

Agricultural Research Institutions in the Tropical Insular Pacific

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Agricultural research is an essential component of any program to increase the sustainability of agriculture. Agricultural research is necessary to help farmers deal with diseases and pests. With the dramatic increases in travel and trade of the twentieth-century, even the traditional agricultural practices of relatively isolated islands in the Pacific have come under threat from introductions of exotic diseases and pests. Agricultural research also is needed to develop sustainable production practices and to adapt new technologies and cultivars to local conditions. Many of the traditional agricultural practices used in the tropical Pacific become non-sustainable when they are intensified due to increases in population, or due to movement from subsistence to market production. Cultivars and practices developed elsewhere may not be suitable for the climates and soils of the tropical Pacific. For those agricultural products that are produced for export markets, local research is necessary to adapt to the constantly changing demands of these markets.

Thus, the search for a sustainable agriculture can no longer be viewed as a search for a static system that once perfected does not change. Rather sustainability results from a system that can incorporate change while preserving the resources upon which it depends. Locally oriented and responsive agricultural research is integral to this vision of sustainable agriculture.

The best agricultural research for a region is often conducted at a local, well funded, permanent research institution with a strong commitment to local products and to the problems of its service area. The professional staff usually has a long term relationship with the area and have developed intimate knowledge of its problems and potentials. This paper focuses on such institutions in the Polynesian, Melanesian and Micronesian regions of the Pacific Ocean. It does not address institutions in the region that are have no permanent physical existence. This is not to demean such institutions. They make significant contributions to the agricultural knowledge base of the region and bring much needed funds and expertise into the region. However, they are constantly changing and hard to track on an on-going basis. Such effort is beyond the scope of this article.

The pattern of agricultural research institutions present today in the insular, tropical Pacific exists largely as a result of the colonial history of the region. In particular, the post World War II pattern of colonial rule has determined the distribution of agricultural research institutions of the region. The level of funding and support of these institutions depends upon at least three factors: the size and wealth of the population of the area that the institution serves, the current politi-

cal relationship of the area with the historical colonial power, and to a lesser extent, the relative importance of agriculture to the overall economy of the area.

There were three colonial spheres of influence remaining in the insular Pacific at the conclusion of the World War II. The British Commonwealth (Great Britain, Australia and New Zealand) controlled much of the central and southern Pacific. This included the present day entities of Papua New Guinea, Nauru, Solomon Islands, Kiribati, Tuvalu, Fiji, Tokelau, Samoa, Tonga, Niue and Cook Islands. Vanuatu was jointly administrated by Great Britain and France. France had areas in the southwestern Pacific (New Caledonia and a shared interest in Vanuatu) and in the Southeastern Pacific (French Polynesia) and Wallis and Futuna in the Central Pacific. The United States controlled much of the northern and western Pacific with the present day entities of Hawai'i, Guam, Commonwealth of the Northern Mariana Islands, Republic of Palau, Federated States of Micronesia and Republic of the Marshal Islands under its administrative control.

The principal institution of agricultural research for the areas which were under the rule of the British Commonwealth at the end of World War II is the agricultural programs of the University of the South Pacific. The University of the South Pacific (USP) is a cooperatively funded regional university with its main campus located in Suva, Fiji. The University has four academic schools: Agriculture, Humanities, Pure and Applied Sciences and Social and Economic Development. It was founded in 1968 and is jointly owned by the governments of 12 island countries: Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu. All of these areas were under the domain of the British Commonwealth at the end of WW II except for the Marshal Islands.

The School of Agriculture (SOA) of the USP is housed in a satellite campus at Alafua, Samoa. The research arm of the USP School of Agriculture is the Institute for Research, Extension and Training in Agriculture (IRETA) of the USP.

Table 1. University of the South Pacific at Alafua discipline distribution of researchers.

Agricultural Education and Extension	3
Agricultural Economics	2
Agricultural Engineering	2
Agroforestry	1
Agronomy	2
Animal Science (Production and Nutrition)	3
Chemistry	1
Entomology	1
Plant Pathology	3
Soil Fertility and Statistics	1
Tissue Culture	1

Source: Mareko P. Tofinga, pers. comm.

It has three research and demonstration farms, Alafua, Moamoa, and Laloanea Farm, in Samoa that total 81 ha (University of the South Pacific 2001). The SOA had 114 students in the spring of 2001 with an additional 400 in its regional extension programs. There were 20 researchers at USP Alafua/IRETA, and of these, 7 held the PhD degree (Mareko P. Tofinga, IRETA, pers. comm.) The distribution of their research interests is presented in Table 1.

The Fiji Ministry of Agriculture, Fisheries and Forests, Department of Agriculture, Research Division has its main research station at Koronivia near Suva. It has 8 other research stations, six (including Koronivia) of which are located on Viti Levu, two on Vanua Levu and one on Taveuni. With a professional staff of approximately 17, the Research Division conducts research on coconut, ginger, kava, taro, tropical fruits, vegetable production and farming systems (Fiji Ministry of Agriculture 2001).

In Papua New Guinea, the National Agricultural Research Institute (NARI) is administered by the PNG Ministry of Agriculture and Livestock. NARI was established in 1996 and is headquartered in the lowlands at Lae. It has seven satellite research and service centers in different agroclimatological zones and its research program is organized to match the climatic zones of each of the stations (Papua New Guinea National Agricultural Research Institute 2000). The focus of the Institute's research is on small-holder, semi-subsistence farming.

The Papua New Guinea University of Technology (Unitech) has a Department of Agriculture that offers the Bachelor of Science in Agriculture and post-graduate degrees. It has one research farm of 39 ha and plans to buy a second farm of approximately 300 ha. Unitech also is located in Lae, and given the location, is focusing its research on lowland subsistence or traditional sector production of food crops and livestock (The Papua New Guinea University of Technology 1998). The Cocoa and Coconut Research Institute (CCRI) is a research center, funded by the PNG government and aid donors, that actively participates in the International Coconut Genetic Resources Network (Ovasuru 1999).

The primary method by which the French government supports agricultural research in its Pacific Territories is through the Center for International Research and Agronomic Development (CIRAD). CIRAD is a French scientific organization that specializes in agricultural research for the tropics and subtropics. It operates in about 50 countries. The Center's global budget amounts to approximately \$135 million per year and it employs 900 senior scientists and administrators (CIRAD 2001) CIRAD had its largest facility in the Pacific in New Caledonia and it has smaller facilities in French Polynesia and Vanuatu.

Since 1 January 2000, CIRAD has operated in New Caledonia through the newly formed Institut Agronomique Neo-Calèdonien (IAC). The IAC is an autonomous local organization with its own board of directors. The funding of IAC is shared between the New Caledonian partners and French government through CIRAD (T. Mennesson, IAC, pers. comm.) Its research programs is divided into eight areas. These areas along with the number of researchers assigned to each are summarized in Table 2 (T. Mennesson, IAC, pers. comm.)

Table 2. IAC/CIRAD Institut Agronomique neo-calédonien FTEs by program area.

Agrarian Systems and Agro-ecosystems	3
Animal Husbandry	2
Coffee	0
Food Crop Farming (root crops)	0
Forests	2
Fruit Crops	4
Market Garden Crops	3
Wildlife Management	2
Rural Technology	1

Source: <http://www.cirad.nc/index.htm>

The IAC has four experimental farms and a fifth facility for social-economic research in New Caledonia. Research staffing is provided by CIRAD professionals, local researchers and post-doctoral interns.

In French Polynesia, CIRAD provides institutional support to the Rural Development Service (Service du Développement Rural (SDR)) of the Ministère de l'Agriculture et de l'Élevage. The research program of the SDR is divided into eight project areas: 1) the production and commercialization of pineapples, 2) noni, *Morinda citrifolia*, culture, 3) kava, *Piper methysticum*, germplasm collection and biochemistry, 4) experimental hydroponic vegetable production, 5) research and development for the vanilla industry in French Polynesia, 6) sandalwood, *Santalum insulare* var. *deckeri*, forestry and propagation, 7) temperate vegetable culture and 8) animal sanitation research (Le Ministère de l'Agriculture et de l'Élevage 2001).

In Vanuatu, CIRAD has operated the Vanuatu Agriculture Research and Training Centre (VARTC) since 1994. The center has traditionally focused on perennial crops (coconut, coffee, cocoa) and cattle ranching. VARTC has added a third component of diversification into its research program which has increased the scope of the Center's research to include root crops (yam, taro and sweet potato) and kava (Derevier & Pointereau 2000.)

In the American Affiliated Pacific (AAP), the colleges and universities of the US Land Grant System are the principal institutions conducting agricultural research for the region. Agricultural research in the US Land Grant System is conducted by the Agricultural Experiment Stations of each institution and is funded jointly by the local government and the US Department of Agriculture as authorized by the Hatch Act of 1862.

There are four Land Grant institutions in the that serve US state or territories in the AAP: the University of Hawai'i at Manoa, the University of Guam, Northern Marianas College and American Samoa Community College. The fifth land grant institution in the AAP is the College of Micronesia (COM). The COM conducts its program through three national colleges: Palau Community College

Table 3. University of Hawai'i at Manoa research FTEs by department.

Human Nutrition, Food and Animal Sciences	HNFAS	26.5
Molecular Biology and Biosystems Engineering	MBBE	19.88
Natural Resources and Environmental Management	NREM	10.45
Plant and Environmental Protection Sciences	PEPS	23.25
Tropical Plant and Soil Science	TPSS	25.23
Family and Consumer Sciences	FCS	1.00
Total	Research	106.31

Source: James Hollyer, pers. comm.

(PCC), College of the Marshall Islands (CMI), and College of Micronesia-Federated States of Micronesia (COM-FSM). Its joint funding was provided for under the treaties of free association between the each of three nations and the USA. It was established by the College of Micronesia Treaty among the three Micronesian nations. The Deans and Directors of of the five US Land Grant Institutions in the AAP cooperate the Agricultural Development in the American Pacific (ADAP) program which was initiated in 1989 using support from the U.S. Department of Agriculture (ADAP Home Office 2001a).

The largest Land Grant institution in the AAP is the University of Hawai'i at Manoa (UH). Agricultural research programs of the UH's College of Tropical Agriculture and Human Resources date their origin to the creation of the original Hawai'i Agricultural Experiment Station in 1901 which predates the creation of the University (CTAHR Office of Research 2001). The college has recently undergone a reorganization and has divided itself into six departments to better reflect the changing needs of its clientele. These departments and the number of research full time equivalents (FTEs) are given in Table 3. The Hawai'i Agricultural Experiment Station has 17 field stations on four of the eight main islands of the state.

Additionally, there is a College of Agriculture within the University of Hawai'i at Hilo and two non-university agricultural research institutions in the State of Hawai'i. The College of Agriculture, Forestry and Natural Resource Management was established in 1975 with an orientation towards teaching, but like most US Universities, the faculty are expected to maintain a research program. The College has 11 full time faculty all of whom hold the PhD degree, a 51 ha. farm and an aquaculture facility (College of Agriculture, Forestry, and Natural Resource Management 2001). The USDA Agricultural Research Service (ARS) is constructing a new Pacific Basin Agricultural Research Center in Hilo, Hawai'i. The Center is not yet completed and is operating in a limited capacity. It will be a large regional research center with an investment of approximately \$50 million in its physical plant (J. Quisenberry, USDA, ARS, pers. comm.) Its focus will be in five areas: tropical pest, post harvest, tropical plant physiology, germplasm collections and aquaculture (USDA ARS 2001). The second non-university insti-

tution is the Hawai'i Agricultural Research Center (HARC). HARC specializes in horticultural crop research. Areas of interest include plant nutrition, physiology and breeding, genetic engineering and tissue culture and integrated pest management. HARC is a private, non-profit organization with a professional staff of 27 of which 13 hold the PhD degree. It has five research stations on four of the Hawaiian islands (Osgood 2001).

The second largest Land Grant institution in the AAP is the University of Guam. The University of Guam gained its land grant status in 1974. Agricultural research is primarily conducted by the Agricultural Experiment Station (AES) which is a unit of the College of Agriculture and Life Sciences (CALs). CALs also houses the Guam Cooperative Extension Service which conducts some on-farm research (McConnell 2001). CALs offers a B.S. in Agriculture and a M.S. in Environment Sciences. Each of these programs has approximately 20 students enrolled at any given time. The AES has a faculty of 12 PhD researchers who cover most of the agricultural disciplines. The distribution of its researchers is summarized in Table 4. The AES has 5 experimental farms totaling about 60 ha. Four of these farms are devoted to land-based agriculture and cover all of the major soil types on Guam. The fifth farm is devoted to aquaculture. The Guam Aquaculture Development and Training Center was recently transferred to the University. It was originally built as a commercial fish hatchery and was acquired by the Government of Guam more than 20 years ago.

The Northern Marianas College Cooperative Research Education, Extension Service (NMC-CREES) is the Land Grant institution in the Commonwealth of the Northern Mariana Islands (NMC CREES 2001). The Northern Marianas College was founded in 1981, and the Land-Grant was established in 1986. It offers the A.S. degree in Natural Resource Management. The Land grant effort is divided into three areas: agriculture extension, agriculture research plus family and consumer sciences. The agriculture program has 15 professional employees of which approximately 5 are intended for PhDs. These employees normally carry a 50/50 percent split appointment between research and extension. CREES has offices on the three main islands of Saipan, Tinian and Rota (Van Der Veen 1999).

The American Samoa Community College Land Grant Program was established in 1980 and is situated on a four hectare research farm next to the main campus (ASCC Land Grant Program 2001). The land grant program is divided into an agricultural research program and a separate extension program. There are seven professionals with research appointments, the majority of which have PhDs. Their discipline distribution is included in Table 4.

In 1980 the US Congress designated College of Micronesia as the land-grant college for the former Trust Territory of the Pacific. Micronesian land grant programs continue to be offered through the College of Micronesia (COM) administration (COM Land Grant 2001). The Directorate is in Pohnpei and there are associate directors based at each of the national colleges: PCC, COM-FSM and CMI. There are also Agricultural Experiment Stations at each of these national colleges. Recent research staffing has focused on obtaining researchers in two

Table 4. Smaller land grants of the American Affiliated Pacific discipline distributions of researchers*.

	ASCC	COM	CNM	UOG
Agricultural Economics/Marketing	1		2	1
Agricultural Engineering				1
Animal Science			1.5	1
Agronomy			1.5	
Aquaculture		4		1
Environment/Safety			1	
Entomology	1	1	2	3
Forestry	1		1	2
Horticulture	1	4		1
Nutrition	1		1	2
Plant pathology	1		1	2
Sociology			1	2
Soils	1		1	1

* May include PhD Faculty with extension appointments.

Sources: ACC - Carol Whitaker, COM - Singeru Singeo, CNM - Craig Smith, UOG - John Brown

areas: aquaculture and horticulture (tissue culture) for each of the experiment stations (Singeru Singeo, COM, pers. com.) Palau Community College is nearing completion of a new experimental farm facility on the island of Babeldaob (Anita Suita, PCC, pers. com.) COM-FSM has an experimental farm adjacent to its Kolonia campus and a tissue culture facility on the island of Kosrae. CMI has recently completed an aquaculture center and a tissue culture laboratory as a part of the new Marshall Islands Science Center in Arrak.

There are two organizations that work to provide coordination of agriculture in the region. The most comprehensive of these is the Secretariate of the Pacific Community (SPC). All of the island countries and territories discussed so far with the exception of Hawai'i are members. Hawai'i is a state of the US, and the US along with France, Great Britain, Australia and New Zealand are also members of the SPC. The SPC, formerly the South Pacific Commission, was founded in 1947 and it is one of the oldest regional organizations in the world. The SPC is concerned with the full range of issues facing its members including agriculture. The Land Resources Division of the SPC is divided into two programs: forestry and agriculture. The agriculture program divides its activities in three divisions: Crop Improvement Services, Plant Protection Services and Animal Health Inspection Services (SPC 2001). The SPC Agricultural Programme does not have a formal agricultural research institution, but does generate considerable amounts of regionally applicable knowledge and connects the nations and territories of the region primarily through the relevant governmental agencies in each area.

The second regional agricultural organization is the Permanent Heads of Agricultural and Livestock Protection Services (PHALPS). Twenty of the twenty-two members of the SPC are also members of PHALPS. The government of the state of Hawai'i is also a member of PHALPS but not of the SPC (ADAP Home Office 2001b). PHALPS holds a conference every two or three years to determine agricultural priorities for the insular Pacific region (United Nations Division for Sustainable Development 2001).

Finally, while both SPC and PHALPS coordinate agricultural development programs in the region and both participate in setting agricultural priorities for the region, neither has agricultural research cooperation or administration as a primary interest.

Historically, contact and cooperation between the research institutions and researchers in the region has been, and remains, informal and limited. Differences in political affiliations, language and funding sources, combined with the tremendous distances of the Pacific Ocean, have hindered the full development of cooperative regional research efforts between the institutions of the three historical regions. This represents a lost opportunity. Many of the crops, pests, climates and soils are similar. The limited agricultural research resources of the region therefore should be leveraged to the fullest extent possible for the benefit of the region. A more formal structure of contact among the research institutions and researchers in the region would be of substantial benefit in better utilizing the limited agricultural research resources available for the benefit of the people of the insular, tropical Pacific islands.

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