fresh and frozen tuna for processing and export. In spite of such activity, however, Fiji must still import large quantities of canned fish from Japan for domestic consumption and distribution to the other Pacific Island countries.

Most fishing companies in the South Pacific are foreign or joint-venture companies. The Pacific Fishing Company, Ltd. (PAFCO) is one such company in Fiji. It is basically a processing and transhipment company which owns no vessels and buys fish from Taiwanese and Korean vessels. The cannery utilizes two-thirds of the fresh fish and the rest is made into fish meal for animal feeds. Fiji produced 560 tonnes of fish meal in 1978 and sold most of it locally to livestock farmers. The Fiji government also owns the Ika Corporation, a fishing company established in 1975 to develop a locally-based skipjack fishery.

Agricultural Credit

The Fiji Development Bank (FDB) was established in 1967 to provide financial assistance as well as engage in other related activities in the field of agricultural and industrial development. During 1974, the bank made 588 loans totally F$3,127,000. Of these, 489 were made for agricultural purposes. Sixty percent of the loans were made to sugarcane growers, 20% to livestock enterprises and 10% for the production of fruits, vegetables and rice. Copra, fishing and tobacco accounted for the balance of loan approvals. Livestock loans were largest in size with an average loan value of F$5,600 compared to F$2,400 for sugarcane and other crops.

Loans run from 1 to 15 years depending on the type of operation and capital purchased. Capital investment and/or production credit is the area of emphasis for loans by the FDB.

Another source of credit involving crop production is operated by the Ministry of Agriculture and Fisheries. Loans are made to growers for the purchase of production inputs. These loans are administered by the MAF extension staff and are limited to F$200 per person. There is no formal security required but the borrower must agree to pay back the loan within one year and show the existence of a market for his product.

A third source of rural credit, limited to F$200 per loan, is sponsored by the Fiji Government primarily for cane growers. These loans are for bullocks, production supplies, equipment and services. Interest is 7.5% with a payback period of 2-1/2 years. These loans are administered by the Fijian Affairs Board (FAB) through District Cane Committees.

Sugarcane farmers turn to the Fiji Sugar Corporation (FSC) for a major source of credit. This credit is for fertilizer, seed cane, fungicide, rice and sugar. Advances are also made towards covering the cost of harvesting, transport and tractor service.

In addition, there are more than 160 thrift and credit societies centered in the sugarcane growing areas of Fiji. This movement began in the late 1960's and reached a membership of 3,000 by 1973. The local credit societies made 1,936 loans totalling F$ 13,000 for family living, school fees and some farm inputs. Central credit societies made 179 loans in 1973 for farm equipment, buildings and debt payment.

Credit unions numbered 344 in 1973 with a membership of 47,000 people. Ninety percent of the loans were for less than F$ 200. Most were for personal and family expenditure with some farm inputs. Local shop owners are another source of credit for rural farmers particularly for the purchase of agricultural chemicals. Moneylenders are another important source of credit although many farmers find it difficult to break their dependence on them.

Land Tenure

There are three basic forms of agriculture production systems in Fiji, as with most of the large island nations. On one extreme are the large commercial farms which employ highly trained managers and paid labor while on the other are the purely subsistence farmers. The majority of farmers in Fiji are engaged in some combination of subsistence and commercial farming although the allocation of land and labor to one or the other varies from farm to farm.

Nayacakalan (1971) has described the Fijian land tenure situation relative to agriculture. Throughout Fiji, approximately 18% of all landholders are engaged in a combination of subsistence and cash crop farming. In this category, there are two types of landholders. The majority are Fijian village farmers using land under traditional tenure structures producing primarily for domestic consumption. These holdings are small (ranging from 2 to 40 acres) with family labor generally sufficing in lieu of mechanization.

A second and growing body of farmers are the small independent holders. This group had consisted almost exclusively of Fiji-Indians working leased lands until the last 20 years. Recently more native Fijians have chosen to participate in this form of farming. Independent farming is characterized by individual land tenure rights, either freehold or lease, employment of wage lab rers and production primarily for commercial markets.

Most of the land in Fiji, some 83%, is held by native Fijians under traditional land tenure arrangements. The rest is either Crown or private freehold land. Traditional land tenure is intimately tied with the Fijian kinship and family structure. Under 'native customary' law, land is held by partrilineally organized social units. Land registration follows the customary pattern and decision-making relating to the allocation and use of the land within such groups is a focal point of Fijian social organization. The influence one has in this process is an important expression of social status.

Over the years the traditional principles governing people, the land, and resources have been affected by the actions and policies of

the colonial government. The most significant change has been a shift in emphasis from communal to individualistic development schemes. During the late 1950s agricultural development work was carried out within the traditional land tenure framework. Since then there has been a trend away from programs centered on the communal land holding groups. To be eligible for financial assistance from development funds it has become necessary for an individual to show clear title to the land farmed. This has meant that individuals wishing to grow crop on land owned by the family unit must obtain an agricultural license or a lease in order to receive loan money.

Such changes have not occurred without some social cost. For example, the traditional land tenure system was flexible in the dispersal of parcels of land among kin. Most families worked a number of parcels of land located in various ecological zones. With parcels dispersed in this manner protection from a complete crop failure and diversity in diet was insured. Land could be exchanged or cultivated by members of another kin group in return for part of the harvest. Under the new system such transfer is more difficult.

In addition, the struggle of Fiji Indians, who constitute 51.1% of the population, has become a growing problem.

Indians were brought to Fiji between 1879 and 1916 as indentured laborers to work on the sugar plantations. Following abolishment of the indentured system, many of them stayed on and became independent farmers and businessmen. Today this group outnumbers the native Fijian population and is responsible for nearly 90% of Fiji's sugar production.

In 1976, reforms were introduced to the land tenure system which extend the length of time that Indians may lease land from 10 to 30 years and restrict the annual rentals to a maximum of 6% of the unimproved capital value of the land.

RESEARCH, EDUCATION AND EXTENSION IN AGRICULTURE

Institutional Capabilities

The Ministry of Agriculture and Fisheries (MAF) contains three major divisions as shown on the accompanying chart. Within the Department of Agriculture headed by the Director of Agriculture are four sections: Animal Health and Production, Extension, Drainage and Irrigation and Research. Between 1976 and 1980 research was allocated 4% of the total agriculture budget while 45% was designated for field works. The Services Division, the 2nd largest unit of the Ministry, is also divided into four sub-units (Administration, Fiji College of Agriculture, Information, and Economics Planning and Statistics). The Ministry of Forests incorporates the former Forestry Department and Fiji Pine Scheme. This industry functions autonomously.

Research Activities

There are nine major agriculture research stations in Fiji. Seven are located on the Island of Viti Levu and two are on Vanua Levu. These stations have primarily been involved with field experiments on various crops, cattle-raising, soil analysis, climate measurements, and methods of pest and disease control. The specific problems addressed are generally identified by the Extension unit. The main function of Research Division to provide back-up research and technical information

to the extension efforts. In 1974, the research staff consisted of 26 graduate level researchers, 100 assistants and 150 supporting staff. On-going and proposed research activities include the following:

Coconuts

The future of coconut production in Fiji is limited and consequently small growers are being encouraged to diversify into othe crops such as cocoa, yagona and root crops. The larger coconut plantations will be given advice on how to integrate coconuts with cattle. The main research thrust between 1975 and 1980 (according to the Fiji 7th Development Plan) has been on small scale processing of coconut and such coconut bi-products as charcoal, coconut fiber, desicated coconut, lolo, coconut oil and particle board.

Fruits

A multi-purpose processing plant is planned for Vanua Levu. Research is being conducted on improved varieties, root stocks, pests, disease control and the processing of fresh fruits into jams and marmalade.

Vanilla

Trials with vanilla were planned for the 7th Development Plan (1975-1980) in the Central and Northern Divisions. Following the trials 3-to-5 acre blocks will be planted to determine the commercial potential of vanilla as a chas crop.

Root Crops

Although dalo (taro), tapioka, rumala and yam have been grown as traditional crops for home consumption, the urban markets in Fiji show a commercial potential for these crops. Extension efforts will be focused

on increasing yields per acre and on year-round production. During the 7th Development period (1975-1980) efforts are being focused on the processing root crops.

Current research on ginger has been focused on nematodes and other ginger diseases. Fertilizer trials have been conducted under various soil conditions. The Food and Technology Units is investigating the processing of ginger for local and export markets.

Vegetables

Studies are underway on varieties of vegetables with extended growing periods, methods of production, including controlled environment, as well as storage and processing.

Chilies. Chilies are currently being promoted as a diversified crop. Research has been focused on methods of drying and processing.

Cereals and Legumes. Field trials have been conducted on sorghum, maize, and pulses. Additional research is planned on mechanization and processing for peanuts, sorghum and pulses.

Livestock

Beef. Research efforts will continue to focus on increasing the carrying capacity of existing pasture and on improving the economics of beef farming.

Dairy. Work is currently underway on dairy pasture management, zero grazing, Navua sedge control and supplementary feeding. Research stations are responsible for the production of replacement dairy bulls, T.B. and mastitis testing programs.

Poultry. Research is planned on poultry feeds, shed designs and production costs.

Swine. Experimentation on local feeds and the breeding of stud boars is planned.

Extension Efforts

Extension activities are carried out under the auspices of at least three governmental units. The Ministry of Agriculture and Fisheries is responsible for extension efforts relating to farm production and livestock while extension programs involving sugar cane are the responsibility of the publicly-owned Fiji Sugar Corporation (FSC), which hires its own agricultural officers. The Ministry of Fijian Affairs and Rural Development, through its Women's Interest Office (WIO) provides extension support services to more than 1,200 Women's Clubs throughout the country.

Within the MAF extension programs are conducted by the Extension Section of the Department of Agriculture and the Information Section of the Services Department. In addition, the various agriculture research stations host a number of field days throughout the year. These gatherings are designed to promote interpersonal communication and to allow farmers to view demonstration plots and to speak with extension agents and farmers from other areas.

In 1975, before the Ministry was divided into separate ministries for agriculture and forestry, there were 580 agricultural extension officers and field staff of which 268 were in direct contact with farmers (140 in agricultural extension, 69 in fisheries, 3 in forestry and 56 in the Pine Scheme).

The 7th Development Plan projects an increase in Extension Division staff to 775 by 1980. Agricultural Extension Officers work out of 44

offices located throughout the country. They are assisted by fieldmen, generally older experienced farmers between the ages of 40-50 who have had no formal agricultural training but have grown up on farms in the areas where they are assigned to work. In 1975, 30 fieldmen were employed to assist the 140 agricultural agents with their average load of 1,500 farmers. The agents work primarily among cash crop farmers. The government estimates that 60% of all agricultural information is transmitted to farmers through extension agents. The extension efforts of the agricultural agents of the MAF are complemented by the services of the Women's Interest Office. In 1975, the WIO extension effort was being coordinated by 24 Interest Office assistants, 16 of whom had been trained at the South Pacific Commission Community Education Training Center at Suva. Agricultural extension officeers are required to pass the college certification examinations, attend a 1-year course at the university of the South Pacific and receive an additional two years of training at the Fiji College of Agriculture.

Mass media is an important tool in agriculture extension efforts. There are 10 staff members assigned to the Information Section of the Services Division of the MAF. Staff members have received media training from internships provided by the Fiji Broadcasting Commission, training seminars by UNESCO in Suva, on the job training and media study programs in London, India, and Malaysia. All the staff speak at least two languages, English and Fijian or Hindi, and have three or more years of experience at the Center.

Radio is a prime means of communication in Fiji and ranks second to personal face-to-face interaction as a medium of exchange between

farmers and the MAF. Since 1972, regular broadcasting hours have provided at least 13 farm-oriented programmes in Fijian and Hindi.

The Information Service also produces a variety of brochures on different crops and farm-related issues (at least 50 such pamphlets were in print as of 1975). However, because of distribution problems not all brochures are always available at the various research stations and extension offices. Most of these materials have been produced in the three major languages.

Current and Projected Extension Projects

Rice. Fiji had hoped to be self-sufficient in rice by the end of the 6th Development Plan (1975). The results fell short of expectations due to high costs and shortages of staff and machinery. A major problem with the expansion of double-cropping was the high percentage of part-time farmers, a situation that is incompatible with the labor requirements of intensive rice cultivation. The 7th Development Plan aimed to improve this situation by encouraging full-time farming, increasing the number of rice specialists and by providing certified quality seeds and pest-resistant varieties.

Banana. Extensions efforts have been geared towards increasing yields and the feasibility of moving towards a plantation mode of productions.

Virginia Tobacco. The Southern Development Company provides all extension and marketing services under special arrangements with Fiji tobacco growers.

Root Crops. Ginger and other root crops are being introduced as cash crops by MAF Settlement Programs after the collapse of earlier Banana Schemes.

Livestock. Plans call for a 3% increase in beef production between 1976 and 1980. The decrease in production from the previous development period (1970-75) was expected to be reversed through the importation of 6,900 female stock from New Zealand and expansion of pasture. Extension efforts will focus primarily on increasing the number of combined coconut and cattle farms and by providing service to already existing cattle ranches. Additional training will be given to cattle farmers and extension agents.

In dairy, the 7th Development Plan projects an increase in milk production of 13% through increased yields and number of cows. Extension officers will promote whole-milk production as well as provide better milk collection services and cooling centers for small farmers. Some dairy farmers will be encouraged to remain in cream production while others produce ghee (Indian-style clarified butter) as a cottage industry.

Extension plans for poultry during the 1976-1980 period will call for increasing the output of small producers by encouraging the development of vertically integrated farms and close supervision of growers.

Education

The Fijian Government estimates that between 1975 and 1980 that 125 agricultural graduates will enter the labor force. Of this number, 90 students will have diplomas in agriculture and 36 are expected to complete their training in fisheries.

Agricultural training is provided by the government at the secondary and tertiary levels. Rural development training for adults is also provided by various churches and the government Rural Development Centers.

The Navuso Agriculture School, (established by the Methodist Church in 1923), offers three major programs, a 4-year General Agriculture Course, a 3-year practicum Student Farm Course, and a short 1-2 week adult training course. In the general agriculture course students are required to take 36 hours of instruction per week. One third of this time is spent in class and 2/3rds is in the field. The objective of this program is provide agricultural training and experience and to help the students accumulate the capital necessary to start their own farms. Each student is assigned 8 acres of land and is supervised by the school staff. The student farmers automatically become members of a registered cooperative and may save as much as $F1,200 after 3 years.

The Fiji College of Agriculture at Kronomivia founded in 1954 is the main institution for the training of Agriculture Officers and sub-professional staff. In 1978, the faculty included 6 full-time and 15 researchers/part-time instructors. Present enrollment is approximate 150 students. In addition to a two-year training course, those students who will become Agriculture Officers receive an additional year of training at the University of the South Pacific.

Additional agriculture and rural development related training is provided by the South Pacific Commission Community Education Training Center at Suva. The SPC Community Ed. Training Center at Sufa offers a ten month training course to community leaders in Fiji and 18 other nations. The curriculum includes courses in food production, nutrition, home manag ment, health and hygiene, community development and family planning. Most of the extension assistants working out of the Women's Interest Office of the Ministry of Fijian Affairs and Rural Development, have been trained at this center.

RELATED SOCIAL AND ECONOMIC FACTORS

Balance of Payments and Trade

Fiji's trade balance (exports less imports) has grown steadily worse over the last ten years. In 1972, the trade deficit was F$65,967,000; it jumped to F$100,219,000 during the oil embargo of 1973 and further increased to F$130,123,000 in 1978.

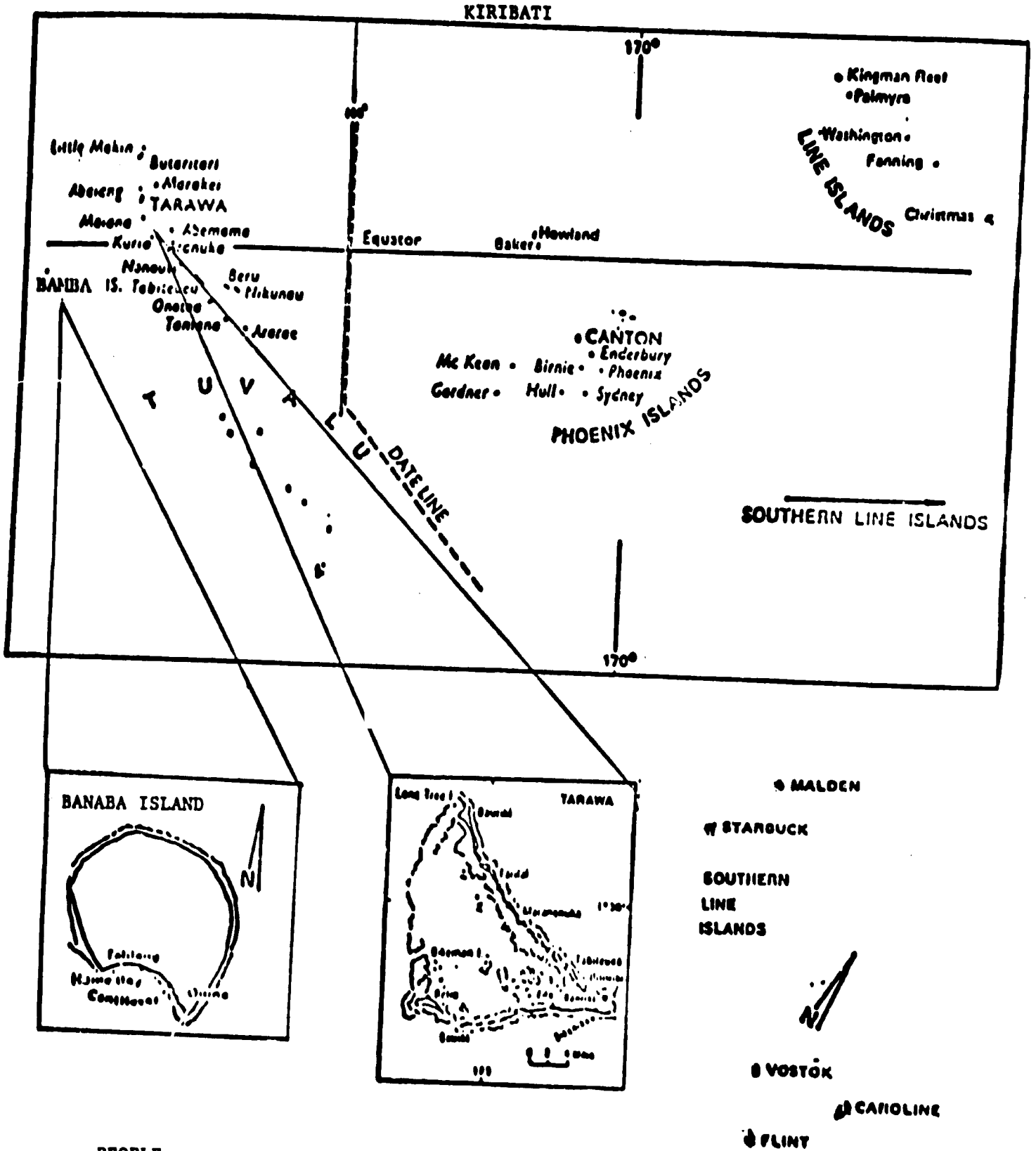
Imports during the first quarter of 1979 amounted to F$80,605,790. Machinery and transport equipment accounted for 23.5% of total imports, followed by manufactured goods 18.4%, food and mineral fuels 17%. Thirty-three percent of all goods imported during this period were from Australia. Other important trading partners are the Japan, New Zealand, the U.K. and the U.S.

The United Kingdom, New Zealand and Australia are the major purchasers of Fiji products. Exports of locally produced products totaled A$144,300,000 in 1977. In addition, Fiji is the largest re-exporter within the Pacific Region, particularly to Western Samoa, Tonga, Kiribati and Tuvalu. In essence, Fiji acts as a wholesaler to these islands. Re-exports in petroleum and petroleum products to supply the interisland transportation systems totaled F$10,657,000 during the 1st quarter of 1979. Exports of biscuits, paints, cement, corrugated iron and steel totaled F$1,380,000 during the same period.

Government officials are anxious to arrest the growing trade deficit by diversifying and providing incentives to increase agricultural production for import substitution and trade. However, much of the deficit is due to expenditures on development programs that are partly financed by foreign aid grants and loans.

Foreign aid to Fiji totaled $A19,070,000 in 1977. Of this amount, $A16,896,000 was provided under bilateral agreements. Thirty-nine percent of the total was provided by New Zealand followed by Australia (32%), the European Economic Community (8%), UNDP (3%), the U.S. (0.6%) and Canada (0.1%). This aid represented 3% of the GDP and 7% of total import expenditures in 1977.

KIRIBATI



PEOPLE
Population: 56,452 (1978)
Net annual growth rate: 1.9%
Ethnic groups: Micronesian (94%), Polynesian (4%), other (2%)
Languages: Gilbertese, English
Literacy: 90%+
Life expectancy: 53 years

GEOGRAPHY
Land area: 719 sq. km.
Capital city: Tarawa
Number of islands: 33
Terrain: coral atolls

ECONOMY
GDP: $A 34.9 million
GDP per capita: $A 625

TRADE
Exports: US$ 18.2 million (1977)(US$ 3.2 million(1982 projected))
Imports: US$ 11.7 million (1977)(US$ 19.1 million(1982 projected))

KIRIBATI

OVERVIEW

Kiribati, formerly known as the Gilbert Islands, consists of 33 islands in four main groups (the Gilberts, Phoenix, Northern and Southern Line) plus Banaba Island (Inder 1978: 175). The total land area is 719 sq. km within an ocean area of 5,000,000 sq. km.

Population data from 1978 (Navunisaravi 1979) indicate a total population of 56,452 with an annual growth rate of 1.7%. Because the country is composed of many far flung islands, the population is isolated in small communities which average 2,000 persons and tend to be quite self-contained. Tarawa is the most populous island with one-third of the population living near the urban centers (ADB 1979: 333). Due to the geographic situation, the islands depend very heavily on transportation and communication as their lifeline.

Between 1975 and 1977, Kiribati was one of only two countries in the Pacific whose exports were greater than imports (Dommen 1980:4). The surplus resulted from the mining of phosphate deposits on the island of Banaba (formerly Ocean Island). The mining was terminated in 1979, an action that is likely to alter the balance of trade from a large surplus to a substantial deficit (Govt. of Kiribati 197-:33).

The government will seek to restrict the level of imports by developing local production of food and energy (Govt. of Kiribati 19 :33). Coconuts, fish and the Reserve Fund (from the mining) are Kiribati's major resources, actual or potential. At present, agricultural activity accounts for only 10% of GDP (ESCAP:12). Generally, subsistence affluence augurs well for the potential to expand production into marketable quantities of agricultural products. The absence of population

pressure on land resources, favorable climatic conditions plus efficient local systems of agriculture result in maximum exploitation of land and sea at minimum energy output (Fisk 1978:94). In Kiribati, given the limited soil resources, it remains to be seen whether production can be expanded.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

From March to October the climate is pleasant, but becomes somewhat oppressive during the rainy and windy season, October to March. Temperatures generally range from 26-32°C (Inder 1978:179).

Land/Soil

Kiribati is a chain of islands strung out over the very dry equatorial zone. Atoll terrain, the coral rock is covered with only about 2.5 m of hard sand and only scant soil (Inder 1978:179). Nutrient levels of coral soil are low and lack humus; therefore, they have little capacity to hold water (Fisk 1978:94). Although most islands enclose a lagoon, there are no rivers. The islands are only 4 m above sea level (Ka 1979:53). There are few indigenous plants and those that grow well are exploited.

The natural limitations of the environment with respect to soils, trees and plants, periods of drought and an almost continuous shortage of water all contribute to a careful use of Kiribati land, a precious and scarce resource (Ka 1979:2). "To a Kiribati, land is highly valued and apart from being the basis of subsistence, has social, political and legal significance" (Ka 1979:31).

Rainfall/Water

There are wide variations in rainfall patterns both between island groups and between islands within groups. Coupled with the absence of rivers, it produces a general scarcity of water. Some yearly averages for rainfall are: Gilbert Islands, 1000; Tarawa - Phoenix Islands 1000-1500 mm; Line Islands, 700-4000 mm with Christmas Island receiving the least of this group) (Inder 1978:179).

Minerals

Phosphate has been Kiribati's most important export but was depleted on Banaba in 1979.

Crop Production

Commercial

In the rural areas, the major source of cash income is copra production (Govt. of Kiribati 197-:93). The northern islands tend to be the center of the copra industry because of their greater soil fertility, rainfall, and the location of the best anchorages (Ka 1979:51). In 1978, total copra production amounted to 10,257 tons with small holders producing 80% and plantations producing the remainder. The production proportions tend to remain fairly constant, however, overall production can vary significantly from year to year. Production in 1978 was 30% greater than 1977, and 16% less than production in 1974 (Govt. of Kiribata 197-:93).

Traditional Subsistence

Most Kiribati depend on subsistence production for their living. While only 8 percent of the National Income is provided by subsistence farming, this relatively small proportion (valued by labor input)

inaccurately reflects the value of subsistence production in terms of the standard of living potential it provides (Govt. of Kiribati 197-:26). Cash income from subsistence cropping amounts to approximately $50 per person, yet most families engaged in the subsistence sector have additional cash income from copra production or remittances and maritime employment (Govt. of Kiribati 197-:26). Figure 3.1 indicates the types of subsistence production activity.

Subsistence labor traditionally has been regulated by sex and age. Housework is done by women, and heavier work (babai pit digging, toddy-cutting, and construction) is performed by males. Cultivation is shared by both sexes (Ka 1979:35).

Potential in agriculture is not great in the coral atoll environment whose limitations have already been enumerated. Imports of food in 1971 accounted for about one-third of total imports. Babai, a staple root, can only be grown in pits excavated to the water lens, enriched with compost and specially prepared soil. Breadfruit must be continuously composted and on the drier islands even pandanus and coconuts are killed by periodic drought. The mean annual rainfall in the north at Butaritari is 3,163 mm. while in the south on the Island of Tamana it is only 1172 mm. Drought is common in the south (Fisk 1978:95).

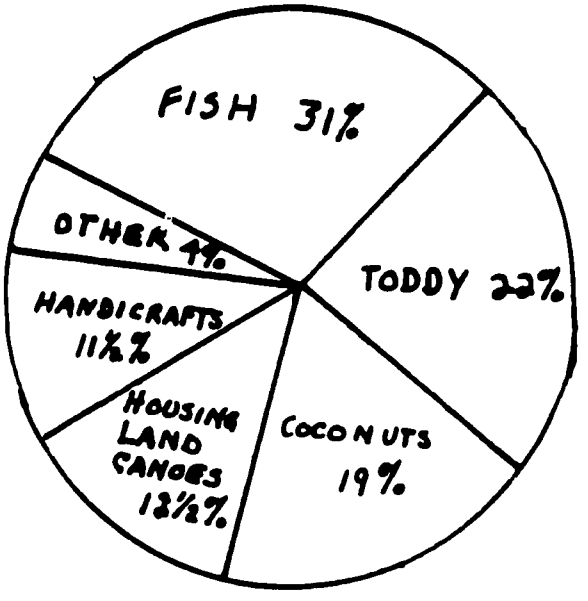


Figure 3.1. Types of Subsistence Production

Source: Govt. of Kiribati :53.

The introduction of exotic crops has been unsuccessful. Vegetables such as tomatoes, eggplant, onions, various Braisica, carrots, cucumbers, beans and other curcubits have been tried by the Division of Agriculture in both hydroponic taks and sand plots. Sweet potatoes, papaya, and citrus fruits have been only marginally successful. The main constraint thus far seems to be the need for high inputs of fertilizer. It has been suggested that composting techniques using leaf-fall of native plants and manure from villages may be a solution to this problem (ADB 1979:334).

An alternative to Kiribati's dependence on imported foods may be the intensification of multi-storied cropping. 'Compound gardening,' as practiced around South Pacific villages and Southeast Asia could be a means of increasing local starch, vegetable foods, fruit and nuts. The

expansion of tree and shrub crop cultivation of this type in the fragile eco-system of an atoll would not necessarily compete with coconut cropping. Because labor output is small, the expansion of multi-story cropping offers a means to increase the proportion of local produce in local diets. Even as a major project, however, it promises to be only a part solution to the larger problem of import substitution (Ward 1979:342).

Livestock

Pigs and poultry are the primary livestock bred by local people for subsistence. Meat, chickens, and eggs are the primary food imports (Govt. of Kiribati 19 :95).

Forestry

Timber imports cost Kiribati $150,000 annually and the government is trying to encourage local production (Inder 1978:180). In 1974, seven acres of local timber had been planted in Temaiku on land never before used for forestry. Because of the drought that year there was little further progress (Great Britain Colonial Office 1974:37). Trial planting of imported and local trees in collaboration with SCIRO of Melbourne achieved little success (Inder 1978:180).

Many old trees have been felled in the coconut replanting program and so far have been left to rot instead of being used for construction. Coconut stem timber could soon be produced in Kiribati by New Zealand aid which has supplied the portable mill. It has been suggested that permanent mills would be well worth the investment. They are potentially useful in a coordinated effort to reduce timber imports while disposing of disregarded trees in the coconut re-planting scheme (ADB 1979:341). The coconut may also yield a source of energy, as the fossil

fuel problem becomes acute. Charcoal may be made from the coconut palm as well as fuel wood (ADB 1979:341). Delays in manufacturing new sawmill equipment prevented the projected operation of the mobile sawmill in 1977. This mobile sawmill would also be able to take advantage of timber on the various islands (Govt. of Kiribati 197-:97).

Fisheries

Kiribati abounds with marine life which is its most promising resource. Kingfish, snapper, and tuna form the staple food of the islander's diet and are caught by netting, trolling, hand lines or in fish traps. Lagoon fish and shrimp farming are promising areas for aquaculture. The development of skipjack and yellow fin tuna fisheries are also a possibility. This may be assisted by the successful project on bait fish culture (Inder 1978:179).

Traditional exploitation techniques vary from simple collecting to more elaborate indigenous technology such as stone fish trap. Traditional rights of land tenure extended into the reefs and surrounding ocean and infringements were punishable by death. Rights of access to fish traps are still strictly observed and inherited by next of kin upon death. Fishing and collecting shell fish in the lagoon was done by women, while deepsea fishing was done by the men (Ka 1979:35).

Agricultural

Credit

Land Tenure

Traditionally, the main social group in Kiribati has been the ka'ainga, a small group of extended families (utu) related through a common ancestor. Twenty to thirty people in each ka'ainga shared a

piece of land on which all member families built their homes, forming a hamlet. The land of the ka'ainga extended from the ocean to the lagoon of the atoll in strips, and include both ocean and lagoon reefs. In the reef islands the land of the ka'ainga extended from one ocean reef, across the island to the opposite ocean reef. Access to resources of a ka'ainga was limited to its members.

Even in the absence of systematic government regulation the islands themselves began to modify the traditional land tenure in the 1920's. Cyrtosperma (a tuber staple food) gardens were registered in the 1950's further demolishing ancient kinship ties and chiefly privileges. Sibling groups no longer shared communally in the labor and harvest. Individual land tenure was finally introduced in 1954 when the estates of the atoll were divided and many small parcels were allocated to individuals. The immediate result of land partition was that islanders cleared more land and planted coconuts, the only cash crop (Crocombe 1971:163).

Since 1917 sale of land to non-locals has been prohibited in most of the Gilbert Group. Washington and Fanning Islands in the Line group were owned in fee by Burns Philp and Co., Ltd. and the government has negotiated to buy back both. Christmas Island is owned and used as a plantation by the government (Inder 1978:179).

Land ownership is by customary law. The registered owner must pass on rights to a next of kin at death. There are some legal circumstances permitting other than next-of-kin inheritance, which accounts for a great deal of land litigation. The law of customary inheritance causes continuous subdivision of family land equally to all children. Some children have inherited plots of only three or four coconut trees and

fragmentation of the land has become a great problem resulting in land hunger generally accompanied by low standards of development and cultivation (Inder 1978: 179).

Basically land tenure is managed by the Gilbert and Phoenix Island Land Codes under the jurisdiction of Land Courts. Rights to land usage rather than ownership dominate the system, coconut gathering being the most important right. Boundaries are often disputed and ill defined (Govt. of Kiribati 197-: 15).

Kiribati have a type of indigenous cooperative of about 16 persons who usually function as middlemen buying goods from a store, reselling them in small quantities and accepting coconuts from the public. The profits are put into a common fund which is periodically redistributed. Participation in such a cooperative provides for an impetus to increase production or at least to establish projects on the local level. As will be discussed later, the Kiribati have definite attitudes by which they type money and hence predetermine its use. By forming cooperatives, the money earned is "big" money not "small" money and is therefore not a disincentive to production (Fisk 1978: 99ff).

RESEARCH, EDUCATION AND EXTENSION IN AGRICULTURE

Institutional Capabilities

Agriculture will play a key role in Kiribati in relieving the burden of high imports of food and energy products and in providing people in the rural communities with a better living condition. The Fourth Development Plan covers the period 1979-1982 and includes a number of aims and specific programs geared toward improving agriculture. Of the

eleven specific objectives in the Plan, the following four pertain specifically to agriculture-related projects:

3.1 To promote the development of new and existing industries based on marine and other resources.

4.2 To encourage improvements in the subsistence income or rural households.

4.3 To increase opportunities for cash earning in rural areas.

5. To develop an educational system that provides for the needs and conditions of the community as a whole in both quality and quantity. (Govt. of Kiribati 197-: 18-19).

Planning is being undertaken with the full realization that the fine environmental balance of the atolls tends to make rural farmers conservative and that development will be both difficult and expensive. Moreover, it is recognized that changes may upset the environmental balance and care must be taken to avoid damage to subsistence crops.

Developments during this period will focus both on increasing export capability and on reducing imports. Copra production, fisheries and brine shrimp are areas which will be counted heavily upon to produce a share of export potential, according to the Plan. (See Table 3.2)

Table 3.2 Exports

$'000 fob

	1974	1975	1976	1977	1978	Forecast 1982
Phosphate	18,851	26,745	17,155	15,741	17,849	--
Copra	4,871	950	956	2,432	2,513[a]	2,600
Handicrafts	13	37	36	30	na	100
Fisheries	--	--	--	--	na	300
Brine Shrimp	--	--	--	--	na	100
Other Commodities	310	2	--	9	na	100
Total Exports	24,045	27,734	18,147	18,212	na	3,200

[a] provisional

Source: Govt. of Kiribati 197-:32.

To decrease imports there is a need to increase production of the foods grown locally, as well as the identification and development of alternative sources of energy (alternatives to fossil fuel). In particular with respect to improvements in subsistence agriculture, the Government may focus upon increasing yields of existing food plants, introducing new food plants, providing financial assistance in new coconut planting as well as instruction in new fishing techniques and the formation of canoe passages (Govt. of Kiribati 197-:57).

There has already been significant progress in poultry and egg production. There could be an increase in the output of vegetables and fruit if the technology for automatic feeding of plant nutrients were to prove successful. In addition, there will be a heavy emphasis on the development of a tuna fishing industry. Dependent upon a secure supply

of baitfish, these plans can now move ahead as it has been demonstrated that baitfish can be reared in artificial ponds.

Three sections of the Plan, those dealing with Agriculture, Handicrafts and Local Production and Fisheries, include projects and training programs that relate specifically to agriculture.

Specific aims for agricultural development are as follows:

- To maintain the coconut new planting project at a rate of 500 acres per year;
- To implement a new planting programme on Christmas Island with a target acreage of 220 acres per year;
- To draw up a replanting project for Fanning and Washington Islands, for implementation on successful resolution of present negotiations concerning these islands;
- To establish an Agricultural Division office in the Line Group and commence programmes of vegetable production and livestock development;
- To develop the commercial production of timber from coconut stems produced by the coconut new planting and replanting projects;
- To develop vegetable and meat (poultry and pigs) production for import replacement;
- To continue research and development on subsistence crops;
- To improve subsistence livestock farming;
- To improve rural extension work in all aspects of agriculture;
- To maintain and expand the training programme for outer island staff;
- To control insect pests and rodents;
- To control animal diseases (Govt. of Kiribati 197-:96).

Specific aims for the development of handicraft and local produce related to agriculture are:

- To extend gardens of food produce for cash sales by distribution of quality seedlings from experimental gardens;

- To minimize costs in marketing and distribution (Govt. of Kiribati 197-: 104).

Specific areas of activity for fisheries include:

- Development of a tuna export industry;
- Licensing of foreign fishing vessels in Kiribati waters;
- Subsistence fishing and fishing for local cash markets;
- Brine Shrimp development;
- Development of other marine resources (Govt. of Kiribati 197-: 107).

Activities to support the aims in each of these three areas of activity -- agriculture, handicraft and local produce and fisheries include programs of research, extension and training activities.

Research Activities and Plans*

Food Crop Development

10.31 Work on subsistence crops will emphasize research, which has been neglected in the past . . . Capacity for research will depend on the recruitment of a second Research Officer.

10.33 Investigations will continue into new methods of cultivating food crops. A modern version of hydroponic culture known as Nutrient Film Technique will be evaluated . . . If successful, it is proposed to use the technique in commercial vegetable production . . .

10.43 The production of animal feedstuffs is unlikely to be possible. A considerable proportion of the ingredients of feedstuffs could be locally produced. The development of a local fishing industry offers the prospect of by-products, or even mainstream production products, suitable for animal feedstuffs. Extraction of coconut oil would also provide an ingredient of animal feedstuffs. These and similar opportunities will be investigated during the plan period.

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* All numbered paragraphs refer to material quoted from the Fourth Development Plan (Govt. of Kiribati 197-).

Fisheries

12.6 In parallel with the experiments with dories, the Government instituted a programme of research into the feasibility of culturing baitfish to supplement the natural stocks . . .

12.8 The trials were extended in 1976 when construction began on 40 hectares of ponds at Temaiku, South Tarawa . . .

12.10 The successful cultivation of baitfish eliminates the major obstacle to the development of a tuna fishing industry in Kiribati.

12.15 The Fisheries Division has carried out two major surveys over the last three years to lay the foundations for a local fish retailing industry . . . It gives comprehensive details of fish caught and distributed . . . also investigated fish consumption . . .

12.16 The second survey . . . involved catching, identifying and recording of all species found in Tarawa lagoon . . .

12.32 In conjunction with the development of the company a continuing programme of baitfish research will be maintained. The following aims are adopted for baitfish research:

- To continue the development of culture practices for the production of fingerling milkfish in quantities suitable for use as live bait in pole and line tuna fishing.

- To demonstrate the commercial viability of pond culture of milkfish on South Tarawa; to develop the most effective programme for pond culture;

- To survey the atolls of Kiribati and identify sites where commercially viable milkfish culture facilities could be established;

- To survey the naturally occurring baitfish stocks in Kiribati and evaluate the sufficiency of these stocks for a commerical pole and line fishing operation; to develop the most effective methods for capturing and handling wild baitfish;

- To index the surface tuna stocks available to pole and line fishing gear in Kiribati and to evaluate the relative performance of cultured milkfish fingerlings and species of naturally occurring fish as bait for pole and line fishing;

- To train national personnel in all aspects of baitfish culture and commercial pond management.

12.35 A study of infrastructure on Butaritari for the proposed tuna fishing base has been commissioned from the University of the South Pacific.

Extension Activities and Plans

Agriculture

10.32 Work on exotic food crops will concentrate on production. Additional agricultural demonstration gardens will be established to encourage vegetable production in the villages and for marketing in South Tarawa . . . Good quality planting material will be made available for development of village gardens. Later in the plan period further demonstration gardens may be established on other islands with airfields. The airfield construction programme during the plan period will provide all islands of the Gilbert Group with airfields and consequently all will have the possibility of access by air for exotic food crops to the South Tarawa market.

10.34 An extension campaign will be launched during the plan period with a view to improving crop production. Pamphlets and books specially designed for local conditions will be prepared by the Agricultural Division in cooperation with other government ministries. Community organisations will be encouraged to become more involved in agricultural activities and improvements in production of both local and exotic crops will be stimulated by island and inter-island competition.

10.35 The project for distribution of hand tools will be retained. It is proposed to distribute a further 2,000 sets in 1979, giving about one set for every two families . . . The sets consist of a small axe, shovel, spade, crowbar and machette.

Livestock

10.36 Livestock development will continue to concentrate on improved output from subsistence stock through cross-breeding with quality stock. The main emphasis will be on poultry improvement, since this stock can contribute more than any other to improvements in subsistence diet . . .

10.38 The output of improved pigs for village distribution will be retained at its present level of about 200 weaner pigs per year. By the end of the plan period, about 1,400 pigs will have been distributed. At that level of distribution, further multiplication of improved stock should be possible on the islands themselves, given proper supervision.

10.41 Production of eggs might also be increased, particularly if local wage earners adopt eggs as a regular item of diet. The nutritional value of eggs could be important in the campaign against malnutrition (see Chapter 12).

10.44 It is expected that local staff will take over the operation of the livestock breeding, improvement and distribution programme, and development of commercial projects, during the plan period. The livestock extension services will also be run by local staff. An expatriate livestock investigation officer will be retained for the research programme, with an advisory role in other aspects of livestock development.

Pest Control and Quarantine

10.45 Control of insect pests will be carried out along the lines proposed in the consultant's report noted above (see paragraph 10.16). The Gilbert Islands are currently relatively free of pests and strict quarantine regulations will continue to be imposed to maintain the position. Suitable plant and animal fumigation and quarantine facilities will be installed at the main ports of entry to the country. The development of tourism is noted as increasing the risks of introducing insect pests.

Handicraft and Local Production

11.5 . . . Demonstration gardens for European vegetables have been established at Butaritari and Marakei . . . These demonstration gardens will provide seedlings to enable local producers to grow vegetables for sale on South Tarawa. The present undersupply is such that imported vegetables, fresh or preserved, were valued at more than $82,000 in 1977.

11.14 The seedlings distributed from the existing experimental gardens on Butaritari and Marakei will increase output of local food produce . . .

11.15 Consultant advice, possibly from the Tropical Products Institute of the United Kingdom, will be sought on increasing the output and quality of certain items of handicrafts and local produce . . .

11.16 Efforts will be made to reduce the costs of marketing and distribution through improved transport arrangements, storage facilities and other methods. The problems of marketing are most acute with perishable products . . .

Training/Education Activities and Plans

Agriculture

10.46 Control and prevention of animal diseases is important to the livestock programme. A project will be developed on the basis of the findings of the current Animal Diseases Survey. Emphasis will be placed on the training of agricultural assistants to recognise common animal diseases and carry out control measures, with the help of a veterinary diagnostic service based on Tarawa.

10.47 Initial training courses in agricultural work were commenced in 1969. There have been three full courses, each with about 15 trainees, about 11 of whom have successfully completed the course. Further courses will be held during the plan period.

10.48 Regular in-service training of extension staff will also be undertaken during the plan period to inform staff about new developments in crops and livestock. These courses will be held at District Centres.

10.49 The Agricultural Division will continue to use the facilities of overseas educational institutions and other institutions which provide agricultural training courses. At present, five students are overseas on degree or diploma courses.

Fisheries

12.60 The aims for fisheries training are:

- To develop and maintain systematic training programmes for Fisheris Division staff covering all aspects of the Division's activities;.

- To operate training courses for national personnel suited to the requirements of fisheries development in Kiribati.

12.22 A Fisheries Training Section was formed in the Fisheries Division in 1976 to concentrate on training the fisheries technicians who will be required in the development of the industry. Training is based on Tarawa. Fishermen from outer islands have been brought in to Tarawa to train as pole and line fishermen.

12.33 Overseas training has also been arranged. Fisheries staff have attended training courses in Japan, Israel and the Solomon Islands. It is intended to maintain use of overseas facilities.

12.24 In late 1978, a start was made in the establishment of a Fisheries Training Centre at the Tanaoa Natural Resource Development Centre on South Tarawa. It is intended that this centre will be fully operational in 1979. It will work in close association with the Atoll Research Institute of the University of the South Pacific, which will be situated in the same complex.

12.61 A Fisheries Training Centre will be established at the Tanaoa Natural Resources Centre on South Tarawa.

12.62 Training courses will be operated at the Centre in pole and line tuna fishing. Overseas training will also be available. Arrangements for training will also be incorporated in any joint venture agreement establishing a local tuna fishing company.

12.63 Training in baitfish culture and management of commercial baitfish farms will be incorporated in the UNDP/FAO/UK baitfish project.

12.64 The Fisheries Training Center will also run courses for extension staff and island fishermen in various fishing techniques designed to raise productivity in subsistence and cash market fishing. Extension officers will teach similar techniques on outer islands.

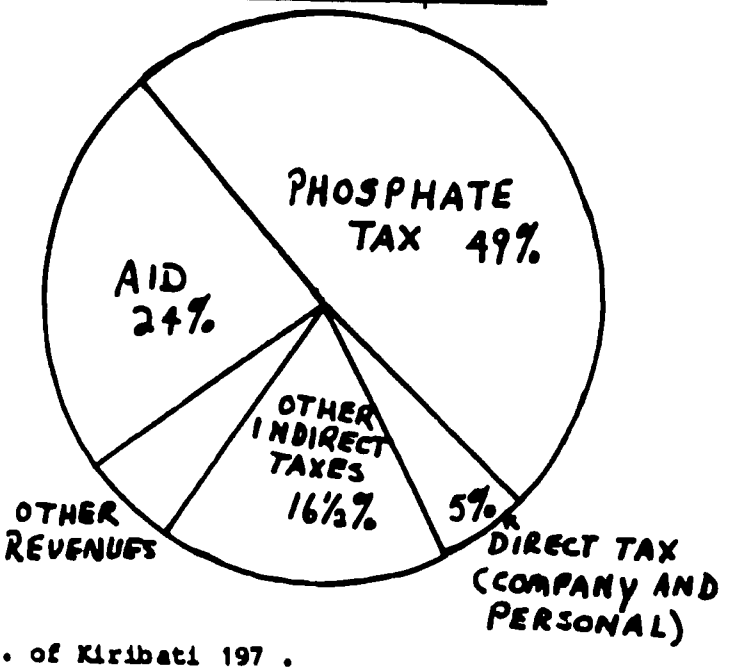
RELATED SOCIAL AND ECONOMIC FACTORS

Economy

The Gross Domestic Product for 1977 was estimated at $A 34.9 million. Subsistence output is valued at $A 2.6 million but is actually non-monetary. GDP per capita, including the valuation of subsistence output is about $625, and adjusts to $A 575 without the subsistence output. These GDP per capita figures reflect only relative amounts and mask the great disparities in incomes between wage and subsistence earners, and between expatriates and the Kiribati (Dommen 1980:2; Govt. of Kiribati 197-:9).

Figure 3.2 indicates the sources of the Government's operating revenue. It is apparent that the major source was phosphate tax (49%). These revenues reached a peak of $A 23 million (or 85% of revenue) in 1975, falling to an estimated $A 6.6 million or 61% of revenue in 1979. Fortunately, the impact of the loss of phosphate earnings on per capita income will be minimal as a result of both the strong subsistence activity, and a reserve fund which has been created from phosphate earnings set aside earlier. It is hoped that interest earnings from investment of the Reserve Fund will replace foreign aid (ADB 1979:334).

Figure 3.3 Sources of Government Revenue, 1977



Source: Govt. of Kiribati 197 .

The termination of phosphate mining on Banaba has greatly affected the economy. Figure 3.4 shows the relative export figures for the years when mining activity was active, and the projections for 1982. As was noted in the discussion of the Fourth Development Plan, the Government intends to replace the phosphate mining income largely from agricultural sources. Copra production is projected to increase about 6% to US$ 2.6 million; handicrafts are projected to more than triple from the 1977 figure of US$ 30,00 to US$ 100,000. Fisheries income, nonexistent in the past, are projected at US$ 300,000 in 1982, as is the case with brine shrimp, estimated at export value of US$ 100,000 for 1982.

Figure 3.4 Exports

	$'000 fob					Forecast
	1974	1975	1976	1977	1978	1982
Phosphate	18,851	26,745	17,155	15,741	17,849	--
Copra	4,871	950	956	2,432	2,513[a]	2,600
Handicrafts	13	37	36	30	na	100
Fisheries	--	--	--	--	na	300
Brine Shrimp	--	--	--	--	na	100
Other Commodities	310	2	--	9	na	100
Total Exports	24,045	27,734	18,147	18,212	na	3,200

[a]provisional

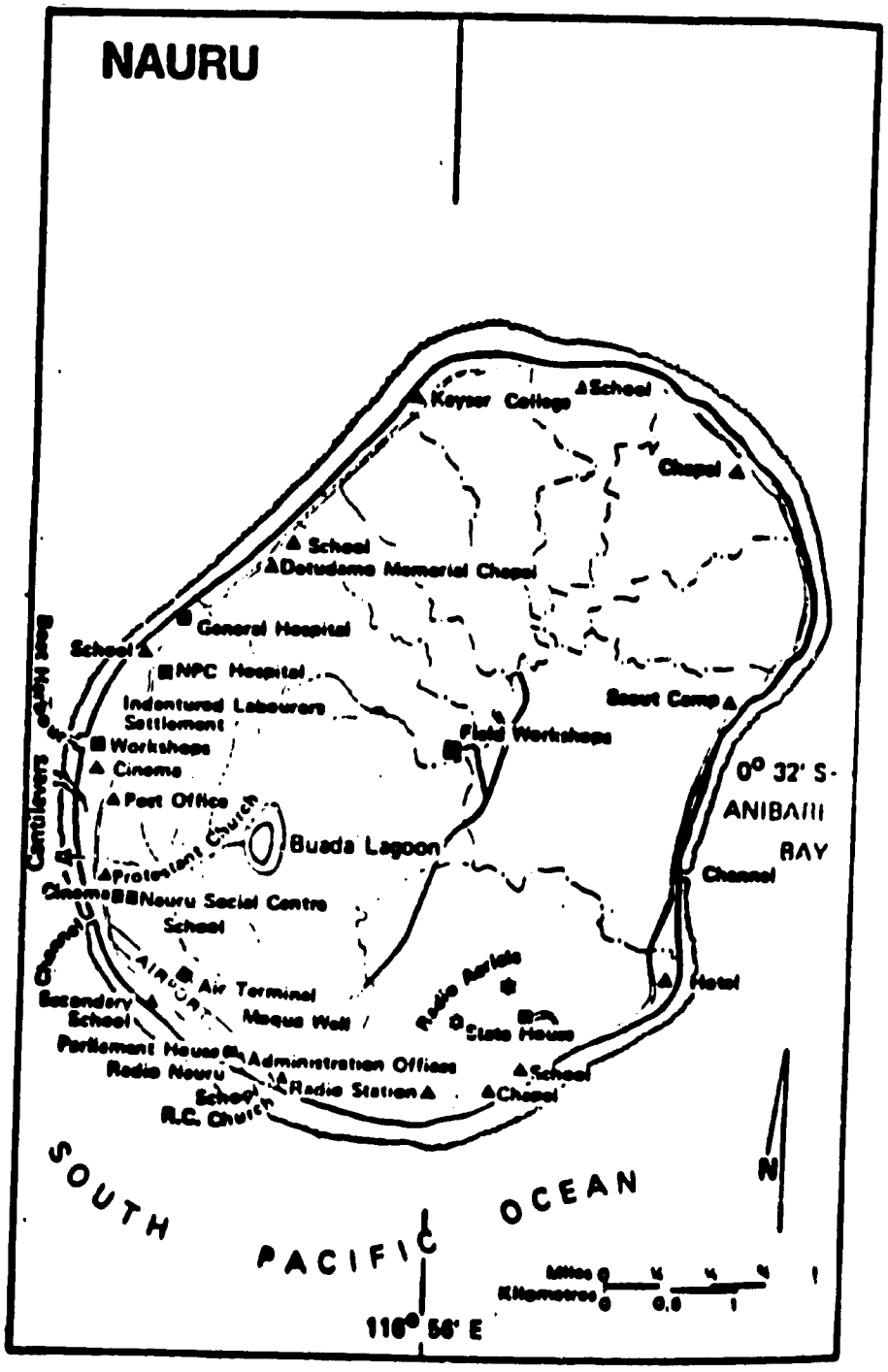
Source: Fourth Development Plan, p. 32.

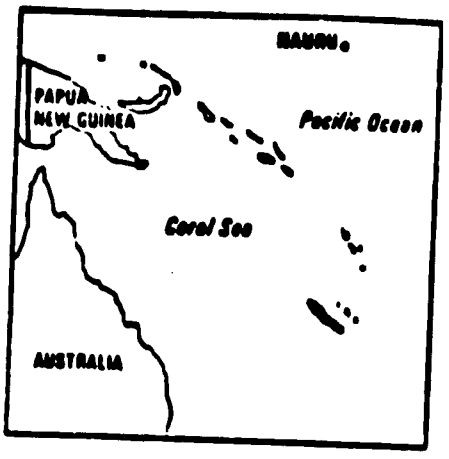
Attitudes Toward Money

The utility of money as a financial inventive to expand development must always be understood in a cultural context. In the case of Kiribati, that context accords different status to two different types of money. Karinimani ("money that you keep") is "big" money earned in large amounts usually through remittances, which is kept and saved for special purposes such as feasts, schooling and taxes. Kabirongorongo ("money that you spend") is "small" money used for everyday expenses. People have typed Karinimani as that which must come from off-island, and Kabirongorongo as not useful for generating Karinimani. As a result, Kabirongorongo is used on everyday expenditures which give little satisfaction. Copra money, for example, accrued in small amounts

is used to buy food products. So money earned which falls in this category acts as a disincentive for local production.

Encouraging participation in a cooperative could be a successful method for increasing the efficiency of cash cropping or for promoting more enthusiasm for subsistence farming and fishing. The key is that the cooperatives are recent, fit the culture, yet free the individual of tradition-bound limitations individual achievement. As money may be accumulated in larger amounts, and classed as Karinimani, the cooperative may provide an answer to rural incentives. It might be concluded that there is a ceiling to demand for and incentives to increase cash production if the cultural attitudes toward the utility of money were to be ignored (Fisk 1978: 109).





PEOPLE

Population: 7,500 (1977)
Net Annual Growth Rate: 1.2%
Ethnic Groups: Nauruans, Gilbert and Tuvalu Islanders, Chinese, Europeans.
Languages: Nauruan, English.
Literacy: 99%
Life Expectancy: 62 (Micronesian Ave)

GEOGRAPHY

Land Area: 20.7 sq. km.
Capital: Yaren District
No. of Islands: One
Terrain: Raised coral atoll

ECONOMY

GNP: Ranges upward from US$ 25 million*
GNP/capita: Ranges upward from US$ 6,250*

TRADE

Exports: US$120-130 million (Phosphate)
Partners: Australia 50%, New Zealand 25%, Japan and far East 25%
Imports: $US 15 million
Partners: Australia, New Zealand, U.K.

POLITICAL STATUS

*Subject to world market price for phosphate.

NAURU

OVERVIEW

Nauru is a single raised atoll, 19.3 km in circumference and 21.2 sq. km in area. Its nearest neighbor is Banaba (formerly Ocean Island, of Kiribati) 306 km to the east. It is 4,023 km north of Sydney and 4,184 west of Honolulu.

Nauru is completely self-reliant as a result of profits from the mining of phosphate deposits which cover more than three-fifths of the island area (Trumbull 1977:216). It neither asks for nor receives aid of any sort from other nations or international bodies (Skinner 1977:105).

The island has a narrow coastal brim and a crown, a low plateau some 65 m above sea level, formed mostly of phosphate rock. An area of about 200 to 250 ha, mainly around the coastal belt, is available for cultivation (Commonwealth Inst. 1975).

Of the 7,500 persons living on Nauru in 1977, 4,400 are Nauruan. With its phosphate deposits expected to last another 14 years at full production (Inder 1978:254) Nauru is one of the richest nations in the world on a per capita basis, and can afford to purchase food or other products required for consumption. However, a number of studies do indicate that local production of root crops, eggs and poultry could be significantly improved, and that steps may be taken to preserve or reclaim some portion of the soil.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Land and Mineral Resources

Nauruan phosphate is the highest grade in the world with 84% BPL guaranteed and treated rock from Nauru's modern calcination plant as

high as 91% BPL. Phosphate is Nauru's only mineral resource and its only export (Inder 1978). The annual shipments can run to 2.2 million tons (Trumbull 1977:216). In June 1976, it was estimated that 42 million tons of phosphate remained to be worked, representing a lifespan for the industry of approximately 18 years at the existing rate of extraction (Inder 1978:254).

When the rock is extracted, coral pinnacles of up to 15 m are exposed. A pinnacle-dotted living coral reef which is exposed at low tide surrounds the island. The reef is rich in shells and marine life. On the seaward side the reef abruptly dips into the Pacific Ocean. On the landward side a narrow beach fringes the fertile coastal strip encircling the island (Govt. of Nauru 1976:1).

The island possesses no natural harbors. The soil is highly porous and the rainfall irregular. The central plateau, which is about 30 m above sea level, is surrounded by a fertile belt, some 150-300 wide, which is a few meters above sea level. The highest point is 70 meters. There are no rivers (Inder 1978:253).

The total land area of Nauru is estimated at 2,100 ha. Coconut lands are estimated at 350 ha at the coastal belt and 65 acres at the lagoon. Rocky land of limited phosphate content below 25 m in altitude amounts to 250 ha. Worked out phosphate land amounts to 610 ha, 64% of which has been returned to original owners and 36% leased by BPC. Unworked rocky land above 25 m in altitude is 70 ha, and unworked phosphate land at that same altitude is 865 ha (Hugh 1969).

<u>Water</u>

Tests have been recommended to determine the extent to which wells may be dug and water pumped before reaching the salt water table. The

rainfall is erractic and the soil has little water-holding capacity. The average rainfall for the period 1956-66 was estimated at 2030 mm annually, with variations from 300 to 4600 mm per year. During the course of a year, rainfall varies from month to month (Hugh 1969:3).

Crop Production

Primary agricultural production is confined to fruit and vegetables, livestock and fish. Coconuts are the main crop. The flat coastal strip is generally used for coconuts, yet production is poor. The trees are usually overcrowded and there are problems with weeds and drainage. There are several fertile and humid areas on the coast not suited for coconuts, yet suitable for taro and babi, with bananas on these areas which may be drained (Hugh 1969:5).

Livestock

The people keep pigs and chickens which provide some fresh meat. All other food requirements are imported (Trumbull 1977:254). There were limited ventures in poultry production in 1969, and there is evidence that the returns were not commensurate with the labor and capital outlays because of the lack of expertise. It has been suggested that a regular shipping schedule with Australia would facilitate the importation of concentrated poultry feed (Hugh 1969:12). It is possible to import day-old chicks from Fiji via air, and a proposed agricultural demonstration unit may be able to produce three-week old or day-old chicks for sale to local rearers. Apparently, Nauru could achieve self-sufficiency in egg and poultry production (Hugh 1969:12).

There is a relatively large number of pigs being raised. The sanitary conditions are poor, with few pens having concrete floors and most

pigs foraging indiscriminately for food. Their rooting undermines house foundations and causes breeding places for mosquitos and flies.

Forestry

No information available.

Fisheries

Some fish farming is done in the lagoon. The lagoon itself is divided into individual fish farms where a salt water variety of fish, netted in the sea are slowly acclimated to the brackish water. Kept in conch shells filled with sea water, fresh water is added until the fish become acclimated (Trumbull 1977:222). The seas team with fish but the people are content to catch only for their own use (Inder 1978).

Agricultural Credit

Land Tenure

RESEARCH, EXTENSION AND EDUCATION IN AGRICULTURE

With an economy that should be underwritten for many years by the production, sale and investment of funds from phosphate mining, Nauru can afford to purchase food and other products required for consumption. There is no Ministry for agriculture, however, a number of studies by outside groups have been undertaken to determine whether local food production could be increased and whether there are steps which could be taken to preserve or reclaim the land and soil of the island. Some recommendations have been developed from these reviews.

Recommendations for Extension and Research

In 1969, there were problems involving land usage. Planners had earmarked areas for housing, village, town expansion, roads, schools and

recreation areas which appears to encroach on the limited amount of suitable agricultural land. Access to the areas of cultivation posed another problem, as was the question of whether people would wish to become farmers (Hugh 1969).

At that time, there was a need to establish an agricultural extension and advisory service. It was felt that a demonstration station was necessary in order to successfully introduce an agricultural program. This would have entailed the appointment of a qualified agriculturist to plan and direct the program, someone experienced in tropical agriculture, and a supporting staff.

The demonstration station would perform the essential function of a resource for planting material and new species. It was to offer the local people expertise in the fields of fertilizer application, the correct use of newly-introduced plant species, facilities and demonstrations for insect, pest and disease control (Hugh 1969:8).

It has been proposed to the government that pigs and poultry be kept at the station as a demonstration of the effects of proper rearing, feeding and management. The droppings could be used for compost or deep litter. Deep litter management would be an appropriate way to introduce intensive poultry production. The litter could be used as manure in vegetable production. It is suggested that a cage system be a secondary stage of poultry management. The Buada Lagoon area, because of possible supplementary water supply, accessibility, and good agricultural potential has been suggested as the best possible site. Previously there was a small experiment station established there (Hugh 18).

Since Nauru is able to buy grain, it could use modern techniques to produce healthy animals under sanitary conditions. Feed can be supplemented by coconuts, kitchen scraps, cooked swell, fooder, etc. Penning the pigs is necessary and should be built near village communities with concrete floors and separate breeding units attached. If a vegetable plot was located nearby, it could use the effluent and manure from the pens, and perhaps be run communally. Suggested breeds are Hampshire or Saddle Back, Berkshire, and the large white pig which may be crossed with local breeds. Artificial insemination is also suggested to replace boar breeding. It would be more efficient for local production to use cross breeds rather than pure breeds (Hugh 1969:).

Cattle production is definitely not recommended given the delicate condition of the ecosystem which is already being strained, and also because it is not in keeping with current land use patterns. A limited alternative exists in the cattle under coconuts' scheme, if pastures are established and carefully managed (Hugh 1969).

The Bauda Lagoon Basin is best suited for vegetable and food crops. Keeping that the choice of vegetables must be acceptable in the local diet, both in terms of eating habits and cultural taboos, the following vegetables were suggested: leafy vegetables (taro, calalou, bhaji, Chinese cabbage, lettuce); fruits (tomatoes, sweet pepper, eggplants, okra); vine crops (cucumber, pumpkin, water melon, christophene, homordica charantia, legenaria siceraria, rock melon); beans (plaseolus, radish, turnip, pueraria lobata, Pachyrezus erosus); and condiments (hot chilies, shallit, sage, chinese parsley, mint, thyme and ginger).

Suggested food crops for the Lagoon area are taro, sweet potato, yams and polynesian arrowroot (Pueraria lobata, and Pachyrizus erosus) (Hugh 1969).

There are areas of Nauru described as having gentle slopes, which must be protected from erosion. Permanent tree crops are suggested for the gentle slopes, such as: sugar apple, sour-sop, custard apple, citrus, mango, breadfruit, coconut, avocado, and the fig (Hugh 1969).

In general, there is a great deal of value to be gained in planting drought resistant grasses and legumes, on the coastal strip, between coconut trees, on the slopes (Hugh 1969).

Soil Research and Reclamation

In 1964, the General Manager of the British Phosphate Company (BPC) reported that it would be unfeasible to replace worked out phosphate coral with imported soil. The cost to fill to a depth of 1.3 m was estimated at $A 73,140 per acre (Hugh 1969). Chan (1968) recommended that partial reclamation was possible and in the mid-1970's a scientist from the U.S. Department of Agriculture thought some land could be rehabilitated by importing soil and cultivating soil-creating plants such as soybeans (Trumbull 1977:216).

RELATED SOCIAL AND ECONOMIC FACTORS

Exports/Imports and Balance of Payments

At an average price of $60 a ton, netting $132 million yearly, Nauru is the richest nation in the world. Acre for acre, Nauru's average per capita gross national product is $40,000 for every Nauruan (Trumbull 1977:216). Of course this figure is misleading since it fails

to take into account phosphate production costs, the expense of running the government, servicing of Investment Funds or the fact that the Nauruans, except for those benefitting from rents and royalties from land, do not share directly in the profits of the industry. Instead, the Nauru Phosphate Corporation, founded in 1970, operates the phosphate industry on behalf of the people, responsibile for both mining and marketing (Govt. of Nauru 1976:1).

More than 60% of the revenue from phosphate exports is being invested in long-term trust funds established to provide an income for the Nauruan people when the phosphate itself is exhausted. In order to broaden the base of the economy investments are being made in a variety of sectors both within and outside Nauru. Examples of investments include Nauru House (a 52-story office building in Melbourne, Australia), Air Nauru (a national shipping line (Commonwealth Institute 1975).

Because all consumer goods are imported, the cost of living rivals Australia. Although duty on imports is negligible, freight charges are high. The main imports are timber and building materials, foodstuffs, motor vehicles and parts, drapery, footwear and pharmaceuticals, valued at $A13.6 million.

In 1977, total trade was $A 37,324,000 in exports, and $A 13,384,000 in imports, leaving a surplus of $A 23,490,000. Imports included food and drink (22%), minerals and fuel (13%), manufactured goods (17%) and machinery (12%) (Sovole and Bollard 1979). Water is imported from Australia because heated drafts from sun-baked diggings drive rain clouds away (Trumbull 1977:226).

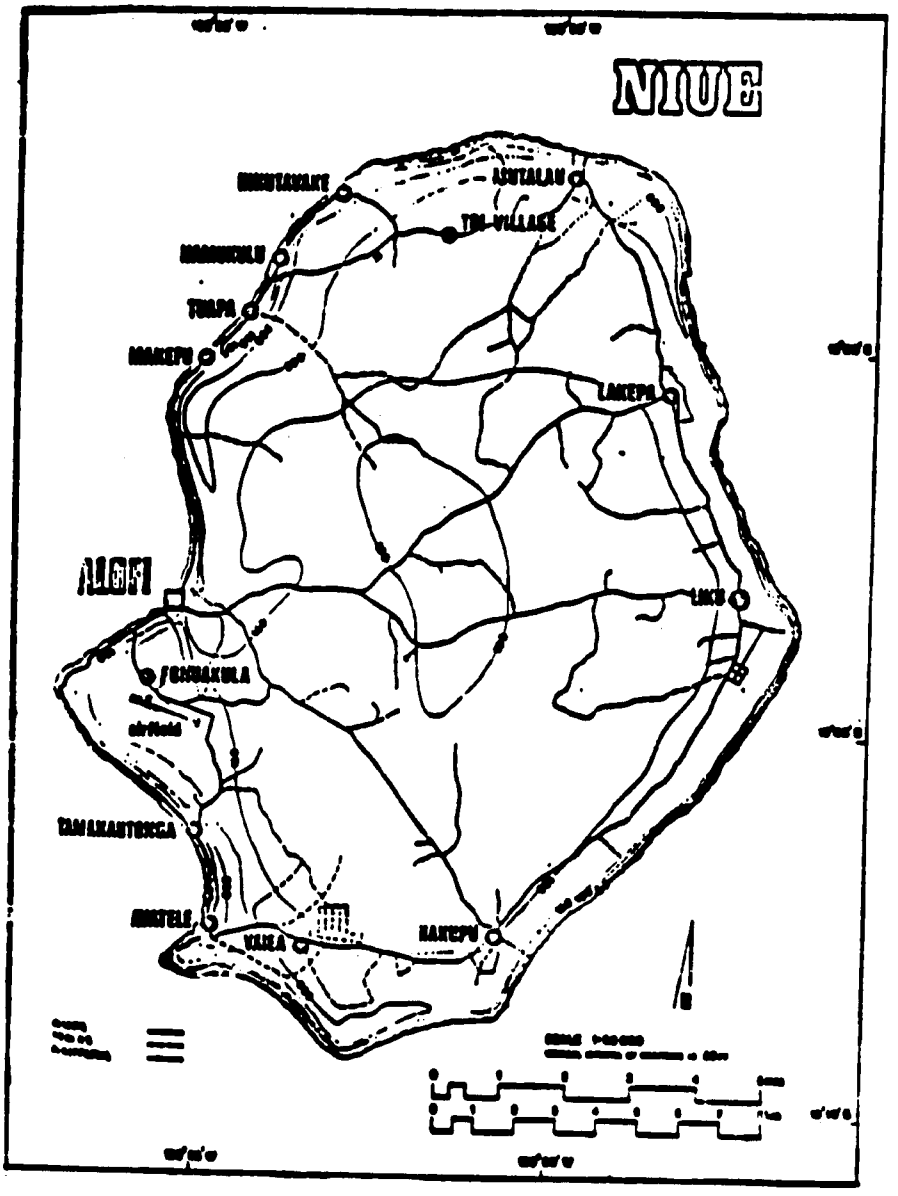
Health

Medical and dental care, as well as hospitalization are free. Nauru has a modern health service, and if special treatment is needed, the patient is sent to Australia. For Nauruans, the government bears the cost.

Transportation

All villages are linked by an excellent road encircling the island. There were 1,761 motor vehicles registered as of 1977.

Air Naru operates a fleet of jet aircraft with scheduled services from Nauru to a growing number of points, including Japan, Taipei, Hong Kong, the Philippines, Guam and Micronesia, the Solomon Islands, Western Samoa, New Caledonia, Fiji and Australia.



PEOPLE

Population: 3,578 (1978)
Annual Growth Rate: -2.6%
Ethnic Groups: Niueans 93%, Other 7%
Languages: Niuean and English
Literacy:
Life Expectancy: 62 (Micronesian Average)

GEOGRAPHY

Land Area: 258 sq. km.
Capital City: Alofi
No. of Islands: One
Terrain: Raised coral outcrop

ECONOMY

GDP*: ($NZ?) 2.65 million (1977-78)
GDP/capita: $742 (NZ) (1977-78)

TRADE

Exports: _NZ 240,000 (1978)
Partners: New Zealand, Fiji Australia
Imports: $NZ 2,317,000 (1978)
Partners: New Zealand 80%, Japan, Singapore, Fiji

POLITICAL STATUS

*Monetary sector only, Plan p. 7

NIUE

OVERVIEW

Niue is a self-governing island in free association with New Zealand. It is a raised coral atoll, 18 km wide and 12 km in length with a coastline 80 km long (Fisk 1978:111). The highest point is 65 m above sea level. The coastline is broken, precipitous, and encircled by a coral reef which provides neither good anchorage nor harbors.

The 1978 census indicated a population of 3,578 with a negative annual growth rate of 2.6%. A large portion of the population has migrated to New Zealand causing labor shortages on Niue itself. Evidence of the shortages become acute at times, such as when a ship arrives which requires unloading and people must leave other tasks to help (APRU 1977).

Eighty percent of the total population is rural (Navunisaravi 1978:16), and most local agriculture is subsistence farming which provides the local staple foods for families. The workday, even in the upper levels of government, is structured to set aside the late afternoons to work in family gardens and for fishing. As a low prestige occupation, agriculture contributes little to the local cash economy but does provide all of Niue's export goods (Govt. of Niue 1979). Highly dependent upon trade, the ratio of imports to exports in 1977/78 was 10:1. The Niue National Development Plan (Govt. of Niue 1979:11) for 1980-85 indicated that, "The breakdown of selected import items . . . suggests that a substantial part of presently imported goods, mainly food items, could be replaced with local products within a relatively short period of time, if existing manpower and land resources were utilized accordingly."

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

The climate is pleasant, subject to southeast trade winds. The mean annual temperature is 24.7°C with average rainfall at 2177 mm. On the edge of the hurricane zone, the last major disturbance of this sort was in 1968 (Inder 1978).

Soil/Land

The soil is rocky, composed of eroded coral. Although not abundant, it is fertile. The island is made up of two terraces, the lower about 27 meters above sea level and the upper plateau which is forested, about 65 meters above sea level (Inder 1978:296). Because of its limestone origin the soil is very porous and there is no running water (Govt. of Niue 1979).

Between 30-40% of the land is unsuited for farming purposes, although some of this area contains millable timber resources. Due to harmful agricultural practices nearly 3,300 ha of land have been depleted of soil nutrients and can only be used with the application of large amounts of fertilizer (Govt. of Niue 1979:31). Figure 5.1 shows the estimated pattern of land use in 1979.

Figure 5.1 Estimated Land Use (1979) - 11,200 Acres Total

Source: Govt. of Niue 1979:27, Table 5.1.

Water

With no surface water and only a few cave sources, water supply has always been critical to Niue. Some boreholes have been drilled and have reduced the danger of severe hardship in drought. The two main sources of water are rainwater collected from roof catchments in tanks installed by both private owners and government consumers, and underground water piped to supply points from the boreholes. It appears that the water lens providing the underground supply has the capacity for considerably increased draw-off, so extraction and distribution rather than actual shortage, are the immediate concern (Govt. of Niue 1979).

Commercial Production

The main cash crops are copra, tropical fruit, lumber, lime juice and honey. A modern food processing factory produces passion fruit pulp and juice, lime juice and oil (Yang 1978:Att.1). A small honey factory produces 30 tons yearly, and beeswax is exported. Production figures for 1977 were: honey, 23,000 kg; passion fruit, 179,000 kg; passion fruit pulp, 86,000 kg; limes, 154,000 kg; and copra, 111,000 kg (Barton 1978).

A considerable investment is being made to increase the production of limes and passion fruit. This will include enlarging family plots to 1.2 - 2.0 ha. Development work is being done to export preserved papaya to food processors overseas. Frozen papaya puree is exported on a regular basis. The demand for passion fruit exceeded the supply in 1976. These factors have helped transform the traditional, small cropping production to a larger, more dynamic approach (APRU 1977).

The development of root crops or further diversification appear to be unfeasible as they would be drains on resources and (especially) manpower. If men in the wage-earning years are unable to secure wage employment at home, they out-migrate. Up to the present, the system of owner produced staples from family plots and subsistence fishing have been successful without the development of a market system.

Subsistence Farming

A unique fact of Niue is that although small in size, it has managed to provide itself with a viable supply of subsistence food organized within the existing non-market system. The workday, even in the upper levels of government, is structured to set aside the late

afternoons to work in family gardens and for fishing (Fisk 1978:112). Pigs and poultry are a large part of the subsistence system although efforts to develop these commercially are hindred by the expense of importing grain protein (Govt. of Niue 1979:32). Production figures in 1977 were: beef, 26,000 kg; pork, 2,200kg; and cattle 720,000 kg (Barton 1978). All farming is done collectively in family groups. Proceeds are paid at the end of a month to the head of the family who is officially registered as such. The acute labor shortages produces a situation where individual family members carry out planting and maintenance of their subsistence food crops as well as pollinating and harvesting their passion fruit/lime cash crop plots. A good proportion of family income is spent on imported foods and other consumer items. Although the income of those who are primarily farmers is less than 20% of those who earn wages, most people have dual occupations, and supply their own staple foods from subsistence gardens and fishing. The standard of living is quite high compared to other Pacific Islanders and already some farmers have purchased motorcycles and pickup trucks.

Livestock

Pigs and poultry tend to be the livestock owned by islanders. In addition, progress has been made in grazing cattle under coconut trees. The cattle are used for both beef and milk production. In 1976, there were 730 cattle (Inder 1978).

Forestry

Niue is well-endowed with large areas of lumber. These forests provide breeding grown for wildlife, particularly a species of land crab which is an important contribution to the local protein requirements.

Niuean timber is predominantly hardwood. A species of mahogany and other attractive wood provide potential for a modest furniture manufacturing industry (APRU 1977).

Fisheries

The main fish resources tend to be free-ranging surface or subsurface schooling fishes such as Bonito, Tuna, and Mackerel. The development of a fishing industry is hampered by the structure of the island which results in bad weather and strong currents occurring at the eastern end of the island where 75% of the fish have been caught. Purse seines cannot be used for the free-ranging fish because Niue can provide no safe anchorage for boats of the size required to handle them (Govt. of Niue 1979:48-49).

Agricultural Credit

Sources for lending capital on Niue are practically non-existent. In 1960, the Niue Development Board was established primarily to promote and assist in land development which includes an agricultural loan program. It is a statutory body and therefore dependent on funds granted yearly by New Zealand's Aid Program.

Land Tenure

Niuean livelihood is dependent on family lands. Alienation is forbidden by law. There are no foreign landowners. All rights are held by family groups or the Government.

Land tenure in Niue is by customary usehold. Traditional family lands remain under the jurisdiction of the members of each family. Because many families are living on New Zealand and some have passed away without heirs, certain holdings have either been taken over by distant

relatives or by next door neighbors who have encroached upon the land holding, laying claim by their own alleged history of uninterrupted usage.

Under the new land law, the leader of the clan allocates and supervises sections of land within the family, subject to agreement by all the family members. The clan may give rights of occupation to individuals who wish to cultivate commercial crops. These rights are binding for life unless the possessor leaves for more than a year. When that occurs the right is cancelled and the land is returned to the family.

RESEARCH, EDUCATION AND EXTENSION IN AGRICULTURE

Development Goals and Constraints

The Government of Niue is very conscious of the need to increase the productivity of the land. Its major thrust in developing employment opportunities will be to encourage private sector investment in agriculture, agro-based industries and light manufacturing. However, because Niue is in the unusual position for a Pacific Island of having a shortage of labor, farming methods must be adopted to minimum labor use. In addition to manpower shortages, the rocky shallow soil has led to the concentration of high value crops and the development of mechanized agriculture. There is evidence that the danger of disturbing the soil sub-structure of the rocky terrain, thus raising the p^H factor of the soil, will not support further mechanization. Yet, the scope of labor-intensive crops, like bananas is limited.

Niuens see themselves as land-owning farmers, but present systems of land holding and farming inhibit the production which is necessary to reach desired incomes. Traditional precedent will remain a factor in

land tenure for a considerable time. The best producers tend to be mature public servants whose organizational skills and discipline learned in government contribute to farming. Others are retired school teachers and policemen. The Niue Public Service tried negotiating with the State Services Commission in New Zealand to grant early retirement to those with on a few years left in government service so that they may work the land, and there was a plan to make a four-day work week so that one day could be devoted to agricultural production. These plans have since been dropped (Fisk 1978:113).

In addition to these factors it appears that extensive training will be necessary to provide the skills for undertaking large-scale commercial farming. It is observed in the National Plan (Govt. of Niue 1979:12) that "having vigorously developed social services and government wage employment, it is now difficult to turn back to the agricultural base which once existed.

Little prestige and economic return are attached to farming as a profession. Full implementation of a government proposal to integrate the management of the passion fruit/lime industries under one management was postponed not only because there was insufficient data on crop performance and uncertainty about the extent of fresh water reserves, but also because it was not clear that the Government could persuade Niueans to enter agriculture as a fulltime profession.

Despite natural restrictions on the use of mechanized agriculture and the consequences of lifestyles dependent upon wage employment, the Government's Plan for Development still promotes commercial farming. The Government has already started livestock and fisheries development

and plans to continue. Twelve hundred acres have been developed for cattle intercropped with coconuts. Originally introduced primarily as weeders for the Coconut Rehabilitation Scheme, half of the original acreage has been fully developed as grassland pasture with 800 head of beef cattle. The scheme has proven uneconomical for dairy purposes. The Government's long-term goal is to replace the external subsidy and imports with local production by both utilizing surplus land and increasing the efficiency with which underutilized land is presently farmed.

Institutional Capabilities

Agricultural efforts are encouraged and carried out through two primary agencies, the Department of Agriculture and the Niue Development Board. The Department is primarily concerned with providing incentives and technical advice and assistance to producers, while the Development Board is involved in the development and management of commercial projects. This discussion will identify the activities of each in turn.

Agriculture Department

The Agricultural Department was established in 1954 as the first systematic attempt for developing cash crop farming. Its functions include: research into cash cropping, with initial emphasis on passion fruit; the provision of technical advice to cash crop farmers through the extension advisory staff; the provision of training where required and feasible; the negotiation of payment of government subsidies for physical inputs provided by the Board; quarantine control; and the provision of technical advice to assist the pig and poultry industry. The Department of Agriculture's performance is hindered by a lack of

trained, qualified staff which consists of only five qualified agriculturalists, including the Director.

Niue Development Board (NDB)

The NDB was set up as a statutory body controlled by a Board appointed by Cabinet under the administrative framework of the Agriculture Department until March 31, 1977. It is now an autonomous body responsible to the Cabinet whose main agricultural objectives are to "promote projects for the development, improvement and the processing of agricultural products and any enterprises that would advance the economic development or export trade." This includes the allocation, development and improvement of available productive land, as well as the development and exploration of the feasibility of existing crops, livestock or any newly-introduced crops for home consumption or export (Govt. of Niue 1979:35).

Specifically, the NDB is charged with:

-- managing government-owned commercial cash crop plantations including all physical inputs;

-- providing at cost, physical inputs to small plantations with the cost being met either through government subsidy or in cash by growers or through credit from the development finance institution;

-- undertaking the purchase, processing and the export of cash crops which are not undertaken by the private sector;

-- managing the government-owned cattle herd;

-- managing the government-owned honey industry until it is passed back to private management;

-- managing the handicraft exporting business on an interim basis (Govt. of Niue 1979:30).

The government feels that cash cropping should be made more economically viable with employment creation of secondary importance. It seeks to develop larger cash crop plantation of 4-8 ha under trained management with an employed work force. Cash crop industry will be assessed for the possibility of increased government investment during 1981. The government also seeks to promote private investment in medium and large scale agro-based industries through development incentives based on actual output. There is a recognized need to prevent the introduction of pests and diseases and the recognition that the improvement of root-crop production should be accomplished with as little disruption of the traditional system as possible. The subsistence sector has a substantial, if not easily quantifiable, role in contributing to the local food supply, as well as the social and cultural life.

Research Activities

Department of Agriculture

There are two people working in the field of research which include only one qualified agriculturist. For 1978-1979, the budget allocation was $13,000.

Niue Development Board

Some research projects under consideration are: production oriented agricultural research; following up research on pollination problems; animal husbandry; the establishment of a pilot irrigation project under local conditions; the initiation of research into the local production of cheap stock foods; to provide cropping recommendations for Niue's cash crops, and; the selection and establishment of better and more productive pastures.

Extension and Training Activities

Department of Agriculture

Two Extension Officers work with 6 field agents on actual extension work on crops. Training is difficult to organize in program for adult farmers since the majority are involved in wage employment. In 1977, training activities were expanded with the establishment of the Young Farmers Training Program. This program has little appeal because it must compete with the preference for paid employment and is being reconsidered. For the 1979-1980 year, the recurrent budget allocation was $ 102,205.

At present there are no trained field officers for livestock. Fieldwork is being handled by the Agriculture Board's livestock officer. There is a Niuean student being trained. The extension scheme for pigs and poultry involves assisting in the construction of open free-range piggery, where pigs and vegetables are rotated, and the construction of 6-tier poultry holding units.

A small quarantine unit employs three staff. This group has a new fumigation unit to handle fresh fruits and produce. For crop protection, three spraying teams are involved in the control of brownspot (passion fruit) and white louse (limes). Lime plantation maintenance provided by the Department of Agriculture is free of charge to growers.

Responsibility for fisheries development rests with the Department of Agriculture. Planned activities include the construction of a sheltered anchorage, extension services to introduce new fishing methods and techniques, and development credit for those initiating activity in

coast fishing. One staff member will be sent for further training outside and an award is planned for a student to take the Diploma in Fisheries course at the University of the South Pacific.

The government hopes to establish a Farmers' Service Center to provide integrated technical advice, input and development credit (in conjunction with the N.D.B. and the Development Finance Institution). This would include training facilities and an agricultural reference and study library.

Other specific projects include:

-- Passion fruit, to increase both acreage and yield.

-- Limes, to increase processing efficiency without expansion of acreage.

-- Coconut, to establish seedling nursery and develop economic uses for senile trees.

-- Cattle, to improve feed through pasture management and improve husbandry practice.

-- Pigs and poultry, to increase number and size of pig and poultry producers through better management and training.

-- Honey, to improve equipment to reduce moisture content of processed honey.

-- Subsistence farming, to introduce better technology and labor-saving devices and improve soil lying fallow by the application of leguminous plants.

-- Fruit and vegetable production, with UNDP assistance, to create a training center, collect data and establish a pilot irrigation project.

Agricultural responsibilities for forestry are primarily concerned with planting and reforestation. Research activities are planned to include a feasibility study for a wood-fuel power generation plant, and a marketing study to analyze production options for use of the Niuean

timber resource. Training will focus on the operation of the new sawmill and the development of a forest management program.

RELATED SOCIAL AND ECONOMIC FACTORS

Economy

De-population and aid-dependence characterizes economic life on Niue. A primary government objective is the achievement of self-sufficiency, but at present Niue must rely heavily on budgetary aid. The portion of the Niue budget financed by New Zealand in 1977-78 was $NZ2.8 million and included the financial base for the Niue Development Board. The development component accounted for $NZ 1 million. Niue's contribution to the budget is increasing; in 1976-77, Niue contributed 58% to New Zealand's 43% (APRU 1977).

External aid from New Zealand was $NZ 2,821,100. Government expenditures amounted to NZ$ 2,149,038 (APRU 1977). Between 1973 to 1975, there was a sharp increase in imports from New Zealand, from NZ$730,000 (1973) to NZ$2,080,000 (1975). Imports were about $NZ1,750,000 in 1976, while exports through these years remained below NZ$200,000.

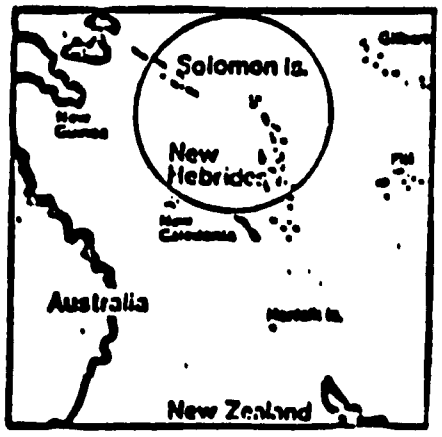
Out-Migration

Out-migration has been a serious problem in Niue. People are leaving to work in other Pacific Island nation's phosphate mines, or seeking wage employment in New Zealand. In 1971, a study by the South Pacific Commission found that 83% of the youth "could be expected to show an inclination to emigrate." (Trumbull 1977:171). The exodus of young people has resulted in a shortage of needed skills, talent and manpower (Trumbull 1977:172). There seems to be a correlation between

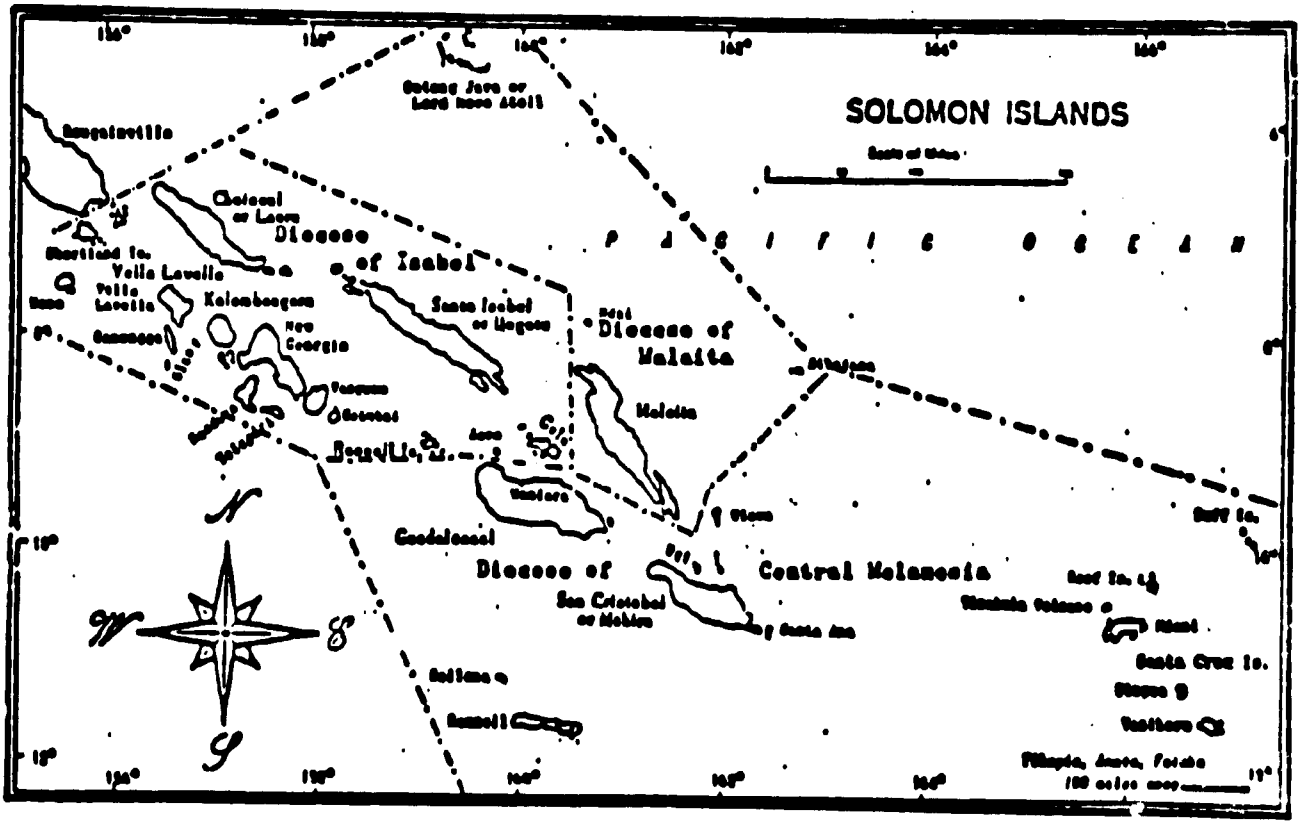
education and development, and the enticement to accept Western ideals of material prosperity that makes it easier to leave one's homeland.

Employment

Opportunities for wage employment exist only within the government services or in small-scale industries (i.e., fruit processing, honey, beewax, handicrafts) such as those organized by the Niuen Development Board. The 1976 census data show that 62% of the population is below 15 years old and 33% is of the wage earning capacity (between 15-59 years) (Inder 1978:29b). A large part of the population has become wage earners on the government payroll.



SOLOMON ISLANDS



PEOPLE

Population: 214,000 (mid 1980)
Annual Growth Rate: 3.4%
Ethnic Groups: Melanesian 93%, Polynesian 4%, Micronesians 1%, Europeans 0.8%, Chinese 0.4%
Languages: 60 local languages, Melanesian Pidginm English
Life Expectancy: 40.3 years

GEOGRAPHY

Land Area: 28,785 sq. km.
No. of Islands:
Capital City: Honiara (pop. 15,000)
Island Type: Volcanic, atoll, reef

ECONOMY

*GNP: 64.1 million (1976) US$
*Per capita GDP: $325 (1976) US$

TRADE

*Exports: $21.6 million (1976)
*Imports: $24 million
Trade Partners: Japan, U.K., American Samoa, Australia

POLITICAL STATUS:

*1977 figures in $SI
GDP $SI 64.63 million
GDP/c $SI 314

Exports $SI 29.6 million
Imports $SI 25.7 million

SOLOMON ISLANDS

OVERVIEW

The Solomon Islands consist of a 1,450 km chain of islands that runs southeast across the Coral Sea from Papua New Guinea to Vanuatu (New Hebrides). The main islands are approximately 1,900 km northeast of Australia.

The six main islands are Choseul, New Geogria, Santa Ysabel, Guadalcanal, Malaita and San Cristoval. Guadalcanal is the largest with a land area of 5180 sq. km.

The Solomon Islands is one of the few countries in the Pacific Basin that has set, as a major development goal, the decentralization of government. This is being accomplished through the allocation of resources and political/economic decisionmaking responsibilities to local councils and area committees.

The Development objectives for the Ministry of Agriculture for 1975-79 were to develop self-sufficiency in key food staples, improve production, increase rural incomes and government revenues, decentralize and localize employment. The Extension Service was fully decentralized in 1976 with all field staff having been assigned to local councils. A key extension program designed to increase agricultural productivity has been the organization of large (100 ha) cooperative farms.

Agriculture already accounts for 60% of the GDP with copra the primary crop. Fishing is also a major cash earner for the Islands, as is timber. However, most of the real national income is produced from the goods and services exchanged in the rural areas and does not enter the monetary sector of the economy. It has been estimated that nine out of ten families depend on their own production for food.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate/Rainfall

The climate is hot, humid and tropical. However, the prevailing trades provide a cool evening breeze. The mean annual maximum temperature in Honiara, capital town and main port for the Solomon Islands, is about 30.2°C. There is little variation in temperature on a day-to-day basis. Rainfall is very variable on the larger islands. Honiara, located on the leeward side of Guadalcanal, had a total rainfall of 2110 mm in 1977, but experienced a severe drought and water shortage in 1978. At the other extreme is Santa Cruz Island with a 1977 annual average of 4640 mm. Short intense thunderstorms are common during the wet season, November to April. Monthly variation in rainfall, particularly in Honiara or Santa Cruz, can double or quadruple from month to month.

Land/Soil

Much of the land area is rugged terrain. The main islands are composed of a high mountain spine which drops steeply to the sea on one side, with rolling hills on the other. There are few plains except for those found on Northern Guadalcanal. The core of the island group is formed of dissected volcanic, metamorphic or sedimentary material. The smaller islands, located to the east, are atolls or raised coral reefs with soils of volcanic ash.

Of the nearly 29,000 sq. km total land area aproximately 25-30% is cultivable (Govt. of the Solomon Islands 1978a), the remainder consists of steep hills, valleys, coastal swamps and marginal soil. It has been

estimated that just over 12% of the land area has above-average agricultural potential (ADB 1979).

Minerals

Gold has been mined since the early 1940s using panning methods in the Golf Ridge area of Guadalcanal. Since 1977, the annual gold production has averaged 17,000 gm. Known deposits have not been sufficient in quantity or quality to warrant larger scale mining operations.

Some silver is produced and potential reserves of phosphate are known to exist on Bellona and Rennel. Deposits of bauxite, large enough to warrant feasibility studies for commercial mining, have been found on West Rennel and Vaghena. The nickel deposits on Santa Ysabel are not sufficient to be of commercial importance.

Commercial Crops

The coconut has traditionally dominated agriculture in the Solomons. It has been the mainstay of the local diet as well as the prime earner of export income. In 1978, copra accounted for 25.2% of total exports with a value of $SI 7,856,000.

Copra is produced by plantations and independent small farmers. Plantation production has remained constant, from between 10,000 to 11,000 tons annually. Small holder production rates, on the other hand, fluctuate greatly depending on the market price for copra. Despite such variability, the independent farmers account for more than 60% of the countries total copra production.

Copra is mainly sold through the Copra Board to Europe although new markets are being explored in the Pacific which will reduce freight charges and bring in a better price. There is not enough coconut

produced on a scale large enough to warrant expenditures on a coconut oil mill. There is a local soap factory in operation that produces copra for its own use.

Yields are low to very low on village coconut plots and plantation estates. A major advance in hybridization of the Malayan variety and a high yielding cultivar from Rennell Island is expected to more than triple yields. Government extension programs are underway to replant coconut groves with this new hybrid.

Palm oil project began with the formation of the Solomon Islands Plantation Company, Ltd. in 1971. The Commonwealth Development Corporation (foreign investors) holds 70% of the stock, the Solomon Islands Government 26% and local owners 4%. Approximately 3,626 ha were planted on the Guadalcanal Plains and by 1977 yields as high as 31,967 tonnes of fruit produced 7,030 tons of oil and 1,435 tonnes of kennels. In 1978, foreign exchange earnings from palm oil were $SI 4.6 million (Govt. of the Solomon Islands 1978b).

An irrigated rice scheme on the Guadalcanal is currently operated by the Brewer Solomon Associates, a subsidiary of C. Brewer and Co., Ltd. in Hawaii. The yields have been encouraging with 3,345 tonnes produced in 1977. High yielding varieties are being imported from IIRI in the Philippines and the target is to expand to 850 ha at 2.1 tonnes per ha. In 1978, rice exports brought in $SI 809,000.

Cocoa is produced on both plantation estates and in mixed subsistence/cash cropping farms. It is a minor export crop and most of it is exported to Europe ($SI 596,000 in 1978). Assistance to village farmers is available in the form of free seed, legume shade, fertilizers

and driers. Spices are yet another potentially viable export commodity. Trials on chilies, tumeric, ginger and cardmon have resulted in good yields.

Subsistence Agriculture

It has been estimated that nine out of ten families depend on their own production for food (Govt. of Solomon Islands 1978a). In fact, most of the real national income is produced from goods and services exchanged in the rural areas and does not enter the monetary sector of the economy. The average family farms 2-5 ha using traditional bush fallow methods on a 5-6 year rotation cycle for the production of food and other agricultural related products. The basic subsistence crops produced are sweet potato, yams, taro, cassava and coconut. The yields are low but adequate for consumption and exchange. River and stream irrigation is employed by farmers in the Western Group for taro cultivation. In Anuta and Tikopia, the permanent taro fields are rotated with cassava. Processing and preservation of taro, cassava, banana, breadfruit and other fruits are done by semi-anaerobic fermentation in ground pits. Santa Cruz and Reef Islands residents also dry breadfruit and canarium nuts for storage. Tree crops are a permanent feature in the Solomons traditional systems. They require low labor inputs and have low susceptibility to pests and diseases. Breadfruit is the mainstay in a Solomon diet. The breadfruit tree also provides materials for barkcloth, construction, fuel and is the chief wood used in the making of canoes (ADB 1979).

Livestock

The Solomons have an estimated 25,000 head of cattle. Most cattle production is under coconuts or in pasture land cleared of forest cover.

The returns from small scale livestock development projects have often been as much as two-thirds below the expectations of planners. This is partly the result of the difficulty small farmers often have in maintaining the sustained effort required for market production. A recent study (ADB 1978:46) noted that development schemes that "require regularity of labor or other inputs over a long period of time are likely to have limited success until such time as the socio-economic system permits a farmer to eschew other commitments and devote himself full time to the enterprise." In spite of such difficulties, livestock production has increased as the result of government subsidies for fencing and cash grants that have been made available for pasture improvement and stockyard construction.

The integration of cattle under forestry cover in an important part of the livestock development efforts and a major project is underway on Kolombanga Island. If this development is successful, it is predicted that approximately 15% of the national herd may be grazing in forestry plantations by 1985.

The Asian Development Bank granted $SI 4.2 million in 1977 to the Cattle Development Authority to operate an efficient transporation, processing, and marketing system. Three other countries involved in the effort are Great Britain (monitoring of cattle disease), Australia (personnel and the supply of Brahman Cattle), and New Zealand (meat canning and processing).

In the Solomons 93.4% (32,700) of all pigs and 99.3% of all poultry is raised in villages using traditional free-range practices. The enclosing of pigs has been encouraged by government and church missions for sanitary reasons and to promote intensive land use practices.

Unfortunately the enclosing of pigs has been to the detriment of pig productivity because pigs do not have access to a variety of natural foods and village farmers are not aware of or cannot afford to purchase balanced feeds. In general, pigs and poultry have received insufficient attention due to the lack of trained Extension workers and sufficient funds. However, recent developments may provide one way to raise livestock production at the village level. A nucleus estate and small-holder arrangement has recently been established in the Solomons. After farmers are trained, they buy six sows and a boar from the estate with a Development Bank loan. The estate supplies the feed and buys the pigs back for the factory. The Solomons could be self-sufficient in poultry and this small holder scheme is being considered as one way to develop the poultry industry.

Forestry

Timber is the second largest export commodity after copra. Nearly 90% of the land area is covered by natural forests and approximately 186,000 ha are considered commercially operable. At a cutting rate of 5,100 ha per annum (ADB 1979), current forest reserves are expected to last approximately 20 years. It is hoped that plantation grown trees will be able to replace the natural forests without a decrease in production. Fourteen thousand ha have already been planted and, at an annual planting rate of 3,500 ha per year, it is possible that the plantation area could reach a maximum of 124,300 ha.

Export earnings from timber in 1978 were $SI 7.1 million or 23% of total export earnings. There are 17 saw mills in the Solomon Islands.

The largest, Foxwood Timbers, in 1977 produced over half of the country's sawn timber (8,215 cubic meters), of which about 17% were exported.

Fisheries

Fisheries has recently emerged as one of the nation's main sources of revenue. In 1978, fish and fish by-products accounted for 21.9% of export earners ($SI 6,883,000). Expansion of the fishing industry has been largely the result of Solomon Taiyo, Ltd., a Japanese joint-venture operation with the Solomon Island Government. Since its inception in 1972, it has steadily improved facilities and increased production. During the last two years, a second fishing base was completed along with an additional freezing and cannery facility.

To support the local infrastructure for the marketing of fish, new markets are being equipped with ice plants and freezers and a public company known as SIACO has been formed to facilitate wholesale and retail distribution of fish. In addition to tuna exports to Japan, crayfish are sold to the United States and shell is exported to Hong Kong and Singapore for the manufacture of buttons. In addition to the increasing expansion of facilities for the harvesting of skipjack tuna, future plans call for the development of commercial crocodile and turtle farms.

Another recent development coinciding with the fishing industry is the conversion of fish waste into silage for livestock protein feeds.

Agricultural Credit

The Agricultural and Industrial Loan Board (AILB) is the primary provider of credit for agricultural development in the Solomon Islands.

The AILB is a government-sponsored agency that is controlled by a board comprised of civil servants and lay persons. In recent years, the Board has given priority to loan proposals for piggeries, small forestry projects, farm transport and fishing nets (Peters 1974). There has also been a tendency to favor group or village applications over individual projects.

The Agricultural Service plays a key role in the administration of the AILB loan program. Its field officers help in the initial screening of applications. Loans involving livestock are referred to the Agriculture Service Headquarters where officers review the proposals and assist the borrowers in developing their plans. Agriculture officers also make periodic checks on the progress of the borrowers and even accept loan payments.

Loan terms vary depending on the particular circumstances and the nature of the loan. Interest rates are usually in the 6-7% range with a 1-1/2% discount for prompt payment. Loans can run for as long as 7 years for cattle. However, those for piggeries and equipment usually run 2-4 years.

In addition to development loans, the AILB provides a comprehensive system of grants and subsidies to assist producers in meeting productions costs. The government also offers a wide range of grants and subsidies for such purposes as cattle importation, pasture improvement fencing and stockyard construction, cover crops, fertilizer, cocoa production, and for the planting, replanting and rehabilitation of coconuts.

Land Tenure

Eighty-eight percent of the land in the Solomons is owned by the indigenous people under customary land tenure arrangements. In general, rights to such land are recognized through clan or lineage group membership. No land may be alienated in the Solomons, but it may be leased.

A large portion of land in the preconstitution days was controlled by expatriates. In 1976, the Parliament recommended the return of this land to the descendants of original owners. This was a radical departure from existing policy and was a controversial issue at the time of Independence. In August 1977, an amendment to the Land and Titles Ordinance converted large, foreign-owned plantations into 75-year fixed-term estates. The Gilbertese and Ellice Island settlers owned 0.07% of the total land area and were permitted to retain their freehold status.

Since 1971, plantation purchase programs have been underway with the assistance of the Land Use Division and the Development Bank, to buy back, manage and develop expatriate plantation. The descendants of original owners have been allowed to purchase the smaller estates but have not been required to pay for undeveloped land. Fourteen such projects have been completed with the assistance of Agriculture Extension Personnel on a total of 1,114 ha of previously-alienated land. A total of 26 plantations were expected to be under this program by the end of 1979.

A major government attempt to register customary land is underway and may take years to complete. Today, 12% of customary lands have been registered. This effort has been fostered so the owners can lease land

with greater security and gain easier access to credit. Clans and lineages (with appointed trustees) as well as individuals may become registered owners.

The Land Division of the Ministry of Agriculture and Lands does all the planning for agricultural lands regardless of the status of registration. The Land Use Development Section of the Extension Service assists local councils in the area of land management by providing information on integrated development projects in their areas.

RESEARCH, EDUCATION AND EXTENSION IN AGRICULTURE

Institutional Capabilities

The Ministry of Agriculture has two major divisions: Agriculture and Land. Each division is further divided into sections. The Agriculture Division has 4 sections: Extension (103 staff), veterinary/livestock (10 staff), research (25 staff), produce inspection and quarantine (9 staff). The total staff working for the Agriculture Division in 1978 (147 persons) was a 16% increase over the previous year. The Land Division had 14 persons in administration and 47 in survey and map production in 1978, two persons less than in the previous year, the headquarters and administration staff of 28.

The activities and targets set out by the Ministry for 1975-1979 Solomon Islands Central Planning Office 1978), include the following:

- To set up methods of measuring growth in commercial agriculture production.
- Establish 50-60 Rural Trading and Marketing Centers and establish 6,000 ha of communal farms.

- Surveys: A 1974-75 survey of small holder agriculture has been completed and the results were published in 1977. A first survey on small holder food production has been completed and another on rural incomes and expenditures is nearing completion

- Identify and evaluate coconut projects, replanting of coconuts on small holdings and communal farms and establish a crushing mill for copra. A feasibility study done on the crushing mill in 1975 showed it to have only marginal feasibility and the project was later abandoned. A study of world market prospects for copra and coconut was commissioned by CFTC. It concluded that a minimal risk strategy was required for copra; that is, to continue to sell copra without further reprocessing.

- In livestock the main objectives was to replace meat imports with locally produced livestock products.

Research

The Research Section of the Agriculture Division has a staff of 25 persons. There is a Principal Research Officer and a Senior Research Officer in charge. Foreign specialists who are not counted as regular staff include a pasture agronomist, an assistant entomologist, and a coconut field trial assistant.

The Research Section is responsible for eight major National Development Projects (NDP). Several expatriates are included in NDP projects, including a weed agronomist, a coconut research consultant, and plant pathologist consultants.

There are three research stations responsible for field trials and laboratory experiments on crops and livestock. These stations are located at Dala, Malaita Island at Dodo Creek and Yandina. Since 1976, the Dala station has been closed for financial reasons. Expenditures on research between 1975-1976 averaged $SI 100,000/yr., compared to $SI80,000/yr. in 1971-1974. Two thirds of all research is conducted on coconut, cocoa, rootcrops and pastures and this pattern is expected to continue through 1979 (Solomon Islands Central Planning Office 1978).

Research Projects and Activities

Livestock. A feasibility study will be done on the establishment of a cattle development authority. In 1978, a small-pasture research team was funded with Australian aid to provide advice to farmers on the management of grasses and legumes. Pigs and poultry have lacked sufficient attention because there have been insufficient staff persons in this area. Trials are underway on the integrating of cattle under coconut trees on Kolobangara Island (Solomon Island Info. Serv. 1978).

Rice. Several trials are underway on finding a variety of rice which will not lodge under high fertilizer systems as well as being resistant to pests.

Spices. Research trials on chilies, tumeric, ginger and cardomon show good yields that may be processed satisfactorily. Extension efforts are now underway to provide seed stock to farmers. Approximately 50 tonnes of spices were exported in 1976 (Solomon Islands Central Planning Office 1978).

Palm. Trials are underway on the oil palm in the Western Solomons. The sago palm is defoliated by a species of stick insect (Ophicranic leveri). Two species of tachinid parasites have been found to feed on it and work is underway to collect the parasites for lab experiments. It is also hoped that the parasites will be effective on the coconut beetle.

Subsistence crops. Field trials are underway on the agronomic, insect pest and disease aspects of subsistence food crops. There is a concentrated effort to control the virus disorders on taro and sweet potato (Solomon Islands Information Service 1978).

Extension Activities

There were 27 general extension staff members in 1978: One field officer in charge, 11 additional field officers, 6 assistant field officers, 8 field assistants and 1 clerk. An additional 75 staff extension personnel were posted at village areas under the government's decentralization policy. Of this number, there were 2 senior field officers, 6 field officers, 10 assistant field officers and 57 field assistants.

Aside from the regular staff, there were nine persons servicing the division from other departments. They included 2 Land Use Development field officers, 6 Rural Development associates, and a Post Graduate student.

All field staff are assigned to local councils. These councils are responsible for the establishment and implementation of the local agricultural policy within the framework of the National Development Plan. The central government oversees the uniformity and quality of extension services. They are also responsible for the promotion and development of trained field staff officers. The three main problems for the Agricultural Extension Staff are in administration, in local government councils and in procuring supplies. Under the new constitution, the administration acts only in an advisory capacity and has little control over what takes place in the field. In some areas field officers are regarded with suspicion by local councils and the result can lead to a break in communication between both parties. Local councils have been known to block promotion of staff members which lends leading to a

decline in staff morale. The provision of supplies is also the responsibility of the local councils and often the staff member has difficulty obtaining them on time.

A major program in extension is assisting farmers in forming large communal farms which will hopefully reap the benefits of large scale enterprises. These projects are 100 ha or more and are usually located in areas of high agricultural potential. A number of setbacks have resulted. These include dissention with the group, difficulty in identifying competent leadership and distrust of extension agents.

The Ministry is confident that these social conflicts can be ironed out and the potential of such a program realized. In 1977, 14 groups involving 800 people on 960 ha had been established. The target is additional 26 groups with 2,500 people on 4,200 ha (Solomon Islands Central Planning Officer 1978).

Education Activities

Training Centers

Training Programs for farmers and staff will continue under the 1975-1979 Development Plan. Emphasis is on cattle and pasture management. By 1977, there were 4 district training centers, 6 village training centers and 10 village demonstration centers. The village demonstration centers are on land allocated by the village for this purpose. Courses run on farms are more effective and popular with farmers than those run at the Training centers.

The distribution of training centers is given in Table 6.1.

Table 6.1.

	Central	Eastern	Malaita	West	Total
District Training Center	1	1	1	1	4
Village Training Center	3	1	2	1	7
Village Demonstration Farm	3	-	4	3	10
TOTAL	7	2	7	5	21

Source: Solomon Islands National Distribution Plan (1975-1979).

Schools and Institutes

The major objective for education under the National Development Plan is to provide skilled manpower to meet development needs. The strategy undertaken is to create a coordinated system from the primary to tertiary levels to provide an environment conducive to learning rural development skills. Churches will be encouraged to relinquish their hold on education particularly at the primary levels and administration will be decentralized at the local government levels. Adult education programs will be coordinated with extension and information services. The curriculum in 8 new secondary schools will be centered around agricultural production, small industry projects and village leadership skills.

The Honiara Technical Institute provides agriculture training particularly for teachers and technicians. However, there are few agriculture courses offered and interest in agriculture is absent among students presently enrolled.

The Melanesian Council of Churches has been actively supporting rural development training among school drop-outs and secondary school students. As a result of their Bougainville Rural Improvement Seminar in 1976, women have been integrated in agriculture courses that were formally taught separately. Saint Patrick's High School is now teaching high school girls agriculture. Courses for women agriculturalists include pig farming, market gardening, sewing and leathercraft. Those going on to the third level are required to take more academic courses. Each girl begins with 3 pigs and by the time she graduates she will have more than 20 pigs, fencing tools, wire, medicine and a sewing machine. She will have also assisted in organizing a producer's cooperative with other farmers.

St. Patrick's High School had 24 graduates in 1977 bringing the total number of graduates since 1968 to 79. Only three of the graduates were female since the program had just been recently integrated.

The Council of Churches has also set up 5 Aevea Agricultural Schools in the Evo District since April 1977. These schools provide agricultural training to school dropouts. The first graduates have learned to manage small cattle operations and a leathercraft course began in 1978 to make products from cowhide.

Agriculture centers run by farmers in the North Solomons Kristen Famas Asoniesen have been set up in 5 member farms for the training of local school dropouts. The farmer/teacher is required to be a graduate of the Department of Primary Industry and a member of the Association.

12.63 Training in baitfish culture and management of commercial baitfish farms will be incorporated in the UNDP/FAO/UK baitfish project.

12.64 The Fisheries Training Center will also run courses for extension staff and island fishermen in various fishing techniques designed to raise productivity in subsistence and cash market fishing. Extension officers will teach similar techniques on outer islands.

RELATED SOCIAL AND ECONOMIC FACTORS

Economy

The Gross Domestic Product for 1977 was estimated at $A 34.9 million. Subsistence output is valued at $A 2.6 million but is actually non-monetary. GDP per capita, including the valuation of subsistence output is about $625, and adjusts to $A 575 without the subsistence output. These GDP per capita figures reflect only relative amounts and mask the great disparities in incomes between wage and subsistence earners, and between expatriates and the Kiribati (Downen 1980:2; Govt. of Kiribati 197-:9).

Figure 3.3 indicates the sources of the Government's operating revenue. It is apparent that the major source was phosphate tax (49%). These revenues reached a peak of $A 23 million (or 85% of revenue) in 1975, falling to an estimated $A 6.6 million or 61% of revenue in 1979. Fortunately, the impact of the loss of phosphate earnings on per capita income will be minimal as a result of both the strong subsistence activity, and a reserve fund which has been created from phosphate earnings set aside earlier. It is hoped that interest earnings from investment of the Reserve Fund will replace foreign aid (ADB 1979:334).

previous plan were numerous and complex and they posed serious administrative difficulties for those implementing them. A re-organization effort took place the following year to streamline the programs. Ten of the earlier projects were combined into three: coconut, cattle and communal farms, and a budget was submitted to the U.K. for financial assistance. However, the delay in approval for these funds forced the Ministry to take a go-slow approach. Meanwhile farmers expectations and confidence in these programs fell as they were not able to purchase the improved seed nuts, cover crop seeds and barbed wire they were promised.

The Agriculture Division, with direct interest in 70 projects and indirect interest in a dozen more, is short of experienced staff required to carry out the plan. The accounting office is inexperienced and understaffed and the ministry itself is short of nationals to fill the Senior Staff positions as expatriates are being phased out. In 1978, two-thirds of the expatriate staff left the Ministry of Agriculture and Lands. All the senior expatriate staff had left the Land Division a year before.

Another problem with respect to agricultural development is the lack of adequate sea transport. Ships often sail and arrive before agreed times, leaving extension officers and agriculture produce stranded. Fertilizers and other supplies are badly handled and risk damage or loss.

RELATED SOCIAL AND ECONOMIC FACTORS

Exports/Imports

The Solomon Islands is one of the few Pacific Nations with a positive trade balance. Favorable commodity prices, rapid expansion of the

export sector, the diversification of production and foreign development investments all supported an average annual growth rate of 7% from 1975 to 1978. Gross Domestic Product in 1977 was $SI 64.684 million with a GDP per capita of $SI 314 (Sevele and Ballard 1979).

The Agriculture sector share in 1979 was 70% of GDP and 90% of all export earnings. The relative share of various exports have changed throughout the decade. In 1970, copra and timber dominated trade with 92% of total receipts ($SI 6.5 million). Their share in 1978 declined to 48% of the total $SI 31 million. Meanwhile palm oil and fish rose from practically nothing to 39% of the 1978 total (ADB 1979).

In 1977, exports were valued at $SI 29.6 million and imports $SI 25.7 million leaving a positive balance of $SI 3.86 million (SPC 1978).

In 1978, the total value of exports rose to $U.S. 35.8 million, imports rose to $US 35.6 million leaving a trade balance of $US 186,000. Imports by SITC section in percentages were as follows: Food and live animals (16.3%), manufactured goods (18.8%), machinery and transport equipment (27.6%), mineral fuels, lubricants and related materials (11.4%), chemicals (5%).

Foreign Assistance

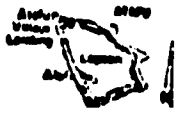
The Solomon Island became independent of Great Britain in July 1978. A post-independence settlement with Britain totaled $SI 43 million for development and budgetary aid during the first four years of independence. British foreign aid has been used to support public works, electricity and water works, roads, hospitals, education, forestry, fisheries, cattle and coconut projects. In addition other

donor countries and institutions include Australia, New Zealand, ADB and UN.

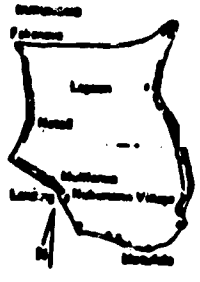
Official development assistance was 31% of GDP in 1976 and 20% in 1977. Total assistance in 1977 was $A 14.54 million with bilateral aid accounting for 95%. The largest shares were from the U.K. (81%), ADB (34%) and Australia (12%) (SPC 1978). Aid from the United Kingdom is to be phased out by 1981 and it is expected that there will be no severe repercussions on the economy.

Development Plans

The Solomons is one of the few countries in the Pacific that has the decentralization of Government as a major goal. The 1975-1979 Development Plan covers the transitional phase from its former protective status through independence. The plan enumerates several principles. Decentralization will shift the allocation of resources and political/economic decisionmaking responsibilities to local councils and area committees. Self-reliance will be promoted through fundamental changes in the aims and content of education so that it may become more compatible with the needs of a basically rural traditional society, a reduction of foreign aid, the use of alternative energy and increased attention and efforts towards raising food productivity and distribution. Localization, increased local participation and regional cooperation are also included as principles.



TOKELAU



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Miles

PEOPLE

Population: 1,600 (1978)
Annual Growth Rate: -1.2%
Ethnic Groups: Polynesian (maj.), European (minority)
Languages: Tokelauan and English
Literacy:
Life Expectancy:

GEOGRAPHY

Land Area: 10 sq. km.
Capital City: Nukunonu, with administrative centers on each atoll.
No. of Islands: 3
Terrain: Reef-bound, coral atolls, enclosing lagoons.

ECONOMY

Total Government Exp: $NZ 1,576,570 (1979), Official Development Assistance = 85%
Total Gov't Exp/capita: $NZ 985 (ODA $838)

TRADE

Exports: $A 14,000 (copra)
Partners: New Zealand
Imports:
Partners: New Zealand

POLITICAL STATUS: Non-self-governing dependency of New Zealand.

TOKELAU

OVERVIEW

Tokelau consists of three atolls, Fafaofo, Nukunonu and Atafu, located 483 kilometers to the north of Western Samoa. Each atoll consists of a number of reefbound islets encircling a lagoon. These islets, called motu, vary in length from 100 m to 6.5 km, and in width from a few to 200 meters. Within this atoll environment, the 1600 people of Tokelau prefer to live on one or two of the main motus of each atoll and commute to the others, which are used for gardens.

The highest point in Tokelau is only 5 meters above sea level. The total land area is 10 sq. km with a total sea area of 290,000 sq. km (Sevele and Ballard 1979). Nukunonu is the largest atoll with 546 ha, Fafaofo has 263 ha and Atafu, 202 ha (Inder 1978:394).

Tokelau is a non-self governing dependency of New Zealand. New Zealand aid provides more than 80% of total government expenditures, and there are more Tokelauans living in New Zealand (2,200) than in Tokelau.

Agriculture provides the only major source of export, namely copra. "Most labor is devoted to procuring food from lagoon, ocean, or plantation, to village maintenance, and to the production of woven mats, fans and curios" (Govt. of Tokelau 1979:9).

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

The mean average temperature is 20°C, with July being the coolest month and May the warmest. The rainy season is from November to March, and in general, less rainfalls between April and October. Yet the

rainfall during July is heavy. Records for the past 20 years indicate an average of more than 300 mm of rain in December and January for all three atolls, and a consistent 170 mm average per month for the rest of the year. Observers have noted that lack of water should not be a problem with adequate catchment (Lambert 1974:5). The islands are exposed to severe tropical storms which have caused serious damage in the past (Govt. of Tokelau 1979:3).

Soil

According to the Ministry of Foreign Affairs, the soil is "thin and infertile, and has resisted all efforts to increase productivity by the application of fertilizers" (Govt. of Tokelau 1979:7). The soil is composed of sand and gravel with coral stones of varied sizes. In some coconut groves there is a very fine layer of humus, located where organic matter decomposed. The soil does not retain water and is very permeable. It is relatively poor in nitrogen and potassium and contains very little assimilable phosphoric acid. Generally, the fertility potential is low. Because soil fertility is so low, it has been suggested that mineral fertilizer containing nitrogen and potassium with a slight addition of iron sulfate be used (Lambert 1974:7).

Water

Tanks and reservoirs have been constructed to collect rainwater from corrugated iron roofs of various structures. There is a capacity in Fakaofo for 45,000 gallons, collectible in underground tanks. There are plans to build large reservoirs under verandas of hospitals which were built on each atoll. Vegetable crops which are limited by the atoll environment, can only be water to a limited extent (Lambert 1974:5).

Minerals

No information available.

Crop Production

The economy of Tokelau is based mainly on sea resources, copra, the pandanus palm and remittances from New Zealand (Govt. of Tokelau 1979:6). The total exports for 1977 were comprised of copra, valued at $A 14,000 (Sevele and Ballard 1979:12). Most atoll land supports coconut trees with little care. However, beyond subsistence, the land yielded only NZ $10 to $12 worth of copra per capita in 1970.

Called "Fala," the pandanus plant is important for food as the fruit is edible and enjoyed by Tokelauans. The leaves are used in mats, ropes and other handicrafts and the Tokelauan pandanus is especially favored for fibermaking (Dharmaraji 1978:2).

In addition to coconuts, the main food crops are taro (Cyrtosperma chamissionis), breadfruit, ta'amu (Alocasia macrorhiza), papaya, the fruit of the edible pandanus, and banana. Taro is grown in marshy areas which is enriched with all kinds of organic waste. The water is barely brackish or even fresh, and the level recedes with the tides (Govt. of Tokelau 1979:7).

Pests

The major pest is the Coconut Stick Insect, Graeffea crouanii. Because copra is the main source of income, any threat to the value of the trees is quite serious. During severe outbreaks of the pest as much as a 15% reduction in yields has occurred. In addition, pandanus plants are severely damaged by this insect. There are apparently no natural parasites. Free-ranging chickens and the blue-tailed skunk lizard are two natural predators of the eggs of the insect (Dharmaraji 1978).

Another coconut palm pest is the Coconut Flat Moth, common also in Fiji, Samoa, Tonga, and other islands. The Polynesian rat is responsible for destroying a large number of coconuts. Wafarin and zinc phosphide hav been used to kill them (Dharmaraji 1978).

It has been suggested that exotic parasites such as Paranastatus nigriscutellatus and Paranastatus verticalis be released to control the Coconut Stick Insect. If the costs of producing the parasites were provided (WS$ 600), parasites could be made available through the USP School of Agriculture (Dharmaraji 1978).

It has been suggested that exotic parasites such as Paranastatus nigriscutellatus and Paranastatus verticalis be released to control the Coconut Stick Insect. If the costs of producing the parasites were provided (WS$ 600), parasites could be made available through the USP School of Agriculture (Dharmaraji 1978).

Coconut palms have been infested by the rhinoceros beetle on Nukunonu and surrounding islets, but as of 1978 there was no evidence of the beetle on either Atafu or Fakaofo. There has been much success in eradication using attractant traps and the Rhabdion virus. The results have been so promising that it is hoped the beetle will be eradicated within the next few years (Inder 1978:395).

Livestock

Livestock consists of pigs and poultry. An experimental piggery was completed on Nukunonu in 1979.

Forestry

The tauanaue tree is grown on one islet in each atoll so that local timber will be available for canoe-making, house-building and domestic utensils (Inder 1978:395).

Fisheries

Ocean and lagoon fish form a staple part of the local diet. Species which are commonly caught include tuna, bonito, trevally and mullet. Tokelau is participating in an SPC-organized skipjack tuna assessment program and expects to enjoy the financial benefits of a 200-mile EEZ.

Tokelau has no natural ports. At the main settlements of all three atolls small boat channels have been blasted through the coral reef (Inder 1978:396).

Agricultural Credit

No information available.

Land Tenure

Land is wealth in Tokelau. In 1952, Gratten reported that the 273 ha of Fakaofo atoll was parceled in 1000 named sections, some so small as to contain only 2 or 3 coconut trees. An extreme illustration of the Tokelauan attention to and need for land occurred during the 1914 hurricane. When additional land (sand) was washed up, the village council divided it into one communal plot for the church and school and 14-individually owned strips (Crocombe 1971:84).

It is a complex system of interlocking social groups which controls and distributes the scarce land and water resources. In general, land is the property of the head of the family; some lands are communally-owned, however.

The resident motu, used mainly for house sites and breadfruit groves, is associated with large descent groups, tracing from a sibling set back ten or twelve generations. The right to occupy land is traced

from females of the original sibling set, and those who trace lineage from males have the right to control the land. Shallow descent groups (3 or 4 generations back) hold land rights to the motus which are not permanently inhabited. The village controls the use and access of the large part of these lands (Crocombe 1971:85).

Approximately one fourth of the atoll's land is held in common. The resources of pandanus, coconuts for housebuilding and thatch are shared. The village has a large pulaka (taro) garden divided amongst shallow descent groups, yet distribution is strictly controlled by the village council. Fish and water distributed in this manner provide for an egalitarian system (Crocombe 1971).

The Tokelau Islands Amendment Act of 1967 permits Tokelauans to dispose of the land amongst themselves; however, alienating land to non-indigenous inhabitants or foreigners is forbidden (Govt. of Tokelau 1979:7). Land reform, given the Tokelauan situation, has little or nothing to contribute to the rising aspirations of the people. Experimentation with resettlement, given the natural limitations of an atoll environment, have evidenced the degree of difficulty involved (Crocombe 1971:86).

RESEARCH, EDUCATION AND EXTENSION IN AGRICULTURE

Institutional Capabilities

The Director of Agriculture for the Tokelaus is Mr. Semu Uilu. He is assisted by Mr. Fous Toloa, a 1978 Diploma Graduate of the student, USP School of Agriculture.

Tokelau receives a good deal of technical assistance from outside agencies in the region, including the University of the South Pacific,

the SPC, UNDP/FAO and the SPEC (Dharmaraji 1978; Lambert 1974). Most higher level training occurs in New Zealand or at the USP.

Projects

In addition to those mentioned already in connection with the Coconut Stick Insect and the Rhinocerous Beetle, several other projects are underway.

The University of the South Pacific and UNDP are engaged in vegetable trials on each atoll using carefully selected seeds and fertilizers (Govt. of Tokelau 1979).

The United Nations Development Program, in 1977 instituted a program of assistance to Tokelau which provides each village with a generator, three freezer chests and a selection of fishing tackle. In 1978, the UNDP provided assistance in the fields of agriculture, and communications of approximately US$ 20,000 (Govt. of Tokelau 1979:7).

The South Pacific Commission is currently helping Tokelau in the areas of water supply projects, technical and in-service training, scholarships, and a fishery development. The South Pacific Bureau for Economic Cooperation is assisting with in-service training, and WHO and ILO continue to offer assistance and advice upon request (Govt. of Tokelau 1979:6).

RELATED SOCIAL AND ECONOMIC FACTORS

Population

The atoll environment in traditional times met the subsistence needs of the people. Until recent years, there was little demand for the material standards of more "developed" countries. Increased contacts with Western Samoa and New Zealand have stimulated wider

aspirations and a desire to raise the standard of living along western models. Coupled with increased population pressure on land and resources, these aspirations have at times, resulted in explicit out-migration policies (Trumbull 1977). The current policy, with population stabilization, has indefinitely suspended the resettlement scheme (Inder 1978:393).

The population of Tokelau in mid 1978 was 1,600 persons. The population density was 160 per sq. km and the annual rate of growth has been -1.2% from 1968 to 1978. In the years from 1975-1978, the annual rate of growth has been 0.0% (Sevele and Bollard 1979).

Presently there are 2,200 Tokelauans living in New Zealand, larger number live at their homeland of Tokelau (Trumbull 1978:175).

The Tokelauans themselves have considered migration to be a solution to problems of overpopulation. With the New Zealand sponsored Tokelau Resettlement Program, the obvious and desired affect of out-migration would be less pressure on the land and resources with the secondary affect to be land reform. Unfortunately, rising expectations and a high birth rate undermine this solution to the overpopulation problem (Crocombe 1971:86).

Economy

The economy of Tokelau is based mainly on sea resources, copra, the pandanus palm, and remittances from New Zealand (Govt. of Tokelau 1979:9). There has been increased attention paid to philately coins and handicrafts, yet copra remains to be the only viable export (Lambert 1974:8). The total exports for 1977 for Tokelau was comprised of copra and worth $A 14,000 (Sevele and Bollard 1979:12).

Village revenue is derived from remittances and from the export tax levied on copra (Govt. of Tokelau 1979:8). All goods entering the group is charged a tax. Revenue from remittances and the copra tax is put into special funds, whose utilization is determined by village authorities. These funds attract a 2:1 subsidy from Tokelau's general budget. In addition, there is a 10% export tax on handicrafts, as well as shipping and freight charges, postage stamp sales and the return from radio and telegram services. Further, local revenue comes from remittances from relatives. During the 1978-79 fiscal year, stamps, coins and handicrafts emerged as the principal revenue earners (Govt. of Tokelau 1979:6). In all, though, local revenue provided only 15 percent of total governmental expenditures during the FY 1978-79. During the same year, grants from New Zealand totalled 82% and other grants, the remaining 3% of expenditures. Table 8.1 indicates the relative size of the government expenditures and sources of funds.

Table 8.1. Total Government Expenditures and Sources, 1978-79 ($WS)

Total Government		Sources of Funds:			
Expenditures	$WS 1,198,330	Local Revenue	$WS	180,000	15%
For Agriculture	20,500 or 2%	Non-New Zealand Grants		30,000	3%
		New Zealand Aid		990,330	82%
			$WS	1,198,330	100%

The sources for financial aid aside from New Zealand include SPC (water supply, fisheries development); SPEC (in-service economic development and training); UNDP, $US 20,000; WHO and ILO (advice and assistance); UNDP/USP college of tropical agriculture (vegetable trial

on each atoll utilizing selected seeds and fertilizers); UNDP/FAO (fisheries development) (Govt. of Tokelau 1979:12).

Financial Institutions

Legal tender in Tokelau is New Zealand currency, yet for convenience, Samoan tala is also used. In Apia, Samoa, the Post Office Savings Bank and commercial banking facilities are available for Tokelauans, yet in Tokelau there are no commercial banks. Since 1977, the savings bank on each island has been under the control of the administration officer (Govt. of Tokelau 1979:8).

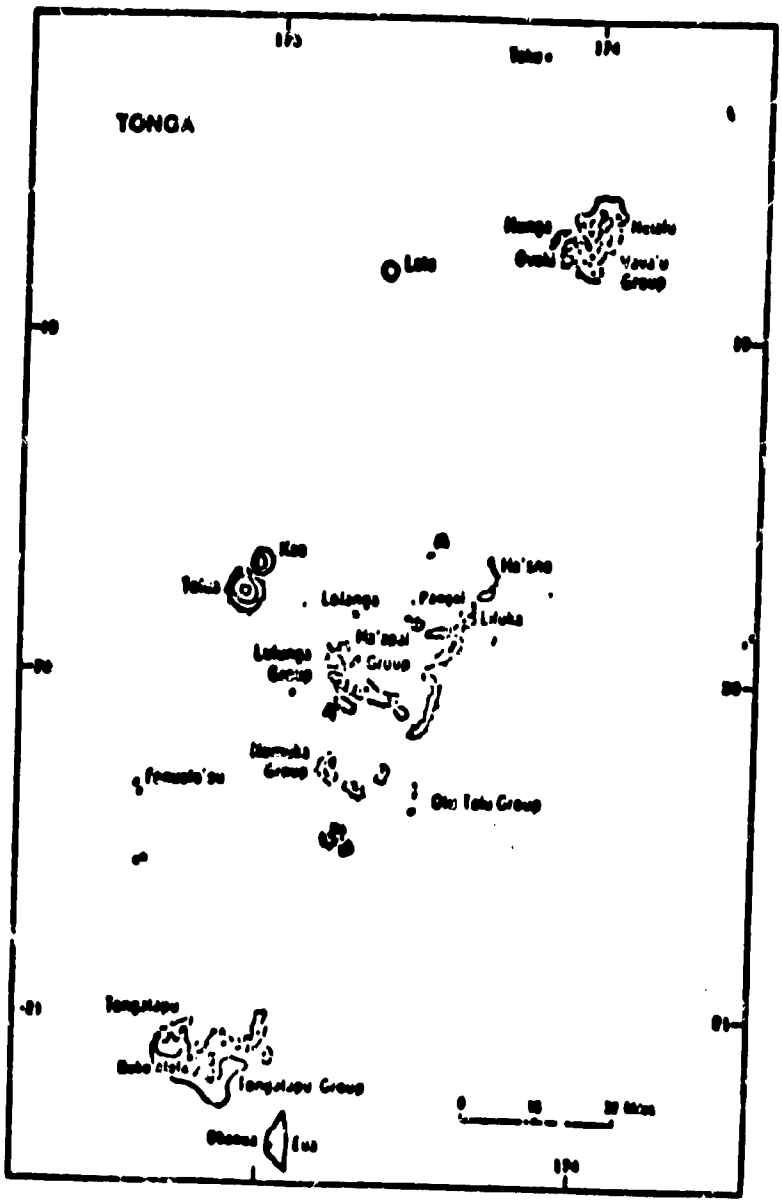
Transportation

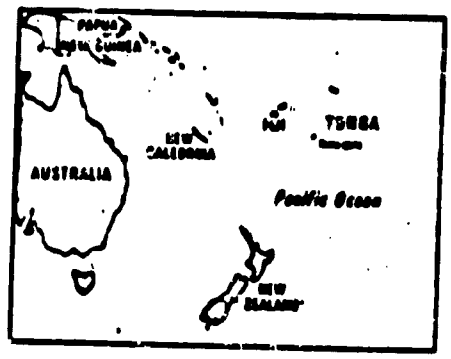
In 1974, the Pacific Navigation Company's "Aoniu" was withdrawn from charter rendering the islands without a regular shipping service. The "Cenpac Rounder" was chartered for 5 voyages from Nauru's Pacific Line during 1978. The Tokelauan towboat was lost in bad seas in 1975 so the Office of Tokelau Affairs is completing a replacement (Govt. of Tokelau 1979:8). Air service to Tokelau is non-existent. There are no ports; the coral reef has been blasted to provide access for small boats.

Communications

Tokelau has four radio stations, three of which transmit weather reports at 4-hour intervals. Each island has a single sideband radio set. It is anticipated that a UNDP-sponsored radio-telephone link between the two inhabited islets of Fakaofo will soon be completed (Govt. of Tokelau 1979:8).

Kingdom of Tonga





PEOPLE

Population: 93,000 (mid 1978)
Annual Growth Rate: 1.5%
Ethnic Groups: Tongan 98%, Other Polynesian, European.
Languages: Tongan, English
Literacy: 90-95%
Life Expectancy: 56 years

GEOGRAPHY

Area: 800 sq. km.
Capital City: Nuku'alofa, Tongatapu
No. of Islands: 150
Terrain: Mainly raised coral, but some volcanic.

ECONOMY

GDP: T$ 31 million (1979)
Per capita GDP: US$ 428

TRADE

Exports T$6,207,000
Partners: Europe 69%, New Zealand 25%
Imports: T$17,697,000
Partners: New Zealand 40%, Australia 24%, Japan and Asia 16%, US 6%

POLITICAL STATUS

KINGDOM OF TONGA

OVERVIEW

The Kingdom of Tonga consists of approximately 150 small islands scattered over 52,000 sq. km of sea. Approximately 36 islands are inhabited and range in size from small reef islets to the largest island of Tongatapu with approximately 36% of the total 800 sq. km land area. About 60% of Tonga's 100,000 people live in the capital town and main port of Nukualofa, Tongatapu.

The islands are divided into three major groups. The most southerly group is Tongatapu, with the same name as the largest island, and consists geographically of mixed volcanic and limestone structures. The island is barely above sea level in the north and rises to 82 m in the southeast. Most of the island is flat and less than 20 m above sea level. The Ha'apai and Vava'u island groups lie further north, and are also volcanic or mixed limestone/volcanic in origin.

According to the Third Development Plan (Tonga Central Planning Office 1976:52) "Agriculture and fisheries will continue to be the major economic activities of the Kingdom for well into the future, in terms of production, exports and employment. In 1974-75, agriculture contributed about half of Tonga's GDP and 95% of her export goods. Agricultural priorities include increasing the level of domestic self-sufficiency and diversification of the agricultural base.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

The climate of Tonga is mildly seasonal with regular tradewinds. There is a warm period from December to April with maximum temperatures

at 32°C, and a cooler period from May to November with maximum temperatures at 27°C. Annual rainfall varies between 1712 and 2972 mm increasing from North to South. Annual rainfall in Tongatapu, for example, is 74 inches.

Tropical cyclonic weather, known in Tonga as Afa, occurs between late November and early April. These storms can produce serious agricultural damage. Since 1951, three such cyclones with winds between 74-110 km/ur each destroyed more than half the banana crop on Tongatapu. A March 1961 hurricane destroyed 100,000 coconut trees and resulted in an 83% decline in copra production that year. Infrequent local whirlwinds known as ahiohio also cause damage. One ahiohio in January 1968 destroyed 90% of the banana crop, coconut and breadfruit trees, and other subsistence food crops in the southern islands of the Ha'apai group (Thaman 1976:26).

Soils

There are two basic soil types identifiable by their location. The upland soils are deep friable clays ranging from moderate to high fertility. They cover 90% of Tongatapu and are particularly valuable for agriculture. They resemble the low humic latosols found in Hawaii. Their fertility derives from the volcanic parent material. These upland soils tend to be very high in available calcium, low to moderate in nitrogen, very low to low in available phosphorus, moderate to high in available potassium and low to high in magnesium (Thaman 1976:34). Zinc deficiency tends to be evident in crops like citrus and corn grown on them. Preliminary findings from a soil survey carried out in 1975 by a team from New Zealand suggest phosphorous and nitrogen deficiency which is inhibiting growth (Tonga 1975: 157).

The second major group of soils are the lowland soils. These soils are shallow, loose, rapidly draining and range from sands to loam in texture. The subsoil is absent and the soils resemble regosols found in other low-lying Pacific coral islands. These soils can be found in the lowlands of Tongatapu and cover approximately 10% of its land area. Most foods crops like coconut, sweet potato and tapioka can be grown on these soils, except yams.

Water

The distribution of rainfall in these islands is adequate although sometimes unreliable. Periods of drought may occur between April and December. An absence of surface streams makes subsurface hydrology an important consideration. However, the main water sources are springs and wells, although water is often collected on tin roofs. A household survey undertaken by the government and the World Health Organization indicated that almost 30% of all dwellings surveyed had piped water and rainstorage tanks, about 13% had tanks and wells, 27% only piped water, 11% wells only, and 11% tanks only (Tonga 1975).

The ground water table is less than a meter above sea level and the depth of the table ranges from a few meters to 46 meters. Some increase in the chloride content of the water is being experienced and is attributed to salt water influx from excessive pumping.

Minerals

There has been activity with respect to the exploration for oil, and to assess the potential for manganese nodules. As yet, the oil explorations have proved unsuccessful.

Crop Production

Agriculture plays a major role in Tonga. Not only does it provide more than 80% of all export revenues but it continues to be a major source of local foods, medicines, oils, soap substitutes, ingredients for beverages and fish poisons (ADB 1979: App. C). As many as half of the dwelling units in Tonga are constructed with various coconut products. In a 1971 survey, Thaman (1976:141) found that a majority of farmers were fulltime agriculturalists. Another 15% still considered themselves primarily farmers but obtained additional income from other jobs, i.e., storekeeper, lay preacher, banana inspectors.

Commercial Production

The contribution of agriculture to the GDP of Tonga is one of the highest national proportions in the Pacific. During 1974-75, agricultural production contributed approximately 51% of the GDP. In 1977, 95% of total exports were comprised of domestic agricultural products. Copra and coconut products accounted for 80% of the export trade in 1978.

Banana is second in importance as an export crop and is also a major staple food. Watermelon ranks third as an export crop. It is a major item at the local market. The two most common varieties are the "Ice Cream" and "Market Wonder". Tomatoes rank fourth as an export crop. However, like most vegetables production, its development is constrained by the lack of a consistent water supply. Pineapple and plantain are minor export crops but are a regular part of the diet. Peanuts are grown for local sale.

Subsistence Production

Subsistence agriculture which includes some cash cropping is the primary form of farming in Tonga. Food produced for consumption accounted for an estimated 71% of all agriculture production during 1974 and 1975. The value of subsistence within the non-monetary economy has been estimated at T$ 11.3 million (1974-1975). This was expected to rise to T$ 13.2 million in 1979-1980, with its share of GDP declining from 40% to just under 36%. However, accurate statistics on subsistence are very difficult to obtain and the share maybe much larger.

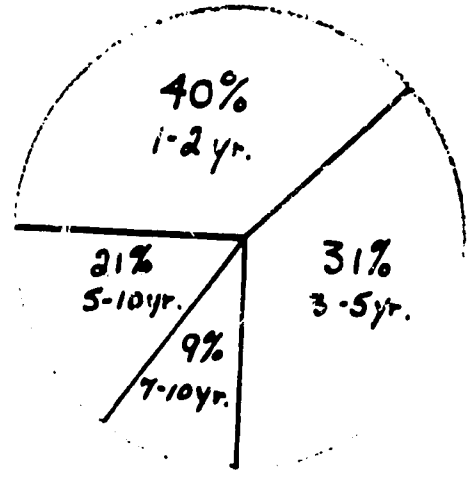
The Tongan diet is largely based on staple and subsidiary crops grown in traditional gardens using simple garden implements such as cane knives, hoes, rakes, digging sticks, spades and small copra knives. A growing number of farmers are using a tractor pulled plow and disc harrow rented from the Agriculture to clear and prepare their land.

About 40% of households use fertilizers, fungicides and insecticides, but in most cases use is related to commercial purposes.

Fertility is restored to the soil through the use of fallow land cycles which vary according to the species grown. Proportions of land

in these fallow stages are indicated in Figure 6.1. At the end of the fallow period trees and all secondary growth are cut, dried and burned to add nutrients to the soil. When yields decrease new sections of land are cleared.

Figure 6.1. Fallow Land



There are a number of root crops which are important staple and commercial crops: the greater yam (Dioscorea alata) is planted during the months of May through December and requires 6 to 12 months to mature; the giant taro (Alocasia macrorrhiza) is planted during July through September and requires 14 months to mature; the gea or less sweeter yam (Dioscorea esculenta) is of major importance in islands where the greater yam does not grow well; and the dryland or American taro is a more recent introduction. Other subsistence crops include sweet potato (which may be harvested throughout the year), cassava and breadfruit. In addition, a variety of tree species are generally grown. They are valued for their fruit, as sources timber, firewood, dyes, traditional medicine, flowers for leis and boundary markers. When land is being cleared these trees are protected.

Livestock

Between 1970 and 1974, imports of animal products almost tripled from T$ 0.5 million to T$ 1.4 million. The focus of activity in livestock is on achieving self sufficiency. The current population of livestock is presented in Table 8.1. Cattle represent a good basis for an industry which may one day supply local needs for meat. At the present time, demand far exceeds supply. In dairy products, Tonga is virtually self-sufficient although there will be a need to expand production somewhat to continue to meet the demands of a growing population. The same situation occurs with poultry. Already self-sufficient in egg production at the time of the Third Development Plan, Tonga expects to be self-sufficient in broiler production shortly. Pigs are the most significant contributor to locally-produced meat, most of which is produced on a small scale.

Table 8.1. Local Livestock

Cattle	6,480
Horses	7,098
Pigs	39,882
Goats	5,836
Poultry	111,066

Various livestock subsidy schemes were initiated since 1968 to encourage commercial production, including:

-- Pig Subsidy Scheme (1968), which provides 3 weaner pigs to farmers who construct cement pig sties and plant approved food crops, e.g., manio, corn and sweet potatoes.

-- Poultry Subsidy Scheme (1971), which provides one-half of initial poultry stock.

-- Cattle Subsidy Scheme (1972) which provides fencing, water system, and land clearing and is intended to allow heifer calf production at subsidized prices to those meeting requirements. It also addresses pasture improvement.

Despite these efforts, an independent observer in 1976, and the government in its 1974-75 Third Development Plan, have both concluded that there has been only limited success in encouraging the inclusion of new techniques in the Tongan agricultural system (Tonga Central Planning Office 1976:185-188; Thaman 1976:187).

Forestry

Estimates indicate approximately 3,000 ha or 4% of the total land area is in natural forest. Coconuts are grown on 54% of Tonga's land and these coconut groves offer considerable potential as sawn timber. Other products such as heart of palm may also be collected and exported. Tonga had two sawmills in operation in 1979.

There has been significant effort to develop the forest resources through plantation methods with an aim of meeting local requirements for timber, shingles, flooring and other goods. A forestry project in the Third Development Plan sought to increase forest acreage by 12% and to double timber yields. Although it may not be possible to achieve complete import subtitution for this expensive commodity, even partial replacement of imported timber with local wood would constitute an improvement.

Fisheries

Most fishing in Tonga is done on a subsistence basis. The shallow reef area surrounding the islands provides a complex ecological environment for a variety of edible fish. Reef fishing is plentiful offshore

on most islands except Tongatapu where the demands of a large population and modern fishing methods have resulted in a serious depletion of the surrounding waters. The government is optimistic about the potential for large-scale fisheries in skipjack tuna. The problem is that such large-scale fishing requires live bait (Tonga Central Planning Office 1976). Skipjack, particularly, requires live bait which is very limited in Tonga (ADB 1979). A survey of commercial fishing potential has been included in the Third Development Plan.

Agricultural Credit

No information available.

Land Tenure

It is not possible to fully grasp the Tongan land tenure system without understanding the social structure as well. They are intimately related and unlike any other in the Pacific. Further, the land tenure system is a key determinant of the productivity of agricultural efforts, particularly with respect to commercial and export crops.

Since the late 1800's, the system of allocation and ownership has undergone several modifications. The early, somewhat feudal system, was changed by law to provide assurance of individual land rights to males older than 16. Hereditary estates still play a major role in the tenure system; however, access to land and security of ownership have been brought within the modern legal and governmental structure.

The limited amount of land and growing population have created pressure for further reform. It has been estimated that by 1980 there will be some 33,000 taxpaying males eligible for town and bush allotments of land and not enough to go around. Much of the land designated

for distribution (registration) remains within the traditional land system and some lands that have been registered remain underutilized. The most important objective of further adjustments is to address the problem of increasing present low levels of production and productivity so that the standard of living for a growing population can be maintained (or improved).

As a result of the strict land tenure code, much of the land is distributed in 3.5 ha allotments. The small size of the allotment inhibits expansion to larger-scale production. However, there is potential for combining farms to market and produce collectively. The New Farmers Federation is an example of such a collective. Participants are required to have at least 2 ha under cultivation. Using an educated managerial and technical staff, production planning is done for the group. Copra and subsistence food crops remain individual responsibilities with group emphasis on bananas, tomatoes, bell peppers and other vegetables.

RESEARCH, EXTENSION AND EDUCATION IN AGRICULTURE

Agricultural Development Objectives

Objectives and strategies for agricultural development in Tonga have been set out in the Third Development Plan (Tonga Central Planning Office 1976:50). The Plan includes the following as part of its overall objectives:

-- The continued expansion and diversification of exports and export markets;

-- The diversification of production in order to reduce Tonga's reliance on traditional products and imports;

-- The expansion of agricultural production and the development of the country's fishery and forestry resources;

-- The continued improvement of the quality of education through the expansion and upgrading of educational and training facilities at primary, secondary and technical levels.

Specifically, the priorities identified for agriculture (Tonga Central Planning Office 1976:152) are:

-- Ensure that adequate homegrown food supplies are available to provide balanced diets for the whole community including all livestock.

-- Grow sufficient quantities of crops for export to provide the funds for the purchase of essential goods not locally available.

-- Increase production levels over and above basic necessity, in order to provide funds for essential services such as health and education and for desirable products which contribute to higher living standards.

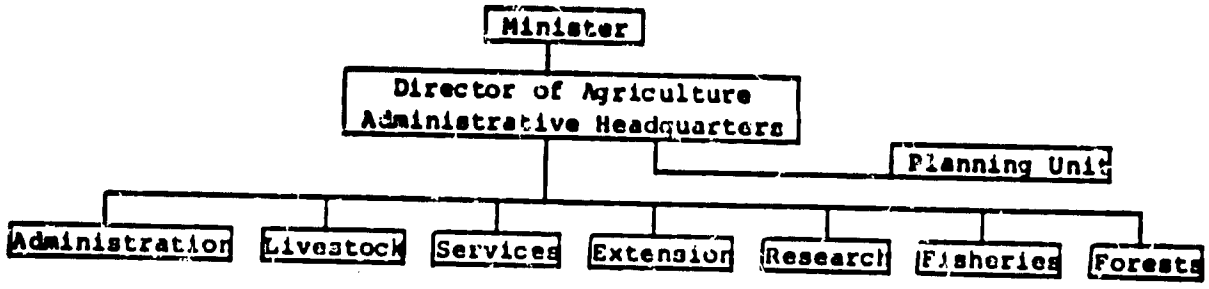
-- Provide funds in excess of the above to facility further development and to increase the prosperity of Tonga and its people.

Specific targets for improving commercial production include a coconut replanting scheme which aims to improve 1050 ha, including an addition of 420 ha. It is expected that the Replanting Scheme will take some years to show improvement because the trees require 7 years of growth before reaching fruitbearing age. The Banana Rehabilitation Scheme seeks to quadruple banana exports by increasing productive acreage by 50% and increasing yields by 100%. In addition, the plan calls for the development of better packing sheds for handling bananas, to improve hygiene and the equipment available for packing.

Other projects in the plan address needs for a cattle breeding farm, machinery and vehicles for agriculture (both the replacement of old equipment and the addition of new) as well as improvements in forestry and sawmill activity.

Institutional Capabilities

The Ministry of Agriculture is headed by a Minister of Agriculture and administered by a Director who has a Planning Unit and seven Divisions under him.



At the end of 1977, the total staff of the Ministry, excluding laborers was 228 with 26 vacancies. Extension and Research are the largest divisions with 66 and 56 permanent staff respectively (1977 figures include laborers assigned to each unit).

The Central Administration has overall responsibility for the planning and management of finances, manpower and resources. An agricultural planner was requested from the United Nations to assess the needs and formulate policies and programs for the Ministry. To increase their administrative and supervisory skills, several staff members were scheduled to receive additional overseas training.

The Planning Unit was established in 1977 to assist with the formulation of plans and policies. It has primary responsibility for evaluating current projects, identifying constraints, and making recommendations. This office was started with a staff of three but has requested the services of a statistician and an agricultural economists. It is hoped that the Planning Unit will become a valuable support to both the headquarters and the various divisions within the Ministry.

The Administrative Division has responsibility for operating and maintaining two agricultural markets and the government's plant quarantine service. It has a small staff of officers, inspectors and clerks, and is supported by a number of laborers and maintenance personnel.

The Livestock Division, in addition to keeping records on livestock populations, is primarily concerned with veterinary work, disease eradication and the promotion of livestock development programs. In 1977, surgery was performed by a single veterinarian and most of the clinical work was done by a veterinary assistant. Since 1977, the piggery and other intensive development schemes have been phased out and the division has concentrated its efforts on extensive management programs that are more compatible with local social, economic and environmental conditions. Efforts in the poultry industry have had considerable success towards insuring a regular supply of poultry feed and eggs for local consumption.

The Services Division is in charge of the operation and maintenance of the machinery at each of the stations including vehicles, tools and a coconut sawmill. This unit also oversees the enforcement of agricultural regulations and the operations of the Coconut Replanting Scheme.

The Fisheries Division has been involved in marine research and a number of experiments to determine the methods of fishing most appropriate for Tongan waters. Longline fishing has had considerable success in increasing the harvest of Albacore tuna. Experimental efforts with bottom and surface gill-net fishing have proved unsatisfactory thus far.

The Government Fishermen's Loan Scheme has been transferred to the Tonga Development Bank, however, technical approval for loans will continue to be made by Fisheries Division staff. Staff capabilities are continually being up-graded. One staff member has completed a Fisheries Management Course at Gimsby College of Technology in England and another attended a fisheries extension course in Japan. In addition, at the end of 1977 two other employees had completed course work for Diplomas in tropical fisheries.

The Forestry Division has been primarily involved with nursery experiments and raising trees for transplanting. In 1977, 54,232 trees were lifted for planting and an additional 51,423 plants were lined out. Centralization of forestry activities is planned with the establishment of a Forest Headquarters at Tongatapu with a tree nursery, coconut sawmill, maintenance shop and a unified sales and distribution facility. Land tenure problems are making expansion of forest estates difficult.

The Research Division is divided into 7 subsections under a Head of Research: Farm management with 3 staff and 15 laborers; Agronomy with 4 staff, 8 laborers (and a vacant position for an agronomist); Soil Chemistry (with all posts vacant during 1977); Animal Production with staff, 4 laborers (and 2 vacant positions); Entomology with 3 staff officers and 1 laborer; Plant Pathology with 3 staff, 3 laborers (and one vacancy); Horticulture with 3 staff, 3 laborers (and 1 vacant position).

Extension, the largest of the divisions, has five main centers, each providing a link between the Ministry, research and the farmers. In 1977, there were 66 persons working within the extension division

including a Senior Technical Officer in Charge, 4 Technical Officers, 2 Senior Aricultural Assistants, 22 regular Agricultural Assistants, twelve of which were women, 3 Agricultural Instructors, 2 drivers, 2 clerk-typists and 30 paid laborers.

Extension Staff by Island. The 'Eua Station has one Technical Officer (TO) in charge; one Senior Ag. Assistant (Sr. A.A) in banana production; two agriculture assitants (A.A) in General Extension and livestock; two agricultural instructors (AI) in Home Economics and the other in the rhinocerous beetle campaign, one labor/attendant for the station's cattle breading stock and one jr. clerk. Staffing on 'Eua totals 8 persons.

The Vava'u Station has one TO in charge, 2 TO's in Extension and Farm Management, one Sr. A.A market manager, 5 A.A's in extension, 1 Ag. Instructor in Extension, 2 A.A's in Home Economics, 1 A.A. working on vanilla, 4 A.A's in livestock, 1 Sr. technician operating the machinery pool, 1 chief inspector, 5 Rhinocerous Beetle Inspector (R/B), 1 Fumigation Officer and one A.A in Quarantine. The total number of staff on Vava'u was 26 in 1977 (Govt. of Tonga 1977).

In the Ha'apai District on Lifuka Island, Foa Island, Nomuka Island, Niuafo'au and Niuatoputapu there were a total of 24 staff members. Of this number, 4 were TO's, 12 AA's, 2 VA's, 1 AI, 1 R/B. The remainder included drivers, machinery operators and clerks. At least 14 staff personnel were located on Lifuka Islands. The substations on all the other islands had between 2 and 3 persons.

Training of Extension Staff. All extension agents go through 10 months of formal training provided by the Ministry and 2 years of

fieldwork. Specialized training has been conducted in Rarotonga (Revitalization of the Banana) and in New Zealand (rural broadcasting).

Research Activities

Research is generally in the applied and adaptive aspects of crop and animal production. The Farm Management section is charged with the upkeep of each of the research stations, the production feeds for livestock and the planting yams for the Yam Research Program.

The Animal Production section is responsible for livestock breeding for the Ministries Livestock Schemes. The lack of an Animal Production Officer has meant that no research has been undertaken on livestock aside from breeding activities.

There has been some work done on bananas. These include banana spacing trials, variety trials and fertilizer trials. There has been no further work done on soybeans. The taro fertilizer trials show no significant response to nitrogen, phospherous or potassium.

Statistical analysis was done on 24 sweet potato varieties. For cassava, variety and maturity trials have been conducted for tuber yield, along with additional fertilizer trials are on cassava response to NPK. The seeds of Sunrise, Solo and Waimanalo papaya have been released for farmers after successful trials at the research stations.

Vegetables. Tomatoes have had the most attention. Variety trials have been done on 14 tomato varieties. There is currently an economic feasibility study being done on tomatoes for export and trials on mulching and management practices. Other work has been conducted on 3 varieties of winyban introduced from Papua New Guinea, seed production, peanuts and watermelon.

Entomology. A UNDP/FAO Survey is currently underway on insect pests in Tonga. The stick insect parasite has been reared successfully under laboratory conditions and is now being released on Tongatapu. Research is underway on finding a natural parasite for the fruit piercing moth. A lantana parasite was released in 1978 and the work on chemical control of the taro leaf hopper continues. Field trials have been undertaken on chemical control of powdery mildew on watermelons, mango anthracnose and tomato foliar diseases. There is an abnormal plant growth study underway as well as a UNDP/FAO survey on nematodes.

The Plant Pathology units has primarily been concerned with the diagnosis of abnormal growth in plants. Of particular interest has been the identification of new pathogens associated with fruit rot in tomatoes, watermelon virus and citrus nematodes.

Extension Activities

One of the major activities of the Extension Division has been the Banana Rehabilitation Program involving the free distribution of fertilizer, free spraying and insect control. This division also sponsors a variety of field days, demonstrations and training courses in such areas as farm management, economics, cooking and sewing. In addition, daily radio broadcasts inform farmers of agricultural news and market reports.

Education

There are a number of secondary, tertiary and rural development programs teaching agriculture to farmers, women and school children. The following list will describe some of the programs in agriculture education and is by no means complete.

Tupou College. This is a post primary boarding school for boys. It has a basic 4 year program with at least 2 years in formal academic instruction and 2 years in an agriculture practicum. Its objective is to prepare students to be administrators, extension officers and farmers. Agriculture crop production, animal husbandry and woodwork is taught at the college (Dept. of Ag. 1974).

Mango Agriculture College. This college has a 2-year agriculture program and a graduate passes with a Tongan Higher Leaving Certificate. The college possesses a piggery, a dairy, beef and poultry units and a diversified agriculture plantation worked by students for the college mess hall. The curriculum combines academic studies with practical work on individual plots. Subjects taught include livestock theory, English, agriculture theory, veterinary science, entomology, math, bookkeeping, farm management, science and plant pathology (Dept. of Ag. 1974).

Rural Development Training Centers. These centers were recently established by the Tongan Government to train agriculture teachers, farmers and extension workers (Statistics Office-Cook Islands 1976).

Other Development Centers

Fualu Rural Training Center. This center began operating in 1977 to teach Tongan men in agriculture. Each course runs for two years and combines theory and practice. Students cultivate the center's plantation (32 ha) and 0.4 ha of their own plots. The afternoons are reserved for classes on plant and animal husbandry, crop and livestock diseases, insecticides and use of fertilizers. The staff consists of a fulltime manager with 18 years of experience in carpentry, engineering, farming and animal husbandry. There is also a Peace Corps volunteer

with mechanics and agriculture training. The first course started with 15 students, 9 of which completed the 2 years. The second course started with 16 students in 1979.

Mahenac'a Student Farm. This is a 2-year training center for farmers. Toafa Fam School in Vava'u has a 1 year course in farming for unmarried men (Dept. of Ag 1974).

The USP has an extension center in Nuku'alofa which has been operating since 1971. It serves the central functions of university extension by providing information concerning health, education and agriculture and has started a non-formal education program for villagers (which was to begin in June, 1979.)

The Church of Latter Day Saints of Jesus Christ. This organization has offered a vocational agriculture program at Liahona High School since 1975. This course is a 3 year program at the 3,4, and 5 form levels. Its primary purpose is to teach agriculture skills through practical applications and by establishing a financial basis from earnings for future self employment in agriculture. The subjects taught include crops and cultivation, animal husbandry, marketing, agriculture business, machinery and equipment use and repair. Students farm school land and organize small cooperatives. Nine students began training in 1975 and 7 completed in 1978. Of the seven, 3 have started their own farms and 4 are on a mission (Dept. of Ag. 1974).

A similar program has also started at Aninihs High School in Vava'u. There are 10 students currently enrolled.

RELATED SOCIAL AND ECONOMIC FACTORS

Economy and Trade

In general, the Tongan economy has continued to show growth during the period from 1970 to 1976. However, there were intermittent years of growth and stagnation. GDP increased by 70% from 1970 to 1973, and the real growth during 1977 was between 5 and 6% (ADB 1979:108). However, the period between 1974 and 1976 saw less growth.

As a part of this picture, Tonga has a changeable but generally worsening balance of trade, with imports continuing to exceed exports. Imports in 1977, for example, were valued at A$17.69 million; between 1975 and 1977, imports were 250% of exports.

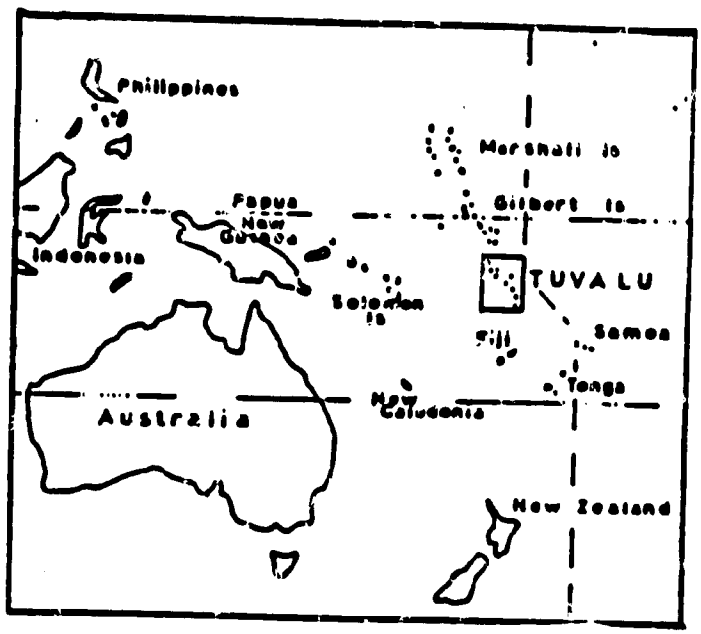
Agricultural products represent fully 90% of total export goods with coconut and coconut products accounting for about 80% of the total figure. The balance consists of re-exports, fish and seafood products. And in 1978, food and live animals constituted the largest share, about 28% of all imports. Of those imports, manufactured goods represented about 20% and machinery transport equipment represent almost 17%. The visible trade deficit has grown steadily worse since 1961 and shows no signs of stabilizing or reversing.

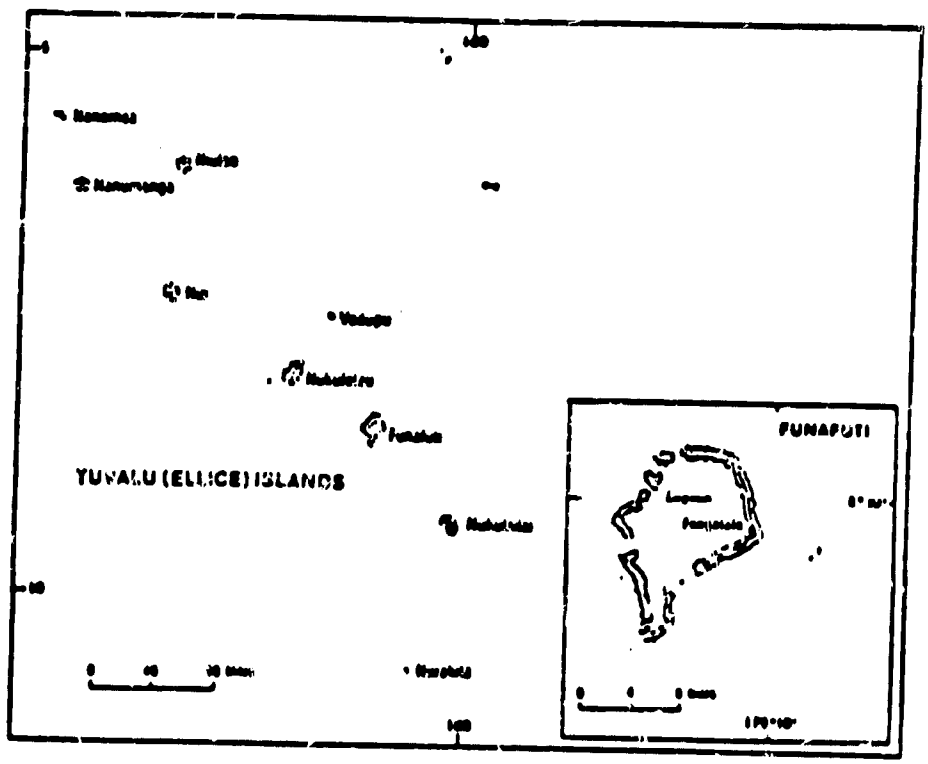
The trade deficit is financed by a surplus of receipts from services, transfers and net capital flows. Remittances, gifts and revenues from tourism offset the trade deficit. Invisible earnings are a weak foundation for an economy. Remittances are especially vulnerable to economic conditions abroad, especially in New Zealand where an economic recession and tighter immigration laws resulted in a fall in remittances in 1975 and 1976.

Tourism is a volatile industry, but the outlook is optimistic. The bulk of tourists are from New Zealand, Australia and the U.S. The number of tourists is expected to grow by 45% between 1976 and 1980.

Foreign assistance is another balancing item in the trade picture. Aid in 1977 represented about 13% of GDP, with both Australia and New Zealand providing the larger shares.

TUVALU





PEOPLE

Population: 7,537
Annual Growth Rate: 4.2%
Population Density: 660 per sq. mile
Ethnic Groups: Majority Polynesian some Micronesian and other non-indigeneous persons.

GEOGRAPHY

Land Area: Approximately 10 sq. miles
Capital City: Funafuti (pop. 2,330)
Island Type: Coral Atoll and reef.
No. of Islands: 9

ECONOMY

GNP: A$890,000 (1975)

TRADE

Exports: (copra only) A$56,429 (1977)
Imports: A$1,572,755 (1978)
Major Partners: Australia, Fiji and New Zealand.

POLITICAL STATUS

TUVALU

OVERVIEW

The new nation of Tuvalu (formerly the Ellice Islands), which obtained independence from Britain in 1978, is made up of a chain of low-lying coral atolls and reef islands within an ocean area of more than 1,250,000 sq. km. The land area, totaling just under 26 sq. km, consists of nine major islands or atoll groups made up of over 100 separate islets.

The most recent census (1979) showed 7,537 persons. Almost one third of these living in the capital town of Funafuti. Because of a shortage of land, the density is one of the highest in the Pacific with over 1550 persons per sq. km even though the population is small. Because Tuvalu cannot provide employment opportunities to its expanding work force, the government actively encourages youths to seek overseas work. Consequently, Tuvaluans have a long history of labor migration, particularly for jobs in Tarawa, Ocean Island, Nauru and in the foreign merchant marine.

Agriculture is primarily a subsistance level activity with copra being the only commercial crop of any significance at the present time. The government Development Plan for 1978-1980 calls for the introduction of a variety of import substitution and export crops; however, the general atoll environment, poor soil conditions and major transportation problems, make such development difficult.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

Tuvalu enjoys a climate with temperatures ranging from 22-38°C, but usually in the range of 28-32°C in the shade (Inder 1978:450). It rains in excess of 200 days per year. During 1978, it rained an average of 23 days per month. During the 1941 to 1978 period, the average annual rainfall was 3535 mm.

Land

All the islands are of low coral formation, seldom rising higher than above sea level. Five of the islands are coral atolls with a continuous eroded reef platform surrounding a central lagoon. The lagoons are of variable depth. In general, the eastern edge of each lagoon is bordered by a narrow but almost continuous strip of land, developed in the shelter of storm beaches thrown up by the prevailing easterly winds. By contrast the westerly sides of the lagoons are often protected only by a barrier reef punctuated by occasional sandy islets (Govt. of Tuvalu 1978:5).

Nauma is a typical atoll having a narrow lagoon and two major islets. Nanumanga, Niutao and Niulakita are true reef islands; each is a single islet made up of sand and coral material which has been thrown up by wind and wave action. These three islets lack an open lagoon but have internal salt lakes with subterranean connections to the ocean. Vaitupu, the largest island with 20% of the total land area of Tuvalu, is intermediate in character, between an atoll and a reef island having, a virtually land locked central lagoon. The lagoons of Funafuti and

Nukufetau are the only two navigable by ocean going vessels (Govt. of Tuvalu 1978:5).

The soil is generally infertile. Seventy-five percent consists of calcerous sand; 15%, coral boulders; and 5%, coarse shell deposits. The Calcium Carbonate content of the sand varies from 60% to 90% which renders it generally infertile. There is low moisture retaining capability, an unsteady rainfall and high evapotranspiration due to the constant winds. All these factors plus a high salt content of sea spray and wind make cultivation of tropical field crops almost impossible.

Water

The lack of access to pure water is a serious problem. Accessibility, catchment and storage require significant inputs to time and labor; it is not uncommon for a woman to spend 2 to 4 hours a day to collect the household's water supply (Guyer 1980:11).

Minerals

There are no mineral resources that are readily available.

Crop Production

The atoll environment provides special ecological constraints on crop production. Hence, agriculture at present is almost wholly restricted to perennial tree crops: coconut, pandanus and breadfruit. The exceptions are root crops, banana, and sugar cane, which are grown in its dug down to the water table (Govt. of Tuvalu 1978:11).

Copra

Although production of copra for the commercial market is secondary to subsistence use at the present time, it is still a major source of income for farmers. Domestic consumption of coconuts averages 100 kg

per person, considerably higher than the present production. However, nuts that fall and are allowed to rot on the ground constitute a potential resource that could more than double the current levels of production. At present, Tuvalu copra is processed in Fiji, and after the oil is extracted the waste product becomes high protein animal feed. In 1979, 461 tons of copra were produced, a 200% increase over the 1978 level and this could be increased even more with the development of local processing facilities.

Livestock

The spring 1980 survey showed that there are 10,000 chickens and 5,000 pigs in Tuvalu, a fairly large number of livestock. In the outlying islands only 4% do not have chickens whereas in Funafuti 33% of the housholds do not. Seven percent of the households in the outer islands do not have pigs, and 33% in Funafuti do not. The animals are kept in pens built of coral rock, and coconut trunks (Guyer 1980:6).

A livestock development project was initiated in 1978. Its main goal is to improve the quality and output of pig and poultry products. There is potential for raising rabbits, ducks and goats but this depends on whether they will be acceptable in the local diet, an important cultural consideration. There is also an interest in bee-keeping. The honey could possibly become a substitute for imported sugar and the bees wax may have some export potential.

Forestry

There are no forestry resources on Tuvalu that are readily available.

Fisheries

At present, lagoon and reef fishing meet the subsistence needs of the people but the canoes and 13 to 14-foot motorboats now in use are not suitable for commercial fishing. The increasing presence of foreign vessels fishing for yellow fin and albacore tuna in Tuvalu waters indicate the commercial potential of the marine resources, however. There are important constraints on development.

The islands are widely dispersed making the journey to a central market difficult. In addition, the outlying islands do not have adequate boat-launching facilities and the reef passages are dangerous. Potential commercial fishermen need facilities to anchor as well as to process the catch. A deep-draft wharf is scheduled to be completed at Funafati in 1981.

Agricultural Credit

Tuvalu uses the Australian dollar for internal transactions and as a unit of account, although Tuvaluan coinage was introduced in 1976, and does circulate as well. There is no commercial bank in Tuvalu nor are there any monetary or exchange control policies or regulations. The Bank of New South Wales operates savings accounts through the Post Office. Lack of sufficient sources of credit makes it impossible for islanders to experiment with new agricultural methods.

Land Tenure

Land tenure is in the form of codified customary law. Most land is held in the form of small parcels by individuals, jointly and communally. With limited resources, there is a problem as holding sizes decrease as they are repeatedly split among relatives after the death of a landholder (Inder 1976:451).

Since 1917, the sale of land by islanders to non-natives has been prohibited. Leases were approved by the Governor in Council for not more than 99 years, nor for any parcel larger than 4.2 ha unless special permission was granted. Tenure is in the form of tenancy for life and the registered owner is the family trustee. The land owner, by law, must specifically allow his children livelihood from the family plot. The next of kin inherit the land after the registered owner's death. Limited powers are granted to the owner to dispense his land through gifts, sale or by will.

Subdivision of land holdings causes maldistribution among families and widespread absenteeism. Although land is greatly sought after, development is slow. The people of Tuvalu are encouraged not to fragment their land but to consolidate land holdings into agricultural cooperatives. Boundary disputes, transfer, ownership are incessant sources of litigation.

RESEARCH, EXTENSION AND EDUCATION IN AGRICULTURE

Experience has shown that much needs to be learned about the dynamics of rural Tuvaluan society to fully understand the social as well as technical issues involved in agricultural development. Reaction to food substitutes, land access and the use of family labor are not adequately appreciated. The most recent development plan calls for careful evaluation of alternative land management strategies that will have a minimal impact on the environment and the social life of the people.

Institutional Capabilities

Since independence there has been a critical shortage of trained personnel in the Agricultural Division of the Ministry of Commerce and

Natural Resources. Prior to separation in 1977, the Division's total manpower consisted of five trained officers and eight unskilled workers. The 1978-1980 Development Plan has called for increasing the trained staff to eight, four of which would be professionally qualified.

Research Activities

So far, little research has been conducted in Tuvalu on the introduction of alternative crops, thus improvement of the coconut industry continues to be the main agricultural development priority. Under the British administration, most of the agricultural research for the area was centered in the Gilbert Islands (now Kiribati). The 1978-1980 Coconut Development Scheme calls for a five-point program aimed at increasing copra production by harvesting fallen nuts, clearing bush areas, improving transportation, up-grading processing facilities, and expanding markets for coconut oil.

Plans call for trials on Vaitupu and Nanumea for crops which may have potential export values such as cashew, castor, kapok, kava, cinnamon and various other spices. Crops to be investigated as export substitutes include tobacco, citrus, bamboo and several species of trees for fuel wood. The possibility also exists for growing crops by hydroponics, employing a technology developed in Western Samoa that is based on the use of coconut fibre substrate.

In an effort to increase research on crops for import substitution, the Food Crop Development Program has called for the establishment of crop research plots, a central collection of breadfruit varieties, investigations into the ecology of pulaka (swamp taro) pits, and the introduction of rice and new varieties of banana and pandanus. Fodder

legumes under coconuts has also been identified as an area where further research is needed.

With respect to livestock production, the 1978-1980 development Plan has noted the need for research on feed formulas for swine and investigations into the suitability of muscovy ducks for shallow lagoon waters. A trial study has also been recommended on the potential of goats for Tuvalu.

Extension Activities

The current development plan notes that one of the main problems with regard to extension is establishing good working relations with the people. Despite improved training and increased understanding of local problems, the field staff of the Agricultural Division have often had difficulty gaining the confidence of local farmers. All too frequently agricultural extension has been carried out without adequate coordination with research efforts and without being firmly based on rural aspirations.

Education

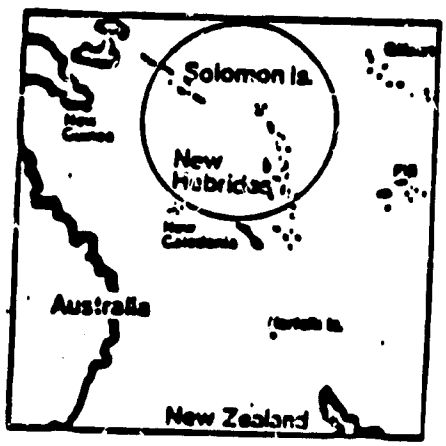
No information available.

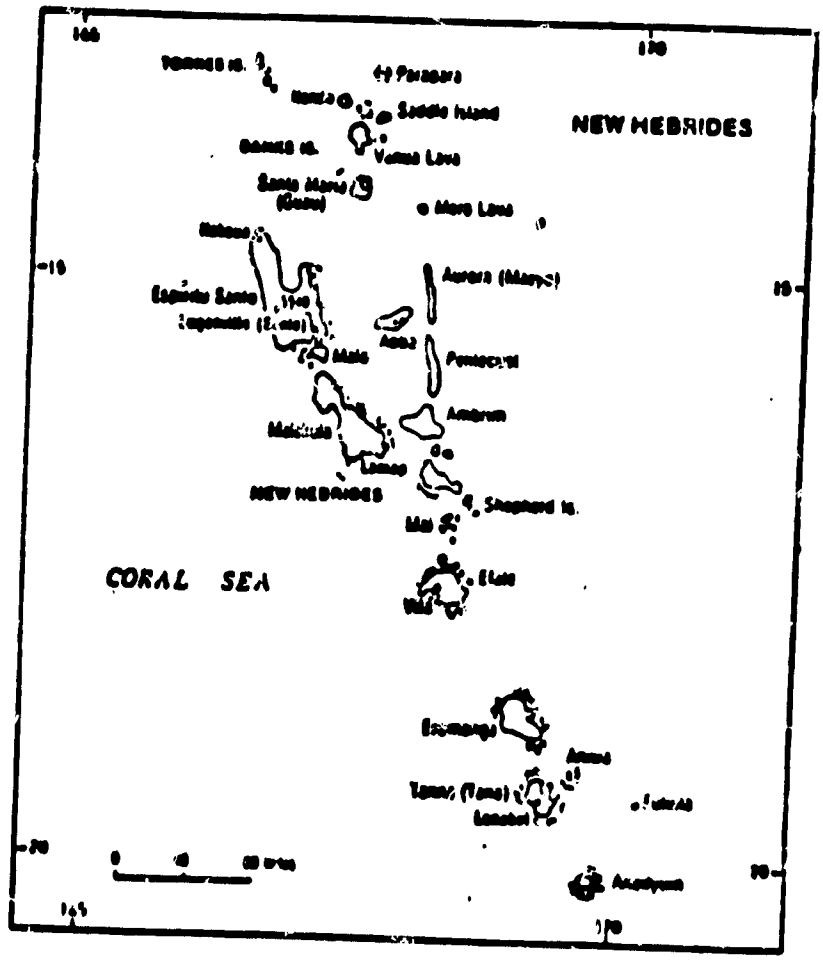
RELATED SOCIAL AND ECONOMIC FACTORS

Major Sources of Foreign Exchange

The primary sources of foreign exchange are remittances, commemorative stamps and grants-in-aid from the United Kingdom. Copra and receipts from visitors make up the remainder. In 1977, foreign exchange amounted to $A 1,033,462.

VANUATU





PEOPLE

Population: 109,425 (1979)
Annual Growth Rate: 2.7%
Language: Lingua franca Bislama (New Hebrides pidgin), English, French (official languages before independence); numerous Melanesian languages and dialects.
Ethnic Groups: Predominantly Melanesian with some Polynesians, Micronesians and Europeans, Chinese and Vietnamese.

GEOGRAPHY

Land Area: 11,800 sq. km.
Capital City: Port Vila
No. of Islands: 80 (12 major)
Terrain: Steep sided and mountainous, most islands are of volcanic origin and young in geological age; five active volcanoes.

ECONOMY

GDP:
Per Capita GDP

TRADE

Exports: 20,503 million FNH
Partners: France, U.S., Japan
Imports: 41,303 million FNH
Partners: Australia, France, Japan

POLITICAL STATUS

VANUATU

OVERVIEW

The newly independent nation of Vanuatu, was created from the former British/French Condominium of the New Hebrides.

The country is comprised of 80 islands that lie in a "Y" shape extending about 450 miles in a north/south direction, 1,400 miles from Sydney and about an equal distance from New Zealand.

The total land area is 11,880 sq. km. Esprito Santo has the largest area with 33% of the total and a population density of 5 persons per sq. km. The next largest island is Malekula with 17% of the land area and a population density of 8 per sq. km. Efate, which houses the capital city of Port Vila, has 8% of the land area and a population density of _____ per sq. km. The physical characteristics of Vanuatu tend to isolate people in small communities.

During the 1970's agriculture played an important role in the economy, providing a significant proportion of export goods including: copra, fish, cocoa, coffee beans, log and sawn timber, beef and other native products. Copra and coconut oil accounted for about 52% of exports in 1978, with fish accounting for 29%, beef and live cattle about 5% and cocoa about 3% that same year.

However, agriculture has played a key role in the social structure as well, with the products of subsistence farming "gardens" serving as a source of cultural wealth. For instance, carefully tended giant yams were used in exchange or in acquiring prestige. While Vanuatu is experiencing a major transition in 1980, history and precedent indicate that agriculture should continue to play a major role in the economic development and social structure.

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

The climate is tropical in the north to sub-tropical in the south. Southeast tradewinds are a moderating force between May and October. The islands are generally hot and wet between November and April. Temperatures tend to be warmer in the north and cooler in the south. The mean temperatures at Port Vila (near the center of the group) vary between 22°C and 27°C with an annual rainfall average of 2,310 mm.

Land/Soil

The islands are rugged, precipitous and covered by dense forest. There are no well developed fringing reefs. About half of the islands are small islets or volcanic outcrops, the other half have numerous peaks in terrain dominated by mountains and plateaus with only limited coastal plains (Inder 1978:279). There are several active volcanoes. Cultivation is restricted to the coastal plains and low plateaus. In the interior, large areas are uninhabitated because the population pressure is not great.

Water

No information available

Minerals

Manganese has been found on the island of Efate and open-cast mining is being carried out. Prospecting was conducted for nickel, copper and bauxite (Inder 1978:281) but quantities have not yet proven to be sufficient for commercial exploitation (ABN 12).

Crop Production

Aside from subsistence gardening, growing coconuts for copra is the main economic activity. Cocoa and coffee are also grown as cash crops but on a much smaller scale. Approximately 61,000 ha were under cultivation in 1976.

Copra

In 1977, 44,304 tons of copra and 821 tons of cocoa were delivered for processing and/or export. The islands of Santo and Malekula account for nearly half of the copra and over 60% of the cocoa production.

Subsistence Agriculture

Traditional agricultural practices in Vanuatu followed a pattern of intensive horticulture aimed at the acquisition of cultural wealth through the production of large taros. Within this system, which is found throughout Melanesia, the production of giant taros was intimately tied to the maintenance of one's position and status within a system of obligations that dominated the social life of the village society.

The time spent in preparing and maintaining garden plots far exceeded that necessary for minimal subsistance. In addition to being a source of pride for its owner, a carefully tended garden produced the giant taro (Colocasia) and yams (Dioscorea) that were used in exchange and for acquiring prestige. With an emphasis on quality rather than quantity, it has been more important to produce a few large tubers as luxury products than numbers of smaller ones. Value is decreed by size and type of tuber grown, and strictly codified. The cultural and kinship-determined circuits of exchange of these products followed a well-defined pattern. Traditionally, competition in the acquisition and redistribution of surplus wealth (in the form of giant taros and yams)

was the primary mechanism for determining status and position within a hierarchical system that was dominated by a "Big Man."

The traditional food production complex also follows a set hierarchical structure. Each garden plot consists of an artificially constructed vertical environment designed for the growing of a single prized tuber (either in a pit filled with the best soil or on a specially prepared mound). Around the central yam or taro are planted the secondary crops for everyday consumption. In the mountainous areas taro is grown by using a meticulous system of hydraulic arrangements. Water is channeled through stone canals or bamboo toughs into terraces that may cover an entire slope. Each level terrace constitutes a small irrigated garden several square meters in size.

The coming of the European missionaries and the establishment of coconut plantations had a major impact on the traditional system. With the emergence of copra production, the economy of exchange and the intensive horticultural practices with which it was associated have been disappearing. The result has been a decrease in the quality of village gardens. For example, formerly yam yields were in the 10-20 kg per root range and today the average weight is only 5-6 kg per root. New plants, which are easier to grow, such as Xantrosoma taros, manioc and sweet potatoes, have been substituted for the Colocasi. Cash incomes have also reduced the necessity to keep up the gardens because the money earned from copra is possible to purchase tinned food, which in addition to being convenient, bestows prestige in its own right.

Livestock

There is an apparently thriving local cattle industry, providing meat for export. In 1974, the cattle industry was expanding with frozen and tinned meat being sent to New Caledonia. Pigs are an important part of local life as well. There is a dairy herd and poultry and egg production. Poultry feed appears to be a constraint on moving toward self-sufficiency in that area (Inder 1976).

Fisheries

Although the Vanuatuans do little commerical fishing, the Japanese are active in this field, especially near Espritu Santo, and there is the capability to expand fisheries.

Forestry

Approximately 303,750 hectares were in forest in 1976. Only a limited amount of timber has been cut and milled for local use. Commercially exploitable stands of timber exist on Eromango, Efate and Aneityum, however, there are no good anchorages for the shipping of logs. Generally soft woods are imported and a local hard wood called "kohu" is milled for local use. A small amount of sandlewood is being exported from the southern islands.

Agricultural Credit

Agricultural loans have been administered through the Agricultural and Industrial Loans Board in cooperation with the Department of Agriculture, Livestock and Forestry. In 1975, the last year for which figures were available, over half of the loans approved were for cattle projects, however, the greatest amount of money was allocated for general agricultural development. In all, 610 loans were approved

totaling F.NH 56,590,429. This was a substantial increase from the previous year when only 121 loans were granted for a total of F.NH 8,154,229.

Land Tenure

Lane (1971) provides an overview of the land tenure situation in Vanuatu. As in other Melanesian island groups, land tenure in Vanuatu is intimately tied to kinship. In fact, the traditional ideology recognizes that people are not only related to each other but also to the land. Within this context, land tenure is best understood in terms of its own "social structure".

In general, the connection to, or sense of identity with, land is transmitted unilaterally through descent groups. European land claims, displacement and de-population have clouded detailed knowledge of the traditional system. From limited and fragmentary information, however, a number of common features may be generalized, that transcend cultural variation. In general, the western concept of ownership is inappropriate in describing aboriginal land rights. Rather, the land and people were perceived as interacting components within a larger socio environmental system. Land was considered inalienable in the same sense that a man does not buy or sell his children. Reciprocity applied equally to individuals and to land. The people considered themselves to be responsible for the care of the land that provided them support and substance.

Within this framework, the primary concern has been the relative strength of particular man-land connections that may be based on a number of factors including descent, residence and use. Lands not in

use may be claimed by an individual, who, being an extension of a group, also claims it for his kin group. Close connection is derived by descent through founding ancestors of kin groups to lands of origin. In disputed claims, those who have lived near or have recently used the land under question may have a stronger claim than those who have not. Special interests, and personalities are also considerations that may influence land decisions. Consequently, precise connections have often been difficult to ascertain, hence, the most viable solution for disputes has been to recognize the theoretical legitimacy of most all claims. The Europeans obtained land in the then New Hebrides most often through adverse possession and direct seizure. Native individuals could not realistically sell land belonging to their kin group nor could they conceive of any person desiring land tracts of land since subsistence use, within their system, determined the amount of land actually possessed by any given group.

European concepts of private land ownership, development and production in a cash economy were as foreign to the Vanuatuans as the concept of permanent alienation from their land. Also because the Europeans did not understand the Vanuatuan concept of ritual and ceremonial gift giving, anticipated reciprical exchanges never occurred.

Colonization by French and British plantation companies resulted in the alienation of large tracts of land. The French were most active, claiming some 55% of the archipelago, although much of this land was not developed (Tacomb 1914:22).

The new Constitution of Vanuatu clearly states that as of Independence Day, July 31, 1980, all land belongs to indigenous custom

owners and their descendants, and that the rules of custom would prevail in ownership and use of land. Alienated land in disputs will be held by the government until a settlement is reached. The procedures to decide customary claims, however, have not been fully worked out. The constitution does provide for persons recognized as knowledgeable in matters of custom to sit with the Supreme Court or the Court of Appeals when these bodies hear land dispute cases.

Tanna "Agricultural Societies"

The agricultural and market gardening societies of Tanna are noteworthy examples of micor-level indigenous development as they are based on pre-existing traditional structures. The "Groupements agricoles et maraichers" or GAMS and other market gardening societies have grouped together the fields belonging to different owner-members. Custom law accepts communal use of land hence there is little opposition to a person cultivating an area other than one traditionally claimed because territorial rights are precisely known. Thus, the society is able to create a land base out of dispersed land rights of individuals (Fisk 1978:40).

There were 190 cooperative societies with a combined capital of $A 740,000 at the end of 1975. Membership was over 11,000 persons with an estimated turnover of $A 5 million. These are multi-purpose cooperatives combining consumer and marketing services (British Info. Serv. 1976:5).

It is interesting to note that technical advice from the agronomists is accepted quite readily if it concerns new plants or European vegetables. The men of Tanna still have confidence in the importance of

their yam and taro gardens reflecting the traditional agricultural law of their ancestors, whose aim was the economy of exchange (Fisk 1973:41).

RESEARCH, EDUCATION AND EXTENSION IN AGRICULTURE

Institutional Capabilities

Before independence, the Vanuatu (New Hebrides) Department of Agriculture, Livestock and Forestry contained an agricultural school, a central extension station and separate sections for forestry, veterinary services and pest and insect control (phytosanitary control). Figure 10.1 indicates the department's organizational structure and manpower as of 1974.

In 1975, the country had only one agricultural research station, the IRHO facility at Saraouton. This station has conducted much of its work under contracts with the former New Hebrides Condominium and the South Pacific Commission. Major efforts have been in the area of pasture improvement and coconut production. In conjuction with an SPC sponsored program the Department has also conducted experimental programs of its own on vegetable production. In addition, some research on potatoes was carried out before independence by the French run ORSTOM.

Research and Extension Projects

Again, because of the governmental transition, data on current activities is unavailable. The following material outlines projects and opinions expressed in documents from 1977 and 1979. While there may be specific inaccuracies in terms of management responsibilities, these

descriptions should provide a rough picture of agricultural activity, bottlenecks and priorities.

Project: Feed Production

Chabeaf (1979) has examined the problems of feed production. Protein sources for animal feed production are the biggest problems in terms of establishing self-sufficiency. There is little scope for new sources such as fish meal to be developed. The animal feed market is estimated at 1,200 tons annually, of which 600 tons are poultry feed, 450 pig feed and the rest miscellaneous. At present, all feed is in pellet form. If cereals can be grown locally, equipment on hand appears adequate for production. The only necessary imports would be vitamins, trace elements, synthetic amino acids and other additives.

The NHA Abatoir manager places the meat and bone meal production at 2t/week, or approximately 100t/year, with an additional 1.5 t/week of fallow. This material contains 48.8% crude protein, 8% fat and 4% water. It is considered the most promising source of feed protein in Efate. It can be produced and marketed locally at F. NH 20,000 per tonne.

An Australian firm was considering establishing an oil mill an Efate to produce 10t/month of copra cake. Copra meal may be used in 5-10% of poultry feed but little more in pig feed. It has an almost unlimited possibility for use in cattle (dairy and beef) feed.

Of the cereals which may be used for feed, maize and sorghum are most practical since they grow well without fertilization. It is projected that 5 to 3.5t/ha may be considered as a normal yield. Cereals are necessary for poultry feeds and production should be extended from

450 tons to 650 tons if Vanuatu is to become self sufficient in poultry products. Several farmers on Efate are considering planting sorghum on newly cleared land as part of an overall economic measure to lower the cost of creating pasture. There is one farmer who owns a sorghum header and grain drier, and is associated with another farmer who is building a grain storing silo.

Cassava in the fresh state, can contribute greatly to the development of animal production, and can replace up to 20% of the cereals in poultry feed. Cassava production has interested several farmers for both export and the stockfeed market of Vanuatu.

Tropical beans and peas such as the pigeon pea and cowpea can be mechanically cultivated for animal feed protein. Unfortunately at present there is but one farmer who has equipment for harvesting cereals or grain, the capacity for drying and storing and a hand roller mill and hand mixer, as well as a pelletizer on order from Noumea.

Project: Pig Farming Feed Production

On Efate, there is only one farm producing pork and it has not been capable of meeting the demand from the butchers of Port Villa. There are quarantine regulations inhibiting pork imports hence import figures do not reflect the possibility of production expansion.

Cassava has the potential of replacing up to 50% of the cereals used in pig feed. In many tropical countries, fresh cassava roots are the staple diet for fattening pigs (Chaheuf 1979).

On Santo Island, there is an over supply of pork for the local market. The local pig herd had been developed economically by a ration

of fresh cassava roots, copra meal and fresh offal, plus boning residues from cattle slaughtering, and sometimes from the export abatoir.

Project: Orap River Central Dairy Scheme

The establishment of a 16 ha dairy farm near the Orap River has been proposed to assist out-of-school youths (Wala-Rano Mission 1977). The grazing lands and quality of the small herd would be improved by pasture renovation, fencing, and the importation of new animal strains. It has been noted that such an operation must be oriented toward the cash economy because of a customary prohibition on drinking milk.

Extension

There is a Central Extension Station at Tagabe houses a forestry nursery, various plant collections and the Department's Charolais breeding herd. The station shares approximately 40 ha of land with the Tagabe Agricultural School. Separate Extension centers are located in each of the four districts. Each district has one senior officer and two to three regular extension officers. The Northern District covers Torres, Vanualava, Gava, Espiritu Santo, Aoba, Maewo and Malo. Moving Southward, the 2nd Central District is made up of Pentecost, Ambrym and Malekula, followed by the 1st Central District comprising Epi, Tongoa, Emae and Efate. The Southern District contains the Islands of Erromango, Aniwa, Tanna and Futuna.

In addition to a variety of demonstration and training programs, major extension efforts have been in the promotion of "cattle under coconut" operations and the introduction of methods for intercropping young coconuts. Other activities in the various districts have included improvement and extension of cattle pastures, rat control and the

distribution of swine and poultry breeding stock. Assistance has also been given to producers in the construction of cocoa and copra driers, coconut thinning, fencing, castration of surplus bulls and stockyard building.

Education

Extension training has been conducted at the Tagabe Agricultural School and at the training centers at Lakataro and Santo. The Tagabe School offers a 3-year general agricultural course along with a number of short courses in vegetable growing and pig and poultry keeping. The school also provides refresher courses for Department monitors and conducts specialized studies. For example, in conjunction with the British Education Department's Women's Interest Section, a study was made at the Lakatoro Center on the role of women in agricultural production and extension.

Forestry

The Forestry Section, since its inception in 1970, primarily has been involved with surveying existing forest reserves and identifying species mostly on the islands of Erromango and Efate. Some planting has been done on a small scale. In 1975, a general forest policy had yet to be agreed upon. Proposals were under consideration at that time by the Residents Commissioners including a reforestation program designed to meet local needs until 1995.

Previously, a sawmill had been in operation on Erromango but this was purchased by a new concern and moved to Efate. At last report, it was operating on a greatly reduced scale with all of its production going for the local market.

RELATED SOCIAL AND ECONOMIC FACTORS

Economy: Development Goals

The former Condominium government attempted to provide investment incentives through tax exemptions covering import and export duties. Especially encouraged were the fishing industry, the processing of agricultural or marine products and the tourist industry, with minimum levels of investment stipulated. Also conducive to investment was the ready availability of credit and subsidies for hotel companies operating under French law before independence (Inder 1978:283).

Prior to independence, most large scale projects were financed by the metropolitan (colonial) governments. The first 5-year Plan of 1971-1975 called for an expenditure of $A 8.9 million, 1/3 to come from local revenue, $2.5 million from metropolitan grants, and the rest from loans. Areas of concern in development were natural resources, communications, public works (schools, hospitals) and urban development which includes roads and housing (Inder 1978:283).

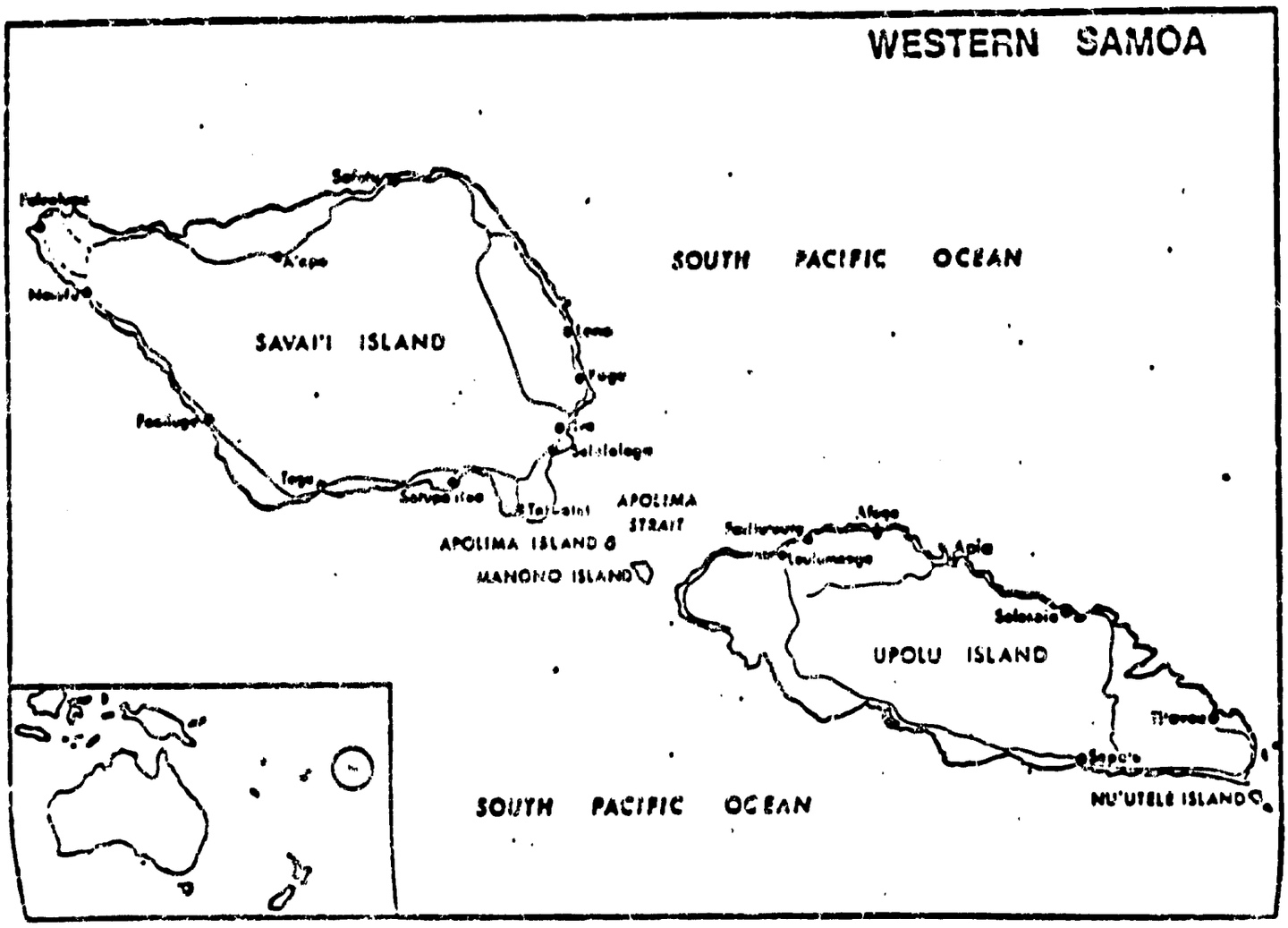
Economy: Migration and Employment

There are two urban zones in Vanuatu, Port Vila (the capital) and Santo. After WWII and again during the early 1960's there was a marked increase in migration of the rural population to the urban centers. In 1967, 13.2% of the population lived in the urban centers. In 1975, the urban population made up 21.7% of the population. Of the 20,656 persons in the urban centers 15,887 were in Port Vila (Fisk 1978:34).

The expansion of the New Caledonia Nickel Industry has led to nearly 2,000 men out-migrating, resulting in a shortage of skilled and semi-skilled men. There have been efforts undertaken in 1974 to train

New Hebridians in building, plumbing and other trades (ABM 19__:2).

In the latter part of 1975, there were 2,649 persons employed in government. The labor force consists of 40,000 persons, of whom 32,000 are involved in traditional agriculture and 8,000 persons, of whom 32,000 are involved in traditional agriculture and 8,000 persons in various salaried jobs as well as service and commerce industries (Inder 1978).



PEOPLE

Population: 152,000 (1976)
Annual Rate of Growth: 1% (1977)
Ethnic Groups: Samoan, European, Euronesian
Languages: Samoan, English
Literacy: 90%
Life Expectancy: 63 years

GEOGRAPHY

Area: 2934 sq. km.
Capital City: Apia
No. of Islands: 2 (two)
Terrain: Mountainous

ECONOMY

GNP: $46 million (1974)
Per Capita Income: $280 (1974)

TRADE

Exports: $2.9 million
Partners: Australia, New Zealand
Imports: $40 million
Partners: New Zealand, West Germany, Australia, Japan, U.S.

POLITICAL STATUS

WESTERN SAMOA

OVERVIEW

Western Samoa is composed of two large islands and several small ones. The total land mass is approximately 2,934 sq. km. If the 200-mile Exclusive Economic Zone is included, land and sea combined amount to approximately 160,000 sq. km (ADB 1979:2).

The Samoan islands are volcanic in origin with the largest island (Savaii) possessing potentially active volcanoes. The islands slope at a gentle angle from central ridges at elevations of over 1,000 m to the coast.

The Western Samoan economy is heavily based on agricultural, with the agricultural sector employing about 60% of the labor force. At the same time, between 1966 and 1976, there was a ten percent decrease in the number of people employed in agriculture, forestry and fisheries (ADB 1979:33).

About ninety-five percent of export income is generated from agricultural products, the bulk of which is from copra and cocoa. Taro and timber make up the balance. Banana exports were important in the 1950's and 1960's, but are currently no longer significant (ADB 1979:371).

AGRICULTURAL RESOURCE BASE AND ACTIVITY

Natural Resources

Climate

The climate is tropical with a mean daily temperature of about 27°C. Average annual rainfall is about 2870 mm, two-thirds of which falls between October and March. On the windward side of the islands, 5,000 to 7,000 mm of rain falls annually. The leeward side receives 2,500 to 3,000 mm of rain. The dry season is from May to August.

Soils

The surface of the more recent lava flows are rocky although potentially fertile with continual weathering of the parent material. However, because lava is porous, large surface areas are lacking surface water. In Western Samoa as much as 51% of the land is classified as having soils of low to very low fertility. An additional 35% is too stony for mechanized agriculture (ADB 1979:5).

Minerals

There are no identified mineral deposits which can be extracted on a commercial scale.

Crop Production

Commercial

Commercial agricultural production accounts for most of Western Samoan export goods. Figure 11.1 indicates a breakdown of the total value of exports by crop, using a weighted average of the five year period from 1974 to 1978. As world prices and local production tend to fluctuate from year to year, the five-year average provides a better sense of the relative importance of crops, than figures from a signal year.

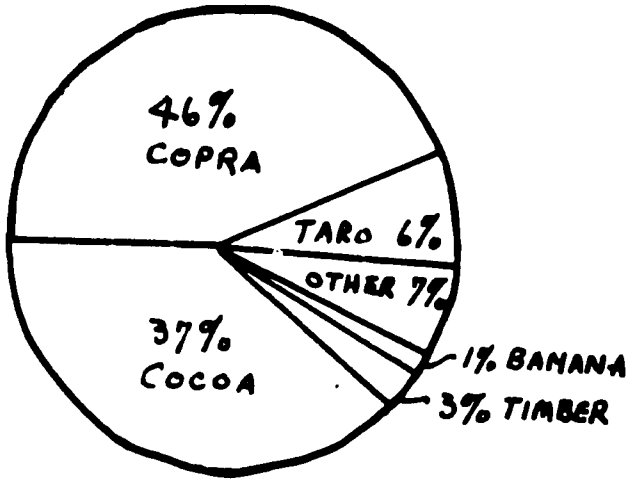


Figure 11.1. Breakdown of Total Value of Exports by Crop
(Five-year weighted average, 1974-1978)

Source: Annual Development Plan for 1979, Table 9.

Copra. A major emphasis in agriculture development has focused on upgrading old coconut plantations through replanting schemes. Between 1970 and 1976, close to 35,000 ha had been planted in coconuts. The results of the scheme will not be fully realized until the 1980's. Construction began on a new coconut oil mill in 1979 and this facility will require a constant and stable supply of copra (Govt. of W. Samoa 1979). Eighty-five percent of copra export crop is produced by smallholders with the remainder produced by the Western Samoa Trust Estates Corporation (WSTEC) and two other privately owned plantations. WSTEC is a government owned estate (formerly controlled by German colonials) which has an area of 13.440 ha. WSTEC's Mulefanua coconut plantation is one of the largest in the world.

Cocoa. Approximately 5,000 ha are planted in cocoa. Much of it is grown by Samoan smallholders. Exports in 1978 amounted to 1,178 tons, down from the 1977 export of 2,149 tons. The reasons for the decline in production were mainly bad weather and the black pod rot. A target of 672 ha of new plantings has been underway since 1976. By 1978, 105 ha had been planted (1978). In addition, the lafi-7 variety was not black-pod resistant as had been anticipated (Govt. of W. Samoa 1979).

Taro. In 1978, taro exports increased more than 200% over the 1977 volume bringing in $U.S. 1,024,644. It is expected that taro will be maintained at this level over the next two years. Markets are in New Zealand, Hawaii and the U.S. Western States which have large Samoan immigrant populations (Govt. of W. Samoa 1979).

Subsistence Agriculture. Pure subsistence agriculture is rarely practiced in Western Samoa. The trend has been toward mixed subsistence-cash cropping modes and plantation agriculture. The departure from traditional subsistence economics is a result of land shortage pressures, mandatory participation in education and health programs which require cash payments, as well as a desire for Western material goods and services. These factors all serve to increase rural village participation in a modern cash economy. Village farmers have set aside part of their land to produce copra, cocoa, taro and bananas for cash. These smallholders were responsible for 84% of the copra and 86% of the cocoa produced for export in 1977. The share of plantation crops in farm output range from a relatively minor share in subsistence farming to 100% of the farm output in smallholder commercial farms.

Livestock. Traditional livestock rearing, particularly of pigs, is an important part of the food distribution system of the islands. Traditional methods of raising pigs and poultry require little capital investment and make limited demands on labor, while contributing substantially to the welfare and productivity of the people.

Pigs generally forage freely, although extension efforts today emphasize the penning of pigs for health, sanitation, and to regulate pig care and breeding practices. Pigs and chickens eat rubbish that is not consumed by villagers. Village pigs accounted for 98.5% (or 115,000) of all pigs raised in 1978. Ninety-one percent (or 25,000) of all chickens in Samoa are raised in the villages.

The quality and quantity of village livestock production is low when compared to commercial grade production of pork and poultry. Research studies show that production could be increased by factors of two or three with addition of locally-grown rations to livestock feed.

Western Samoa has 26,293 head of cattle, 100 goats and 10,000 horses (ADB 1979:262). Of the cattle population, 37% is owned by WSTEC, 30% by village farmers, 3% by the government and the balance by school, and church farms and private commercial farms (Govt. of W. Samoa 1979:16).

Beef and dairy cattle face stiff competition from abroad, particularly from New Zealand whose livestock products are of a higher grade and lower in price. Small, communal, village or women's committee dairy schemes are being implemented at the rate of 5 units per year each with 10 cows. There is also a potential for beef cattle expansion under village coconut groves.

Forestry

As much as 52% of the land area is covered with natural forests. These forests are ecologically complex communities with a spectrum of biological and botanical diversity. However, of several thousand species of forest trees present, only 200 are considered to have commercial potential and less than 20 species are harvested in the Pacific. Samoa has a current sawlog volume of 1.5 million cu m and it has been estimated that the duration of forest resources at the current cutting rate (2700 ha/yr) is 30 years. Forest destruction is a result of commercial timber operations, clearance of the forest cover for permanent or temporary agricultural use and some 100 ha are lost annually (ADB 1979:279). Earnings from timber are not expected to increase greatly over the next few years. Timber is milled by the Samoa Forest Products, Ltd. which is owned (80%) by the Western Samoa government and the Standard Sawmilling Co. of Australia (20%).

Fisheries

No information available.

Agricultural Credit

It is possible for farmers to obtain loans from the Development Bank to purchase dairy cattle and farm equipment. Reports over the period (Source #133) from 1971 to 1978 indicate some growth in the amount of loans provided for agriculture (Sikkem 1975). Extension staff undertake a field appraisal report of farming activity which is submitted with a loan application. Although loan decisions are made by the Bank and extension staff apparently do experience some backlash from the procedure (Peters 1974). The period of loans can run from one to seven years, depending on the project.

In general, there is a high level of sharing and mutual self-help throughout Western Samoa. This may account for the following observation published in 1974: "Rural credit in Western Samoa is not yet viewed as a major contributor to accomplishment of certain clearly defined development objectives in the agricultural sector" (Ref. #76:41). In the fiscal years, 1975 through 1977, the percentage of total loans represented by agriculture fell from 60 to 50, and then 37% by 1977. At the same time, there have been increases in the amounts of money loaned, and the pattern of agricultural loans for the fiscal year 1977/78 (October - September) is shown in Table 11.2.

Table 11.2. Agricultural* Loans Fiscal 1977/78

	To Individual Farmers		To Ag Group Projects	
	Amount	%	Amount	%
Number of Loans	2,316	97%	62	3%
WS$	1,260,168	90	126,476	10

Source: Tables 17 and 18, Annual Development Plan for 1979.

*Excludes loans for cattle, fishing, pigs and poultry projects.

Land Tenure

Traditional land tenure provided villagers with several successive ecological zones from the mountains to the ocean. They served to supply all the food requirements, house building, and clothing material necessary to maintain a high quality of life. The cultivation practices were consistent with the continued fertility of the soil and the maintenance of a diverse species of plant and animal life. Modern agri-

cultural production, on the other hand, has led to the rapid exploitation of forest reserves, depletion of soil fertility, the destruction of the micro-environments vital for ecological and agricultural stability and increased soil-erosion problems.

Five traditional categories of land tenure have been identified (Sutter 1971) in Samoa:

Traditional Houselots. Family dwellings in the village are surrounded by land known as Fanu'a. The boundaries are marked by trees, rocks or other natural features. Breadfruit, coconut, papaya trees and small patches of taro are grown for convenience around the house, however, they are not the main source of food supply.

Plantation Lots. Located around or behind a village (if the village faces the ocean), plantation lands average 225 ha per village. Large stands of coconut trees are found on the lower coastal levels and breadfruit and banana trees on the inland slopes. Taro is planted even further inland. Land is generally not surveyed but rights to the land are clearly defined and natural boundary markers are known by the villagers although neighbors may disagree to their exact location. Family land may be used by distant relatives, however, the resident members retain stewardship over the land and rights to the existing breadfruit and coconut trees.

Family Reserve Sections. Located beyond plantation lots, title is known by most villagers and these lands are usually associated with several families. Taro is the main crop grown on these lands as the soil is very fertile. Planting is undertaken a section at a time to avoid exhausting the soil.

Village Lands. These include potential agricultural land beyond the reserve lands and also reef and sea frontages. If this land is not cultivated other villagers may cultivate it.

District Lands. Claimed by district councils, these are found high in the mountains. There are used for pig and pigeon hunting but are of little economic importance.

Current governance of the total land area of 304,500 ha falls into four categories (Gov't of Samoa 1978):

a. Customary land of about 235,700 ha, or 75% of the total, administered in accordance with traditional practices of the Samoan people. The control of the land is within the family group and administered by the chief for the benefit of the group. Customary land cannot be alienated. However, with the approval of the government, long-term leases may be arranged. The leasing of customary land is a recent phenomenon and commenced with the Alienation of Customary Land Act of 1965 passed by the Legislative Assembly. It is designed to allow Samoan entrepreneurs favorable tenure arrangements in commercial enterprises.

b. Government land consists of 44,100 ha of 14%.

c. Western Samoa Trust Estates Corporation (WSTEC) has 13,400 ha or 4%.

d. Freehold, including missions, have 11,300 ha, or 4%.

RESEARCH, EXTENSION AND EDUCATION IN AGRICULTURE

Institutional Capabilities

Department of Agriculture

The Department of Agriculture and Forests carries responsibilities for activities in this area. With five primary divisions, it has an

active staff of about 140 persons, including both professionals and farm staff. The Divisions include Economic Analysis and Planning, Research and Technical Services, Extension and Information Services, Regulatory Services and Forestry. All but the Economic Analysis Division appear to be involved in both research, extension and training activities. The accompanying organization scheme indicates the structure of the department and approximates staff size (See Figure 11.3).

The research and extension activities of the Department fall into several categories, some of which are clearly differentiated. The Department is involved in more than thirty "development" projects which appear to combine the efforts of both research and extension activities. A partial listing appears below, and some of the projects are elaborated in the ensuing discussion.

1. Coconut Planting, Replanting and Hybridization Project
2. Cocoa Planting and Propogation
3. Banana Project
4. Small Crops Development
5. Agricultural Research
6. Food Processing Laboratory
7. Pig and Poultry Multiplication
8. Beef Cattle
9. Small Scale Agricultural Machinery
10. Forestry
11. Timber Impregnation
12. Fisheries Conglomerate
13. Dairy Production
14. Post Entry Quarantine
15. Baby-Weaning Food Project
16. Passionfruit Project
17. Beef and Dairy Cattle Extension
18. Extension Services Development
19. Western Samoa/German Rhinocerous Beetle Project
20. Agricultural Engineering Centre, Nafanua
21. Agricultural Engineering Centre, Savaii
22. Togitogiga Crop Farm
23. Asau Crop Farm

24. Pasture and Animal Production
25. Extension Support Communication
26. Production Economics and Village Development Planning
27. Plant Protection
28. Cocoa Research Project
29. ADB Beef Cattle Project
30. Pig Extension to Villages and Schools

Research Activities

The Economic Analysis and Planning Division, established in 1975, carries responsibilities that include baseline surveys on village production, the assessment of rural agricultural development need and priorities and assisting in the formulation of agricultural plans. Several benchmark surveys on production and consumption were completed in 1977 for several villages on Upolu and Savai'i. Studies were also carried out on a variety of crops, including banana, coconut, taro and mango, which will serve as the basis for extension manuals. This section also serves as the major interface with international missions, including the Asian Development Bank, International Monetary Fund, FAO/ADB, and the World Bank.

The Forestry Division focuses primarily on research in planting and management techniques and also undertook a survey of natural forest resources.

At one time, the South Pacific Regional College of Tropical Agriculture at Alafua functioned under the auspices of the Research and Technical Services Division. With the transfer of the faculty and establishment of this College to the University of the South Pacific, some of the research capabilities have been disrupted. A variety of projects are underway, including the following:

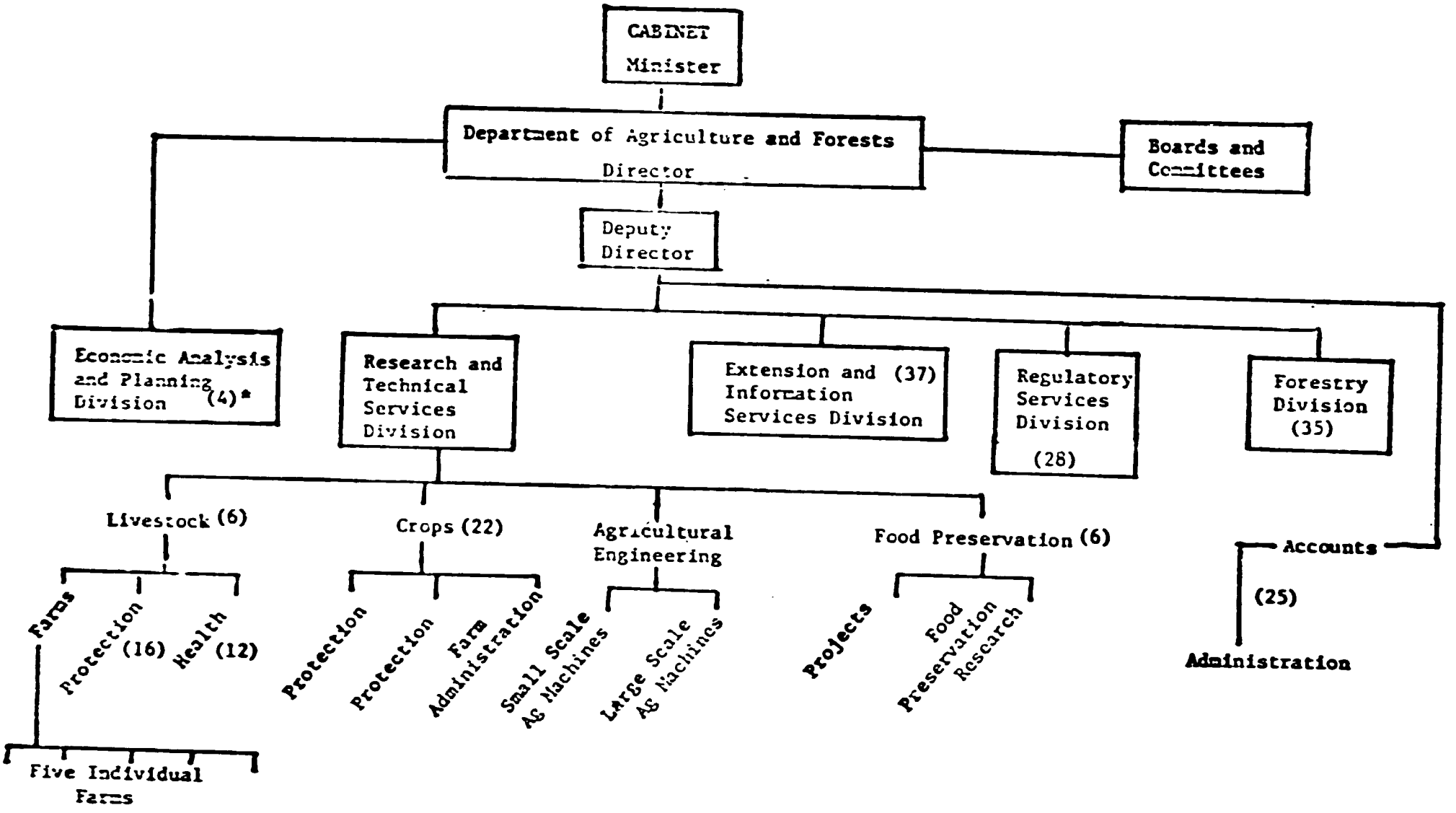


Figure 11.3. Schema of Department of Agriculture and Forests

*Approximate staff size
Source: 1977 Annual Report of the Department of Agriculture and Forests, Western Samoa

Small Crop Development

Several vegetable trials have been underway to determine varieties suitable for the local soils and climate. Local sweet potato cultivars have been collected and trials have been done on pepe, pepper, vanilla, mango and pawpaw. Studies have also been done on reducing the costs of passionfruit inputs. Additional trials on winged bean, dwarf bean, chinese cabbage, and tomatoes have been undertaken. A lack of trellis posts caused a delay in research of 3-4 months. During the Third Five-Year Plan vegetable research, seed testing and seeding propogation is expected to continue. Fruit crop studies are intended to be more comprehensive. In the Laloaenea Guava Project, production will be maintained by the Department of Agriculture with research done by USP at Alafua.

Coconut Planting, Replanting and Hybridization

A study on local coconut genotypes is underway and both seed and fertilizer trials have been started on imported Tahitian, Malaysian and Ivory Coast nuts. Recent setbacks occurred as a result of problems with WSTEC approval of the use of agricultural lands and quarantine restrictions on imported seednuts.

Cocoa

Cocoa plants are propogated in the Nafanua nursery and project staff provide farmers with demonstrations, planting material and fertilizer. Demand for seedlings cannot be met and poor rooting is always a problem. Research trials seek varieties resistent to the black pod disease.

Banana Project

There are banana nurseries at Faleolo, Tufulele, Aleipata, Aleisa, and Valaata. Planting and replanting were setback a few months because of a delay in seedstock arrival.

Food Processing Lab

Research is underway on the processing and packing of pawpaw, mango and banana at the Lab. Construction delays have slowed Phase II of the Food Processing Plant at Vaitele.

Other Projects

The list of ongoing Agriculture Projects for 1979-80 also includes Cocoa Development and Rehabilitation, Food Processing Research and Technical Services, Togitogiga Crop Farm (UNDP Special Fund Project) Asau Crop Farm (UNDP), Plant Protection (UNDP), Soil Research (USP-Alafua) and West German Plant Protection Project. Total costs $WS 405,000 (Western Samoa $WS 105,000 and Aid $300,000) (Govt. of W. Samoa 1979:35).

Livestock Research Projects include Animal Feed Production, Animal - Health and Veterinary Services, Pig and Poultry Multiplication Project (USP-Alafua) and Pastures and Animal Production Project. In 1979, $WS 915,000 have been committed to Livestock Development ($WS 293,000 from Western Samoa and WS$648,000 from aid).

Livestock disease investigation and research includes cysticercus bovis (beef measles), leptospirosis, epithelioma (cancer eye), endo-octo parisitism, fowl cholera and E. coli inspections.

Extension Activities

Extension activities are carried out in several of the Divisions, with the Extension and Advisory Services having major responsibility for

this area. Staff have played an active role in the implementation of Rural Development Schemes and have been involved in planning, and survey activities.

Throughout 1978 and 1979, extension officers were involved in the implementation of most of the 280 microprojects of the Rural Development Programme. The bulk of these projects were located on Apolu Island. As many as 98 villages are involved and the expenditures for 1979 was $WS 949,314. Of the total amount allocated in 1978, the Government contributed $WS 40,000 and the European Development Fund, Australia and New Zealand the balance, through bilateral aid funds. Extension will be responsible for advising farmers on cattle, pigs, poultry, fishing, banana, taro, cocoa, vegetables, plantation improvements and weed control (Govt. of W. Samoa 1979: 15).

The tropics which have most frequently been requests for technical advice include the establishment of banana plantation, landclearing and weed control, fencing and the establishment of pasture grasses. Difficulties which were encountered most often include a lack of cooperation among village people (for lack of a leader), the slow approval of proposals through the Department, poor selection of land (too rocky and hilly), slow supply delivery, or shortages of water for plantations.

The Extension Division is involved in leafspot control, bunchytop control and pest control. It provides field days and demonstrations, as well as providing the results of demonstration projects on banana production, cocoa, kava, vegetable, pineapple, passionfruit, pig and poultry. Courses are offered in farm management, improved farming methods and skills and rural development.

The Forestry Division is involved in a reforestation project on Asau, a timber impregnation Project at Vaitele which should double or triple output. However, treatment plant, yard tractor and power saws breakdowns have stymied this production.

Development projects for 1978/79 included an ADB Beef Cattle Project, Pastures and Animal Project (UNDP), Dairy Production Project, Beef and Cattle Extension Project, Pig and Poultry Project (USP-Alafua), Animal Health Services and a Pig and Poultry Extension Project. Government appropriated $WS 293,000 and aid contributed $WS 622,000 for a total of $WS 915,000 in 1979.

Education

A number of divisions have provided opportunities for staff to obtain higher level training. In the Forestry Division staff have been selected for overseas training in Australia, Papua New Guinea and the Solomon Islands. In Extension and Advisory Services eleven staff members have received training overseas, from 3 weeks to 2.5 years, in the Philippines, Guam, Fiji, Hawaii, Australia, and Papua New Guinea.

RELATED SOCIAL AND ECONOMIC FACTORS

Economic Development and Trade

In the 1975-76 Development Plan (Govt. of W. Samoa 1979:22), three major social-economic problems were identified: lagging agricultural development, partial and ineffective utilization of productive manpower, and financial pressures resulting from domestic inflation and a need for viable international financing.

The economy is based on agricultural production, which consists largely of mixed subsistence-cash cropping production. Economic stability in New Zealand and Australia has a strong influence on the economic outlook as much of Samoan trade is with these two countries.

Export receipts in 1978 amounted to $WS 8.3 million. Imports were $WS 41.6 million that same year, resulting in a $WS 33.3 million deficit. This deficit is 20 times greater than a decade ago and points to a serious trend in Samoa's balance of trade (Govt. of W. Samoa 1979:9).

Dependence on two products (copra and cocoa) whose production volume and world price fluctuate from year to year make the economy vulnerable to circumstances beyond its control. In 1978, cocoa exports fell by 50% while average price fell by 30% compared to the previous year. Copra prices rose in 1978, but production was down 20%. Total exports receipts in 1978 were 29% lower than the year before.

Imports include food, beverages, fuels, chemicals, machinery and transport equipment, and manufactured articles. Food and live animals constituted 28% of imports in 1977. Most imports in 1975 were from New Zealand, Australia and the USA (Ref. #56).

Destination of exports has varied with New Zealand a steady customer. In 1975, 74% went to the Netherlands, New Zealand and West Germany. In 1976, 71% of exports went to New Zealand and West Germany. There is relatively little trade within the Island nations. In 1975 and 1976, only 6% of export trade from Samoa went to the region, and imports from the region were 3% in 1975 and 11% in 1976.

Demography

In mid-1978, the population of Western Samoa was 153,000. Between 1971 and 1976, the annual rate of growth was 0.7%, the lowest in almost twenty years. The low growth rate reflects a combination of population increase and significant out-migration, resulting in an actual increase in resident population which is quite low (ADB 1979:25).

Between 1961 and 1976, population density increased from 39 to 52 persons per sq. km (ADB 1979:27). Although the island of Upolu is the smaller of the two main islands, it has the greater proportion of the population, with 106,063 persons (72%) compared with 40,572 (28%) in Savai'i.

Urban/rural population ratios have remained fairly stable since the 1971 census. However, the annual growth rate is much higher for urban areas than for rural areas. Between 1971 and 1976, respectively, growth rates were 1.2% and 0.6% (ADB 1979:30).

In 1976, approximately 50% of the population was below 15 years of age. Three percent was over 64. Thus about 47% of the population were in the 16-64 year age group that are potentially available for work (Ref. #56:32).

Employment

Employment in Samoa is a serious problem and is being complicated by many factors. Twenty-three percent (approximately 35,000 people) of the population reside in the main town of Apia. The majority still live in the outlying villages. It is estimated that 5000-6000 Apia youths between the ages of 15 and 29 years are unemployed. Many of these youths are unskilled and have only primary level education. The problem of creating attractive jobs for these people and training them is a major concern of policy makers (Govt. of W. Samoa 1979).

In the rural areas, the problem can be just the reverse. As rural youths migrate to the urban centers and overseas, the villages experience shortages of manpower needed to work on the plantations and development projects. Labor is inconsistent or nonexistent for many public and private development projects in the rural areas.

Employment statistics for 1976 showed 23,373 persons (61.1% of the population) over 10 years old, and economically active, working in agriculture, forestry and fishing (Filipo 1978). Of this number, 20,703 (54%) worked for nonwage payments.

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