

Appendix F

Summary of Regional Workshops

Introduction

Three regional workshops were conducted to collect information from local island resource managers, planners, and educators. A total of 55 persons representing various aspects of terrestrial and marine resources participated in the workshops and are listed at the end of this summary. Interests in sustainable resource use ranged from scientific research, to food and fiber production for enhancement of self-reliance, to developing and sustaining tourism based economies.

Within each workshop participants were divided into three working groups covering agriculture, marine resources, and education and planning. The individual workgroups addressed a list of issues identified by the Assessment Advisory Panel at its initial meeting. Work group participants were charged with identifying the applicability of these issues to the various islands, the extent of resulting problems, efforts attempted to ameliorate problems, and the potential transferability of these efforts to other islands. Participants also identified Federal programs extended to the islands that mitigate or aggravate the situation. Options suggested by workshop participants were not restricted to those pertaining to Congress or U.S. Federal agencies; but include some suitable for local governments, regional or international institutions.

Despite varying degrees of development among island areas, many problems, issues, and opportunities are shared. The workshops provided an opportunity for participants to discuss local issues and share possible solutions. The following is a summary of the major points discussed at the three workshops,

Agriculture and Forestry

Information Availability and Sharing

An effective and readily accessible baseline data/information system is integral to planning, management, and development of island resources. However, baseline data on island resources, and information on potentially suitable agricultural technologies are inadequate or unavailable to many island governments. Baseline data on island resources and information on technologies are well-developed in the U.S.-affiliated Caribbean islands,

but systems for delivering technical and marketing information to practitioners and planners need improvement. Effective mechanisms and systems for sharing data/information among international, regional, inter- and intra-island agencies and practitioners are needed in most of the U.S.-affiliated islands,

Factors that hinder development of organized data/information systems in the U.S.-affiliated Pacific islands include: 1) inadequate island infrastructure to support a computerized storage/retrieval system; 2) inability to fund and maintain such a system, 3) a scarcity of on-island experts to interpret technical data, and 4) lack of or inadequate systems for easy access of available baseline data.

Substantial improvement is needed in some information areas (e.g., timely updating of marketing information, increased computerization of information for easy access and manipulation). Increased technology transfer may be accomplished through improving extension services, public education programs, and providing demonstration and pilot projects.

Except for some Freely Associated States (FAS) archives, essentially all baseline resource data for FAS islands are furnished by U.S. Federal agencies, off-island educational institutions, or private organizations. The University of Guam's Micronesia Area Research Center Information System and the Micronesia Area Tropical Agriculture Database Center have effective information storage and retrieval systems, however, development of complementary centers is needed.

suggested Options:

- Establish regional information clearinghouse(s) for acquisition, storage and dissemination of information,
- Increase federal funding and/or technical assistance in data interpretation, dissemination and technology extension.
- Strengthen and broaden the scope and services of the existing local and regional research centers' information systems.
- Develop or improve on-island expertise for data interpretation.

Current Agriculture Technology

Traditional agricultural technologies remain suitable for certain FAS polities, however, these tech-

nologies generally are undervalued or ignored by decisionmakers, developers, planners, and donor agencies. Few government agencies are involved in the planning and marketing of traditional crops or in extension of traditional agriculture practices. Hence, little effort is directed toward assessment or improvement of traditional agriculture technologies. Increased consideration of low input, small-scale technology development and implementation is needed. Extension, public education, and demonstration projects may increase public awareness of available alternative technologies.

Semi-commercial, small-scale agriculture is widely practiced in the U.S. Pacific Flag territories, except in American Samoa where subsistence farming predominates. The strong traditional agricultural practices in American Samoa hinder successful introduction and application of commercial agriculture production technologies. Small-scale farming requires sophisticated management and marketing techniques to be competitive.

A strategy of improving traditional agriculture technologies and encouraging transformation of traditional agricultural practices to semi-commercial practices and (ultimately) into commercial farming may hold promise. Reliable markets must be created concurrently to absorb farm produce.

Most introduced commercial agriculture technologies have proven unsuccessful due to various factors. Major constraints to successful application of commercial agriculture technologies include socio-cultural (e.g., techniques incompatible with local custom/culture), ecological (e.g., technology unsuitable for island ecology or size), and economic factors (e.g., small intra-island and inter-island markets, fluctuating world markets). Factors such as efficient technology, good management, minimal adverse environmental impacts, and selection of high-value crops are important considerations in agriculture development. Suitable agricultural production technologies that overcome the various ecological, social, and economic constraints of small islands are needed.

Full-time commercial farming employing currently available technologies is considered a high risk activity and uneconomical due to high agricultural production costs. Many enterprises have failed despite government subsidies and support. In the U.S. Caribbean islands, some farmers have either stopped farming or now engage in part-time family farming because of low returns. Consequently, large

areas of agricultural lands are left idle, or are used for non-agricultural purposes. A number of farmers in Puerto Rico and the U.S. Virgin Islands (USVI) now are practicing semi-commercial family farming.

High wages, compared to regional averages, and low productivity are the major constraints to agriculture development in US Caribbean islands. Productivity might be increased by selecting improved technologies and high yield crops. Currently, mechanization and/or intensification of agricultural practices is a preferred method to increase agricultural productivity while low-input technologies commonly are ignored. Although this approach might increase productivity, it may not solve unemployment problems in rural areas.

Viable commercial agriculture is restricted to small-scale operation in the USVI because of the small land area and limited freshwater resources. Some small-scale farming of selected crops (e.g., sun-coffee, herbs and spices, passionfruit, ornamental plants) is profitable in the U.S.-affiliated Caribbean islands. Precise identification of high value markets may improve the profitability of this type of farming.

Selected large-scale commercial agriculture using suitable technologies and management may be economically viable in Puerto Rico under certain conditions. A large-scale drip irrigation farming system designed by Israelis and developed on the semiarid lands of southern Puerto Rico seems potentially economically viable, despite a large initial capital investment and management problems. However, some intensive large-scale farming technologies are not profitable, as evidenced by the failure of the rice project on the northern Puerto Rico coast.

Post-harvest technologies (processing, storage, and transportation) of agriculture products are poorly developed in many of the Pacific islands. Although a number of post-harvest technologies could be applied, they are generally not cost effective. Island institutional capacity to develop and implement suitable technologies is limited.

Application of available processing technologies is constrained by a variety of factors, including the high cost of processing; irregular availability and relatively small quantity of local raw materials; small-sized local markets; distance between processing centers and potential export markets; and poor island infrastructure that make transportation and storage costs prohibitive.

Although simple post-harvest technologies such as sun-drying are practiced, local markets for such products are limited. These products could not com-

¹U.S. Pacific Flag territories include Guam, the Commonwealth of the Northern Mariana Islands and American Samoa.

pete with lower priced items in export markets, and commonly do not meet stringent Federal quality or labeling standards.

In Puerto Rico, post-harvest processing technologies are available and many have been researched and tested. However, as yet, few have been applied commercially. This is due primarily to high labor costs, small markets, and the limited quantity and irregular supply of local raw materials. These factors increase production costs, hence products of the U.S.-affiliated Caribbean islands are not competitive with those produced in countries having either cheap labor costs or more efficient production technologies. In Puerto Rico, products using simple processing technologies, such as plantain chips, supply local markets and have entered some export markets.

Success of commercial export crop development depends not only on appropriate production and post-harvest technologies, but also on accurate market identification and forecasting. Organized marketing information generally is inadequate in the U.S.-affiliated Pacific islands and this problem is exacerbated by lack of island experts to interpret available information. Although marketing information is available from Federal agencies and through the Hawaiian Marketing Information Center, high cost and lack of on-island experts to interpret the information effectively prohibit its use. Further, island government institutions largely are unable to identify and create off-island markets. Mechanisms for effectively obtaining, interpreting, and transferring marketing information to planners are needed.

Suggested Options:

- Local governments should formally recognize the merits of those traditional agricultural technologies which sustain island renewable resources.
- Assess current and potential roles of traditional agriculture in overall economic development, and support research for improving suitable traditional island agriculture technologies.
- Assess small-scale commercial agriculture development for applicability to the U.S.-affiliated islands considering the technological, management, economic, environmental, and social factors,
- Identify island commodities with good market value that can be profitably produced, processed, and transported.
- Market economists should participate in island agricultural development planning.
- Establish a new regional marketing information clearinghouse for U.S. Pacific islands or

strengthen and broaden the scope and service of the existing Marketing Information Center in Hawaii,

- Federal agencies could make appropriate marketing information available to island institutions or to a regional depository, and assist in information interpretation.
- Develop on-island expertise in data interpretation.

Education, Training, and Skills

Education, research, training, and extension programs related to island resource bases generally are inadequate and not well coordinated on many islands. Curricula on island resource development and environmental impacts need strengthening at all educational levels on many of the U.S.-affiliated Pacific islands. Consequently, labor skilled in renewable resource management is scarce on many U.S.-affiliated Pacific islands. A lack of public awareness of the importance of resource development issues and concomitant lack of government support for education and training on resource related subjects hinder the development of a cadre of skilled resource managers. Although current programs in the U.S.-affiliated Caribbean islands generally are adequate, further improvement and emphasis is needed to enhance education in environmental issues.

Research on island resource development in the U.S.-affiliated Pacific islands is inadequate and needs coordination. Few research and training opportunities are available and many island governments only can afford to finance research on particular development needs. Research activities are further hindered by lack of experts, funds, and baseline information. Moreover, many research activities are beyond the capacity of some island polities. Results of research projects conducted by island organizations commonly are presented in a format unusable by planners or practitioners,

Suggested Options:

- Provide practical training opportunities in collaboration with other institutions in the Pacific region or with established institutions in Hawaii,
- Support focused and coordinated research projects designed to fulfill island development goals. Encourage and make available experts from Federal agencies and other institutions to assist in research project formulation and execution.

- Develop and provide curricula and educational materials that emphasize island resource related topics at all educational levels.
- Strengthen and improve existing educational programs on the environmental consequences of resource development.

Resource Development Planning

Island institutions have limited capacity to develop integrated resource-use plans. Planners knowledgeable on island developmental issues and resource capability and qualified to develop integrated development plans or to forecast the likely impacts of development are needed in the U.S. Pacific islands. Planning processes are hindered further by fragmentation of governmental jurisdiction over island resources, political interference in planning and implementation of resource use and management, inadequate baseline information, lack of mechanisms to coordinate resource management on islands, and lack of mechanisms to identify appropriate sustainable resource development technologies.

Socio-cultural and political aspects of islands rarely are considered by decisionmakers and off-island planners in resource planning and development. Commercial resource use practices may conflict with customary lifestyles particularly in areas where traditional exchange and sharing obligations and tenure systems are strong. Agriculture development planning for U.S. Caribbean islands similarly is hindered by social, technological and economic characteristics unique to these islands.

Much research undertaken on the islands is not designed to fulfill the information needs of local planners or practitioners, and commonly is not presented in a format suitable for local needs. Development is complicated by Federal regulatory compliance requirements, and by the inability of most U. S.-educated planners and decisionmakers to adapt their skills to local conditions.

Private sector involvement in commercial development of island resources is rare. An increased number of private entrepreneurs (on or off-island) are needed in the commercial agriculture sector. Private (especially off-island) participation in commercial agriculture development on these islands is constrained by factors such as complex land-tenure systems, inability to acquire ownership of lands, islanders' attitudes toward commercialization, relatively high wages compared with labor productivity, limited markets, and great distances between islands and large markets.

Even though large-scale farming may be attractive to those off-island investors who are willing to bear higher risks, constraints for such undertakings are severe on small islands. Smallholder farming systems, on the other hand, may be more likely to succeed, thus yielding increased socio-cultural, ecological, and economic benefits.

Although financial incentives for private sector involvement in commercial resource base development exist in the U.S.-affiliated Pacific Flag territories, many island social and cultural practices, and decisions driven solely by political considerations can negate the effectiveness of these incentives.

Government agencies in the U.S. Caribbean islands have the capacity to formulate integrated resource-use plans. However, political goals commonly overshadow island resource-use management and development plans. Politically motivated decisionmaking results in uncoordinated resource planning and development and, consequently, in resource-use conflicts and mismanagement. Proponents of resource development plans generally have little influence or political clout in the decisionmaking process.

While incentive schemes may have beneficial effects, indiscriminate cash subsidies may lead to uneven local development. Incentive schemes that have immediate cash benefits are attractive for private investors, yet certain management programs that have no immediate and visible cash benefits (e.g. erosion control) may have long term benefits which may not be readily appreciated by practitioners or decisionmakers. Complex formulae and application procedures for obtaining subsidies may constrain the average farmer from applying.

Tax incentives or land leases for overseas investors may be an effective way to stimulate development of the private sector. Development financed by foreign investors also may transmit considerable indirect benefits to the island economies.

Suggested Options:

- Local governments should hire qualified consultants to assist in resource development planning, and increase coordination of agencies now overseeing island resource management and development.
- Coordinate integrated development planning and improve island resource information management capabilities.
- Develop on-island expertise in integrated development planning.
- Provide regular training and education to development planners, resource managers, and

practitioners on island resource use and management technologies.

- Develop public awareness programs and supply training programs on integrated resource management for decisionmakers.
- Include social scientists in development planning and decisionmaking processes to assure that views of traditional island leaders are incorporated.
- Encourage the U.S. private sector to develop and implement technologies that not only sustain island renewable resources, but also are compatible with the islanders' social setting.
- Institute incentives that are conducive to off-island investors.
- Encourage private sector involvement in commercial development of resources through attractive incentives.
- Institute a flexible and simple incentive scheme designed to meet the needs of local practitioners and incorporate tight control and management of these programs.
- Simplify assistance program application procedures and provide assistance to farmers in form completion.

Marine Resources

Information Availability and Sharing

Knowledge of tropical marine ecosystems and current baseline information on marine species is inadequate for sustainable island marine resource development and management in the FAS polities; biological inventories, evaluation, and monitoring of marine resources are needed. Absence of baseline data makes identification of suitable resource management technologies difficult. Local universities address mostly basic biological questions and local marine divisions conduct little applied research on production-oriented issues. Immediate demands on limited personnel and funds hinder investigation of new and/or more appropriate technologies for specific island areas and resources.

Competition and isolation hinder access to information in the FAS. Local fishermen are hesitant to share catch data, sites, and methods with expatriates and local island resource managers for fear of increased fishing competition at preferred fishing sites. Many also have a general distrust of governments. Local markets could serve as information collecting points but owners also are uncooperative. Much U.S. government information is inappropriate for tropical islands, and existing informa-

tion is difficult to obtain. Information from regional organizations is useful but takes months to receive. Outside consultants commonly do not share their findings with local resource users.

Considerable resource information exists in the Pacific Flag territories, but it is not readily accessible and is not presented in a way useful to local governments or resource managers. Data commonly are collected only on selected aspects of marine resources and resource uses (e.g., data from Hawaii is collected primarily to determine maximum sustainable yields and U.S. National Marine Fisheries Service information is primarily focused on offshore fisheries), and data collection is not designed for management purposes. Catch data (species, sizes, and numbers) and nearshore ecosystem carrying capacity information are particularly inadequate for sustainable resource management.

National fishery databases exist in the Pacific Flag Territories, but no system integrates the information into a regional database. National and international fisheries management is hindered by lack of a regional information system. Examples include the WESTPACFIN database developed by the Western Pacific Fishery Management Council at the University of Hawaii and the database Resource Assessment Marianas Archipelago database, which contains primarily maximum sustained yield information.

Overall, information on the nearshore marine resources of the U.S.-affiliated Caribbean islands is adequate, but knowledge of pelagic fisheries is insufficient for sustainable management. Management plans often are based on short-term goals and in some instances rely on data from temperate regions. (e.g., maximum sustained yield estimates for pelagic fishery management plans are based on temperate fisheries data). Current government efforts focus on developing artisanal fisheries, but local interest exists in developing pelagic fisheries.

Data on weights and size are available, but life history data on economically-important species is needed for development of appropriate resource management plans. Puerto Rico's Corporation for the Development of Marine Resources (CODREMAR) collects fisheries statistics but they are not used in management plans and programs. Fisheries management research, although primarily focused on groupers, has initiated new mesh-size standards which have been applied to all species and islands.

Although local information systems exist (Sea Grant, CODREMAR, Caribbean Fisheries Management Council, and the USVI Fish and Wildlife Service), lack of inter- and intra-agency coordination

inhibits dissemination and thus affects local decision-making capabilities. Commonly, data are research oriented instead of application oriented.

Local governments in all of the U.S.-affiliated islands need improved methods for identifying and disseminating information to practitioners. CODREMAR currently is developing programs to extend information directly to the fishermen but implementation is hindered by lack of funds.

Suggested Options:

- Increase funding and personnel for fish-tagging and statistics-gathering programs to include local fish markets, boats and docks, and island governments as well as commercial United States and Japanese sources.
- Collect catch information from American Samoan tuna canneries to improve monitoring of pelagic fish harvest. Legislation or incentives may be needed to overcome their reluctance to share such information,
- Study effects of closed seasons on fish populations.
- Create incentives for village representatives to monitor marine species.
- Increased research on life history data and recommendations on appropriate mesh size restrictions specific to Caribbean fisheries could be carried out by such agencies as the Caribbean Fisheries Management Council,
- Increase the monitoring components of the environmental impact assessment process,
- Local resource organizations could organize informal interviews and workshops for resource managers and local practitioners to promote communication and to collect and disseminate information on local resources and resource uses.
- Designate a person or create a program within marine divisions to screen potential fisheries technologies developed or used in other island areas.
- Develop computerized information management systems to facilitate data collection, monitoring and information dissemination.
- Create information exchanges mechanisms among the Pacific Fisheries Development Foundation, the Pacific Islands Development Program, the Pacific Basin Development Council, and the Aquiculture Development Program, all of which are based in Hawaii.
- Develop inter- and intra-agency information systems coordination with greater emphasis on dissemination of information and exchange with the public sector.
- Develop a network of information sources to include universities, government agencies, and private organizations.
- Develop an information management system accessible to both islanders and outside experts incorporating both written and computer-oriented information.
- Standardize existing databases to facilitate exchange of information and allow regional fisheries management.
- Develop a centralized regional database and disseminate information and analyses to contributors.

Current Marine Resource Development and Management Technologies

Current fishery technologies in the FAS are designed for short-term harvesting goals and not as sustainable systems. Fish aggregating devices are being instituted widely to increase fish catch per unit of effort and island organizations are testing different designs through pilot projects. Concerns have increased, however, over potential adverse impacts of increased fishing activity.

Exploitation of pelagic and of reef fishes require different technologies. Significant differences in scale and in fishing ability exist among certain island groups. For example, small boats may be suitable in Truk because most fishing is within a large, protected lagoon. Pohnpei, Kosrae and Yap, however, are isolated high islands without large lagoonal fishing areas, and the Marshalls are dispersed widely and require fishing boats that are suitable for long-distance travel.

In the U.S. Caribbean islands, there is concern that nearshore fish populations are declining because currently available exploitation technologies restrict harvesting to the continental shelf. Current technologies have promoted harvesting at or above maximum yield within the narrow continental shelf where potentials are limited.

Management schemes have been employed in St. Johns Park, VI which demonstrate the positive effects of protected nearshore areas on fish populations. Similarly, fish populations increased with the closing of Vieques, Puerto Rico waters to fishermen,

Suggested Options:

- Develop new projects and technology based on the comparative advantages of different island environments. Expand feasibility analysis of potential projects (e.g., vertical mariculture in Truk Lagoon, giant clam culture in Kosrae).
- Increase training and technology transfer from

mariculture institutions such as the Micronesia Mariculture Demonstration Center in Palau and the International Center for Living Aquatic Resources Management in the Philippines.

- Devote more land grant funding to development of aquaculture programs.
- Redirect fishermen to exploitation of pelagic stocks to relieve pressure on nearshore stocks.
- Zone areas for fishing, recreation, and protected areas.

Storage, processing, and transport systems are inadequate in the FAS, largely restricting resource development to subsistence and small commercial scales. Poor storage and transport facilities and variable catches currently inhibit full-time fishing efforts and, thus, the development of local and outside markets. Expansion of the fisheries industry into new markets cannot be considered until extension programs develop local expertise in marine product processing, storage facilities are made available, and transportation is assured.

Similarly, storage and transport technologies are poorly developed in the Pacific Flag territories. Export of marine products between islands and to off-island markets is constrained by high airline cargo costs and shipping times. Lack of funds hinders development of processing and storage facilities, although some progress has been made. Increased frequency and improved reliability of cargo transportation services could significantly expand markets.

In the U.S.-affiliated Caribbean islands, lack of infrastructure creates storage and transfer problems; refrigeration, processing, and transport technologies need improvement. Because the whole fish is demanded in local markets,² processing does not pose a problem, however, what is not sold commonly cannot be stored or refrigerated. Facilities are not available for processing or storing excess catch which constrains development of pelagic fisheries. Potential mechanisms to overcome these constraints are being considered by CODREMAR, including establishment of a fishmeal processing plant to make use of fish by-products, and a public education program on fish processing, home storage, and use.

Suggested Options:

- Encourage training and technology transfer from private sector entrepreneurs operating enterprises in the island areas to those interested people lacking such skills.

²Fear of ciguatera poisoning has initiated a trust between customers and individual fishermen.

- Investigate on-board freezing technologies suitable for container ships for islands able to undertake large-scale fishing.
- Investigate joint-venture opportunities to facilitate development of post-harvest facilities.
- Develop storage facilities and increase frequency of pick-up from outer islands.
- Investigate the potential for reducing cargo charges for marine products on local airlines.
- Encourage development of small frozen-product processing enterprises.
- Increase processing technology transfer from Hawaii.
- Increase storage capacity on outer islands to allow larger harvests.

Education, Labor and Skills

Traditional resource use methods may be the most appropriate for fostering development of certain resources in the FAS polities. A need exists to identify special local knowledge and to incorporate this with further development of local technical skills. Local knowledge also plays a role in maintaining island traditions and cultural identity. Sea Grant and the Historic Preservation Program, for example, are Federal programs which have been active in recognizing traditional skills.

Assistance to the islands should be redirected from increasing island government bureaucracies to developing technical expertise for island practitioners. Sea Grant can be an effective education organization, but it commonly focuses on recreational and environmental education and not on development of exploitation or management skills. Outside assistance is needed to develop island management skills.

Little traditional knowledge remains in some of the Pacific Flag territories, but it should be considered in conservation technology implementation activities. Local technical training is needed for all aspects of marine resources development including: project planning, start-up, operation, and maintenance. Business management skills need further development. Development and implementation of new technologies is hindered by lack of education in needed fields.

In the U.S. Caribbean islands, traditional knowledge and cultural characteristics need to be given higher priority in recruiting resource managers and practitioners. Little credit is given to local people possessing traditional knowledge of resource exploitation and management technologies. In St. Thomas, for example, resource skills are disappearing as most employment is found in tourism. This

is due, in part, to an economic development emphasis on capital-intensive technologies in all sectors. The importance of personalities and cultural differences between groups are underestimated in project feasibility considerations.

A better understanding of island ecology by the public, and improved exchange of knowledge between groups is needed in the U.S.-affiliated Caribbean islands. The major goals of public education should be to expand and influence consumer markets and to develop an appreciation of local ecology and resources. Emphasis should be placed on informal education techniques, such as is provided by the park naturalist/guides that are being trained in the USVI.

Pressure to meet U.S. mainland standards in formal education programs hinders creativity and discourages activities focusing on island ecosystems and cultures. Text books currently in use are developed for mainland classes. Some teachers are initiating field activities but they are receiving little support. The Sea Grant program has programs to train teachers in the field, but these have suffered under recent budget cuts.

Suggested Options:

- Recognize value of traditional methods of resource use and management.
- Develop island ecology curricula and materials for primary and secondary schools.
- Encourage school systems to support innovative island-oriented economic development and ecology education activities.
- Use community college programs to enhance local skills.
- Offer classes in higher learning institutions that are directed to management of resource-related enterprises.
- Develop education programs in local schools that encourage information exchange with government resource managers and incorporate traditional values and practices with new technology development.
- Use volunteers and students for short-term assistance rather than consultants.
- Sponsor “fish festivals” oriented towards creating markets for resources and teaching understanding of local ecology.

Extension, Marketing, and Incentives

Changing social values and island economic structures make extension difficult in the U. S.-affiliated Pacific islands. Conflicts between communal and individual interests hinder extension services effectiveness, especially in American

Samoa. The Pacific Fisheries Development Foundation is fostering the development of fishery cooperatives in part to increase transfer of information and technology to practitioners. However, cooperative management systems in the U.S. Pacific have historically failed due to mismanagement and irregular cash flows.

Extension programs in the U.S. Caribbean islands are helping planners to identify resource opportunities through increasing contact between fishermen and representatives of government agencies. However, these programs need to consider both formal and informal information channels, and variability of technologies needed for different ecosystems, as well as increase their emphasis on the technological aspects of small-scale fisheries.

Organizational structures for development of small-scale fisheries exist, but they are underused. Only one of the 17 government-subsidized fishing cooperatives in Puerto Rico is self-managing, and it alone is considered successful. Key people in managerial roles are important. Formal organizations may interfere with marketing links between fishermen and customers.

There are informal marine extension agents and training programs for island managers, but more technical assistance is needed to extend fisheries and aquaculture technologies. The U.S. Soil Conservation Service (USSCS) gives advice on pond irrigation technologies, yet this does not incorporate opportunities for aquaculture in irrigation ponds. CODREMAR is trying to create Fisheries Centers with facilities to store gear and clean and sell fish. It also is providing grants for equipment and giving seminars on small-scale fisheries management.

Suggested Options:

- Develop legislation authorizing the use of local foods in federally funded programs (e.g., school lunch and aid for the aging), to increase markets and to develop local capability to supply nutritional needs in the event of a decline in income subsidies and free food programs.
- Analyze successes and failures of existing joint venture projects to guide development of future agreements, and develop legislation to ensure that an appropriate part of the profits remains within the island areas.
- Expand and improve community college capabilities to teach technical skills.
- Increase media outreach efforts by Sea Grant extension services.
- Encourage appropriate nonprofit organizations to contribute to extension of information and transfer of technologies.

- Increase cooperation between U.S. mainland universities researching warm water aquaculture (e.g., the University of Mississippi) and U.S. Caribbean academic institutions, CODREMAR and Sea Grant services.
- CODREMAR could undertake demonstration aquaculture projects.
- Establish community foundation funds for pilot aquaculture projects and direct extension activities at coastal farmers.

Marketing Information

Current marketing information does not effectively address fisheries catch and consumer demands in the U.S. Pacific Flag territories where demand for fishery products exceeds supply. Because so few fishermen supply local markets, they easily can influence retail prices; surplus catch flooding local markets causes significant price fluctuations. Alternative markets are needed to absorb surplus fresh catch and to stabilize prices. The large military populations on some islands may provide untapped markets for local fresh catch, but they have not been developed because of variability in the quality and quantity of local catch. Market potential also could increase with better air transport services.

Marketing overall needs improvement in the U.S. Caribbean islands. Marketing information is oriented toward commercial and trade associations rather than the fishermen or public. Government marketing strategies need to incorporate new resources and consider both fishermen and consumers as clientele. Government marketing assistance is provided mainly for the manufacturing and service sectors—aimed at promotion of island products in the U.S. market—and little assistance is given to small-scale fishermen in marketing their products locally. Local government agencies are looking for new resources and markets. Tourism development provides a significant opportunity for creation of new markets. Hotel markets currently purchase only certain species of fish; creating tourist demand for native fish could be part of tourism promotion.

Suggested Options:

- Continue to investigate development of cooperatives to coordinate and regulate fish catch to stabilize local markets.
- Develop hotel and military markets to absorb excess products and, thus, to prevent price fluctuations in local markets. This may require special programs and support from upper levels of the military hierarchy.

- Investigate reduction or subsidization of cargo fees for transport of fish products on local airlines.

Incentives

Development of cash economies in the FAS has altered perceptions of acceptable employment and expectations of goods and services. Subsidies and remittances from off-island relatives have created a false sense of security and further disincentive for local conservation. Increased market demand for fresh fish has encouraged small-scale fishing and local marketing efforts, yet full-time fishing is not considered economical or secure compared to government jobs.

Local governments have increased efforts to develop joint venture arrangements. Such projects provide a profit motive and a guaranteed market. Most tuna processing and on-board fish-freezing are examples of joint Micronesian/Japanese ventures.

Politics, limited profits, and government subsidies are major disincentives to fisheries and aquaculture development in the Pacific Flag territories. There are no economic incentives to devise or employ sustainable resource development technologies. Interest in reef fishing is declining because of low and uncertain returns and availability of alternative employment or income (e.g., U.S. social support programs). Minimum wage standards in the Pacific Flag territories translate into high product prices that are not competitive in export markets.

Disincentives for expansion of local fishing opportunities in the U.S. Caribbean islands include: limited funds, monopolistic families, former project failure, and government politics. Individual families have acquired dominance over some fishing areas by virtue of owning larger equipment and discouraging other individuals from expanding their enterprises. Local incentive programs are nonexistent. The U.S. Department of Agriculture (USDA) provides production and conservation incentives for farmers; there is no similar agency for fishermen.

Outside entrepreneurs have eliminated local incentives for aquaculture development. Project viability must be proven before any local entrepreneur will attempt aquaculture. Currently, the perceived risks outweigh economic incentives. Further, most outside investments have been extremely capital- and skill-intensive and, thus, have not demonstrated technologies suitable for local enterprises.

Suggested Options:

- Provide financial help for initial investments, perhaps through Community Development

Block Grants from the Department on Housing and Urban Development (HUD).

- Inland sport fisheries could be developed on St. Croix.
- Encourage hotels to promote local resources through “catch of the day” offerings on menus or weekly local food festivals.
- Provide incentive programs for small-scale fishermen similar to those of USDA directed at farmers.
- Provide low interest loans for aquiculture pond construction (corresponding to the USSCS funds for irrigation ponds).

Planning and Enforcement

Integrated ecosystem management and marine resource development generally are given insufficient priority in island planning and are ignored in long-term management plans in the FAS. Currently, few island people fish full-time. Governments are increasing efforts to change this because of a recognized need to reduce imports and increase employment. Priority ranking in planning and project funding is given to marine resources only during identified crises (e. g., the recent *Acanthaster planci* “Crown of Thorns” outbreak). Marine resources receive less attention in planning than other development sectors such as tourism or agriculture. No mechanisms to facilitate integrated management exist in the Freely Associated States.

Incompatibility of local tenure systems in the FAS with western development principles and technologies hinders identification of potential resource management techniques. Local marine resource tenure systems are incompatible with western ideas and technology based on free access to marine resources. Leasing does not seem to be an effective alternative to ownership.

Mechanisms to increase local participation and flexibility are needed in the planning process in the FAS. Appropriate planning can help direct effective information acquisition and appropriate use of outside assistance. Individual projects must be specified in development plans in order for them to gain support in budgetary determinations. Federal programs commonly are not flexible enough for application to the islands, therefore, funding for marine resource development will be limited if sources beyond the United States are not considered.

The importance of marine resources to economic development needs wider recognition in planning in the Pacific Flag territories. The potential of marine resource development to create employment and generate income is not recognized and subsis-

tence fisheries are ignored in overall plans. Fisheries managers have little input in the planning process, although plans are becoming more comprehensive (e.g. the plans for Guam included local, Federal, academic, and private interests). There is a need to reconcile short-term activities with long-term goals.

Economic development planning is fragmented among economic sectors, and resource agency plans rarely consider impacts on or from other agency activities. Tourism, in particular, is considered to be overemphasized in planning. Coastal Zone Management programs are trying to integrate tourism and fishery development. The Western Pacific Fisheries Management Council has developed integrated planning methods. A new data base has been developed to aid in fisheries planning (Western Pacific Fisheries Information Network—WESTPACFIN), but it has not yet been used in the U.S.-affiliated islands.

Politics and limited funds inhibit planning and enforcement capabilities in the Pacific Flag territories. Regulations are rarely appropriate management mechanisms for island areas. Despite regulations to the contrary, many nearshore areas are overfished and subjected to bleaching and dynamiting (primarily by Tongans). The few well-accepted regulations include the laws on harvest of sea turtles and black corals: occasional harvest is acceptable for traditional purposes but not for commercial sale. However, enforcement of these regulations is weak, and both turtles and black corals are being harvested commercially.

Recognizing marine resource ownership as a management mechanism is extremely difficult when traditional boundaries are no longer recognized, and marine resource tenure is often incompatible with western style development. Permitting and zoning programs can help to sustain resources in the long run.

Marine enforcement capability is increasing in the flag territories; some areas are now able to confiscate boats. However, local enforcement authorities generally cannot handle unlicensed fleets. Because of reduction in Coast Guard presence in the islands, there is no enforcement capability over Korean boats poaching along island shorelines and no longer any monitoring of the 20(-) mile zone. Village level conservation pressure exists, but commonly enforcement of resource conservation laws is hindered because of extended family relationships between judicial agents and resource users.

Marine resources similarly receive low priority in development planning in the U.S. Caribbean islands due to politics, lack of planning funds, and

planning focused solely on generating maximum income. Existing fisheries are considered to be developed to capacity in the Virgin Islands. However, Puerto Rico probably could meet the domestic fishery market from their marine resource base. There is a need for more long-term planning which commonly conflicts with short-term goals.

Enforcement of fisheries regulations generally is weak in the U.S. Caribbean islands. One positive example is enforcement of laws prohibiting setting of unmarked (and therefore unlicensed) fishing pots. Informal tenure—perceptions of territories—already exists and makes government enforcement of restricted access difficult. Informal tenure also complicates coastal planning. Formal recognition of marine area ownership would be virtually impossible to implement and might not improve the sustainability of resource exploitation.

Politics and lack of funds hinder effective resource planning and enforcement. Limited funding has further effects on the development of a cadre of skilled resource planners in resource agencies or planning offices. Political changes make implementation of long-term planning difficult: each administration has to be re-educated and lobbied for program support. Fishermen provide virtually no input for planning.

Although food self-sufficiency must be derived from a combination of terrestrial and aquatic resources, planning in Puerto Rico is primarily concerned with terrestrial development. Adverse impacts on marine ecosystems from terrestrial sources, except those affecting mangrove areas, often are not considered. Consequently, terrestrial influences on marine resources are underestimated.

The primary interest of Virgin Island developers and planners is generating income and employment, and tourism is given high priority. The USVI Department of Conservation and Cultural Affairs gives equal treatment to terrestrial and aquatic interests. Coastal zone management appears to be ineffective in St. Thomas. Federal coastal zoning laws and management plans are poorly accepted by local inhabitants. Local input is needed at all levels of planning to increase local understanding and acceptance.

Suggested Options:

- Develop a local coastal resource management program (perhaps based on the U.S. Coastal Zone Management model) or initiate more coordination between regional and Federal programs.
- Managers of Federal assistance programs should deal directly with the agencies.

- Develop formal mechanisms for inter-agency coordination.
- Collect employment, income, and revenue data generated by fishery and tourism sectors on a comparative basis to illustrate the importance of fisheries management and development.
- Evaluate and compare the potentials of marine resources development and agricultural opportunities, by island groups, in order to improve planning and implementation of both marine and agricultural programs.
- Increase communication between resource managers and resource users.
- Establish links between conservation services and enforcement agencies.
- Initiate monitoring and ecosystem recovery programs that are buffered from political changes and are consistent with enforcement capacities.
- Educate local judicial agents in renewable resource problems and conservation.

Planning, Education, and Commerce

Information Availability and Sharing

Some information is available on biophysical resources in each of the FAS island areas, however, more is required in order to manage and develop resources sustainably. Collection of baseline biophysical information is extremely costly on the islands. Although U.S. agencies have provided useful biophysical information, it commonly is not timely and, often may not be presented in a format useful for local implementation.

Few people within either resource or planning agencies know how to interpret or use biophysical information. Although training opportunities are available from outside organizations (U.S. agencies, regional organizations, etc.), some changes are needed to increase participation.

The information that is now available to the local FAS governments commonly is not centralized. A system to identify what type of information exists within resource agencies and to increase sharing within and among sectoral areas in governments is needed. Further, little of this information is available to planning offices.

Information sharing among governments could be increased. A major hindrance to information sharing among governments is the possibility of creating competitors and of freely sharing information which may have been purchased by just a few orga-

nizations, Regional cooperation depends on the perception that each government wins by sharing.

Despite the efforts of the U.S. Department of Interior's Technical Assistance Program in the Office of Territorial and International Affairs (OTIA), there is considerable difficulty locating and acquiring appropriate technical expertise in the FAS. Further, governments may not know what outside assistance (financial, technical assistance, etc.) programs are available to them, or specific eligibility criteria for those of which they are aware.

While resource data and information are available to the Pacific Flag territories, commonly it is not centralized, organized, or readily accessible. Baseline resource information in Guam and the Commonwealth of the Northern Mariana Islands is good; American Samoa needs a basic lands survey. However, in general, inadequate or discontinuous funding hinders resource census and monitoring activities by local resource agencies. Further, in American Samoa, information traditionally is considered proprietary and sharing can be difficult.

Each government has access to regional information-sharing mechanisms such as Pacific Basin Coastal Zone Management Conferences and South Pacific Commission conferences. Government operations on the Flag islands are beginning to be computerized; this needs to be extended to resource information. Assistance is needed with archive management and mechanisms to integrate and analyze information.

Information relevant to island resource management developed by international and bilateral assistance agencies is not directly available to the Pacific Flag territories and can be difficult to acquire. Local government agencies in the Pacific Flag territories have little capability for data interpretation and impact monitoring or integration of information which hinder planning. Some areas may have experts to interpret data but few who can translate it to the public.

Impact monitoring is performed when mandated by Federal regulations, although both Federal and local environmental impact statements are especially obtuse. Data interpretation provided by Federal agencies commonly is too technical for local use or fails to consider local development concerns or issues. Guam is developing a monitoring capability, but it is hindered by unstable funding. The CNMI Coastal Zone Management program also monitors projects.

Data collection, integration and presentation to decisionmakers pose no apparent problem in Puerto Rico, however, basic data are not readily available

in the U.S. Virgin Islands (USVI). The University of Puerto Rico (UPR), Puerto Rico Department of Natural Resources and Puerto Rico Department of Agriculture maintain major resource-related databases. Information produced by these organizations is used in development planning and other decisions.

Government data collection is directed towards special goals and tends to be aggregated and presented for the entire territory and not by specific island or island subregion, which may hinder effective use of information.

Limited funding hinders the USVI planning office in data collection and analyses, and makes it difficult to maintain a cadre of skilled people. A facility is needed in the USVI where data could be centralized, aggregated, made accessible, and analyses could be provided that extend beyond line agency immediate needs. Such a facility could house a mechanism to screen outside information for applicability to the island.

Some mechanisms to identify technologies that have the potential to sustain island resources are available in the U.S. Caribbean islands, but these probably do not screen the full extent of information available outside the islands. In part, this is due to problems in identifying appropriate people in Federal agencies with whom to maintain contact. "Shared" employees, such as USDA Agricultural Experiment Station and Cooperative Extension Service staff bridge this gap to a considerable extent in some areas. There is some sharing with non-U.S. Caribbean organizations (e.g., Puerto Rico with the Caribbean Development Bank; USVI with the Economic Commission on Latin America), but this probably should be increased.

Suggested Options:

- U.S. agencies could give high priority to establishing baseline information for island use by providing assistance (financial, personnel, equipment, etc.) in data collection and training in data interpretation, manipulation and management. Local governments could contract out for information needed to supplement this information and local education institutions could encourage students to collect such information in the course of their education.
- Each government should develop an archival system to centralize, manage, and control hard-copy information on resources and resource systems. This system should have copy distribution capacity, storage and retrieval capacity, and mapping and statistical systems.
- A computerized system needs to be developed

to assist with data management and to assist in data manipulation for planning. This system should be centralized for each government.

- Federal data of relevance to resource management in the islands should be made available both to the hard-copy archival systems and to the statistical computerized systems.
- A curriculum could be added to the College of the Virgin Islands directed towards producing graduates skilled in data collection, data manipulation and analysis and resource development planning.
- The United States could duplicate international assistance programs applied in neighboring areas to equalize the benefits; or it could provide a mechanism to channel internationally-derived information to the islands. This could be done through domestic programs or through a special fund to the U.N. to provide such services.
- The United States could permit direct representation of islanders to U.N. conferences so that information can be collected first-hand.
- Provide local people the opportunity to work with Federal data collectors to provide some on-the-job training and better understanding of data for eventual interpretation. Most Federal agencies touch base with local experts.
- The University of Guam could provide training in critique and performance of environmental impact statements, and other data interpretation and planning methods.
- One or more "Regional Clearinghouses" could be maintained to share relevant information between governments. These clearinghouses could scan literature produced outside the local governments (U.S. agencies and international) and share relevant information with the governments, and could maintain a "Directory of International Programs" that contains information on assistance programs, contact people, regulations, and procedures.

Current Planning Technologies

The FAS largely are unable to develop technologies for resource management. Island organizations can provide basic research to determine which technologies are potentially suitable, and conduct applied research to adapt technologies developed outside of the areas and to upgrade those traditionally used in the islands. An organization or organizations are needed to identify potentially suitable technologies from the "outside pool" of technologies.

Deficiencies exist in the capacity of island institutions in the Pacific Flag territories to develop and implement needed technologies and programs. This largely is due to a lack of skilled employees. Some efforts are underway to ameliorate this. The CNMI is opening a 2-year agricultural program in their new land-grant college. Guam and American Samoa have had Land Grant programs for some years. However, Guam reports a need to develop expertise outside of the biological sciences in areas such as physical sciences, engineering, business administration, marketing, finance, and accounting.

While small-scale fisheries may be reported as important in development plans, this does not translate into importance in terms of budget. Government officials may think that fishing requires little support; or they may not wish to encourage fishing as a commercial enterprise. Small-scale fisheries tend to be overwhelmed by large, outside fisheries issues. Competition among U.S.-affiliated islands hinders commercial development of small-scale fisheries. Development of small-scale deep-sea fishing enterprises would support tourism and thus may be a type of small-scale fishing on which to focus. American Samoa's economy and food consumption largely are based on its marine resources; CNMI's falls somewhere in the middle, and Guam's are least based on marine resources.

In the U.S. Caribbean islands, local interest exists in ethnobotany and other areas related to development of "new" renewable resources with potential commercial applications, but present activities are small. These activities depend strongly on university staff and programs, and have been hindered by Federal budget cuts. The CVI Agriculture Experiment Station and Cooperative Extension Service, along with the Island Resources Foundation, are studying local versions of commercial crops and ethnobotany. The Puerto Rico Medical School is researching ethnopharmacology.

Suggested Options:

- Regional Information Clearinghouse(s) might collect and provide information on potentially suitable technologies to the islands in addition to such services provided by OTIA and the South Pacific Commission (SPC).
- Federal agency "loaners" through the Intergovernmental Personnel Act from the Environmental Protection Agency and other agencies would help with immediate problems. Military liaisons with local agencies and access to Naval Ocean Command Center expertise would also provide needed skills and information.
- Perform economic impact statements of small-scale fisheries to provide good estimates of their current importance to local economies.

- Research small-scale fisheries technologies to determine which may be appropriate for local enterprises.
- Marine resource conservation laws would assist with managing inshore areas to support pelagic fisheries. Also, definition of traditional fishing areas would prevent pelagic fishermen from hindering local catches,

Education, Labor, and Skills

FAS need curricula development on resources and development for primary, secondary, and college-level programs. Efforts are being undertaken by a variety of organizations to provide needed materials. The public should be made aware of the value of education, and programs should be developed to promote early student interest in fields most integral to the islands.

All island areas need to develop a cadre of skilled resource managers and planners. Students educated off-island in resource-related fields frequently return to jobs which do not allow them to use their skills. In fact, some students decide not to return at all. The Trust Territory of the Pacific Islands (TTPI) Manpower Council identified island development skills priorities and gave scholarships based on those analyses. Similar attempts have been made by local governments by contracting with students to pursue certain fields in return for financial support. There is no enforcement of “contracts” with students because it is too difficult and costly to monitor their course choices and undesirable to withdraw support for education altogether for non-compliance (changing course plans) when educated people are needed in so many fields.

Mechanisms to identify suitable technologies will require development of skilled islanders, which in turn will depend on development of educational institutions. The University of Guam priorities currently are determined not by island needs but by the availability of U.S. matching funds. Students seeking skills from U.S. mainland universities frequently do not return to the islands. Further, mainland expatriates have greater freedom to operate as professionals within the political/cultural island systems,

Development of educational programs, particularly in science, is problematic. Much locally relevant, resource-related information may be traditional proprietary knowledge and, therefore, may be largely inaccessible to formal educational programs. There also is a distinct lack of continuity in school programs.

Primary and secondary school level programs and materials designed to show the links between development and its ecological consequences need substantial improvement for applicability to the Pacific Flag territories. The Government of Guam, in association with the U.S. Department of Education is developing a curriculum and textbook on environment and development, and the American Samoa Coastal Zone Management program is providing environmental education materials and training in field research techniques. However, these programs are seen as piecemeal efforts.

Immigration is causing stress on existing infrastructure, distorting labor markets and adversely affecting some resources in the Pacific Flag territories. Foreign nationals may displace local labor and their paychecks are often remitted to families at home. (For example, 70 percent of the labor in American Samoa tuna canneries are foreign nationals.) However, reducing the availability of foreign labor would result in economic dislocations.

Related to resources, foreign nationals may take resources beyond acceptable or legislated amounts (e.g. land crabs in the CNMI) and may use inappropriate methods of resource capture. Foreign fleets are a significant cause of harbor pollution, largely by crashing on reefs and discharging bilges in harbors.

Colleges in the U.S. Caribbean have resource-related programs, however, primary and secondary school level programs and materials (e. g., textbooks), designed to show the links between development and its ecological consequences need substantial improvement. Some materials are being developed by the Coastal Zone Commission on St. Thomas and at the CVI as well as at the Puerto Rico Department of Education. In addition, there is a distinct lack of vocational education curricula to provide basic agriculture and fisheries (and small business management) skills. Puerto Rico has ample 2-year vocational education programs, but the proposed Hess Oil program focusing on mechanics and agriculture has not materialized in the USVI.

Both island areas have difficulty attracting and retaining skilled personnel. In the USVI, the problem lies primarily in locating and attracting skilled staff for government agencies. Mid-level managers are scarce and local businesses do not train them. In addition, outside companies investing in the islands rarely hire local islanders. Local talent probably already is captured by the government because extra-government jobs generally are not higher paying.

In Puerto Rico, the problem is not in keeping people in the government specifically, but in keeping

people on-island. Skilled personnel commonly are attracted to higher-paying jobs in the mainland, although they frequently return. Despite UPR's poor salary system, its retirement system encourages long tenure. Managerial training opportunities—both on-island and off-island—are considered more than adequate for island resource managers. In the USVI, however, methods to upgrade skills are strongly needed to replace costly outside experts.

Suggested Options:

- A Human Resource Development study is needed to help island governments identify skills needed in the future; this information should be used to direct current educational and curricula development programs.
- Local governments should ensure continuity of local government personnel in order to promote environmental education, and continuity of educational programs despite changes in personnel.
- A program encouraging the elderly to teach young people in formal school systems to transfer resource-related information and skills should be instituted on each island.
- Village “monitoring” of resource status should be instituted to supplement college/university monitoring of resources in their research programs.
- Local governments could invest in scholarship funds to encourage college education in target areas.
- The University of Guam could provide increased substantive courses for secondary school teachers, mostly in the areas of math and science. To do this, they need to develop appropriate curriculum materials.
- Support and assistance should be provided to include planning curricula in university-level education in the islands.
- Provide increased training opportunities in the USVI and provide incentives to increase longevity of tenure in the government agencies (probably security incentives rather than financial incentives).
- Directories of local resource management expertise might be a first step to identify which skills are available, which can be shared, and which are needed.
- Coast Guard surveillance of navigable waterways should be returned to former levels or increased.

Extension, **Marketing**, and Incentives

Lack of marketing information is a serious problem in each of the FAS island areas. While systems

to deliver marketing information are available, the delivery of such information is inadequate.

Incentives systems and programs are a problem in the FAS. Payment incentives are seen as disincentives to manage and follow-through on projects. Participants felt that independent initiative was the best incentive to manage and follow-through on any project. Wage disparities are perceived as the major disincentive in investment in resource management and development. Favorable government salaries affect education choices, increasing selection of fields such as political science and law, and leaving fields such as agriculture and fisheries, lacking.

Lack of needed marketing information hinders planning and resource development in the Pacific Flag territories. Although some marketing studies are being performed, these are not as yet adequate to take advantage of expected appropriate markets. The local tourist market, in particular, needs to be assessed and developed to support local production. Cooperatives as a mechanism to guarantee required quality and quantity to fit into modern markets have not been very successful.

Marketing information is not perceived as a problem in American Samoa, but educated marketers are needed to work in the government and to monitor market trends. Needs exist to reduce competition in exported products among neighboring islands. And surplus goods must be marketed to fulfill plant capacity and achieve economies of scale. American Samoa hopes to develop as a major transshipment port with some on-island processing.

Few incentives exist in the islands for resource conservation. All governments have resource management incentive systems but these tend to be oriented to development. These also focus on management of government-owned, leased land much more heavily than for management of private lands.

Technology identification and transfer mechanisms are needed at all levels: international/bilateral/Federal to local organizations, and local organizations to practitioners.

While technical information is available in the U.S. Caribbean islands, marketing is a major problem to development. In the USVI, four Small Business Administration (SBA)-type organizations help practitioners with marketing, but this is not available to planners. In Puerto Rico, the current focus is on selling Puerto Rico to big business; these efforts probably have not been extended to small producers.

Although traditional fisheries and landholding systems are aggregations of small-scale activities, the small entrepreneur often is overlooked in favor of large, mainland subsidiaries. Scale is perceived as the major source of divergence between traditional systems and contemporary systems.

Several organizations provide information and assistance to the small entrepreneur. The Cooperative Extension Services is one source of information applicable to varying scales of enterprise. In addition, the SBA has programs designed to help entrepreneurs/innovators/inventors go to market with new products. Other, similar groups exist to help small businesses. However, little of the training is directed towards small agricultural and fisheries businesses.

Resource management incentive programs at a local government level are weak in both island areas. In Puerto Rico, priorities vary among departments and fluctuate widely over time. In the USVI, economic development is given almost consistent priority over resource management, which is reflected in low budgets for resource programs.

Suggested Options:

- The Regional Information Clearinghouse could provide marketing information collection and dissemination services.
- Old TTPI “2-pagers” on research projects relevant to potential island development projects, including marketing information, should be located, updated, and redistributed.
- Governments could swap developable lands (determined by land suitability analysis) for “resource-valued” land as a means of preserving certain resources or resource uses (e.g., protection of critical habitat or creating agricultural districts).
- Land Grant and Sea Grant organizations may provide some of these services, and should receive continued support.
- Under Internal Revenue Code 936, large banks in Puerto Rico are holding up to \$6.5 billion for investment in development of private firms in Puerto Rico. Although this has been used for renewable resource-related development in the past, it has been used conservatively. Creation of a “Caribbean Research Institute” could support renewable resource development as well as other technology development making use of these 936 funds.

Planning for Resource Management and Development

Resource development and land use planning in the FAS is extremely problematic largely due to land tenure systems and local perceptions of land as a family heritage rather than a commercial resource. Land tenure is fragmented, hindering development of economies of scale in most undertakings. The

implementation of land use guidelines or restrictions will be the task of local governments. However, U.S. government agencies could assist with information collection, landowner education, and transfer of information on suitable development projects.

Local governments have not had enough experience with the impacts of development to reliably forecast the likely impacts of future projects. Guidelines for analysis and training of people to perform analyses are required. Some suggested analyses are: (1) benefit/cost analysis or other appropriate decisionmaking aids; (2) tourism impact assessment or carrying capacity analyses.

Currently, resource management and development (and other) programs are not directly chosen by local islanders in the FAS. The U.S. Department of the Interior (USDOI), OTIA sends a list of programs “chosen” in Washington, DC and asks governments if they wish to sign up for any of them. Although some of these programs have been very good, this system is perceived as inappropriate:

1. Federal agencies rarely respond to further island communications about programs,
2. island governments may never hear again about programs in which they have interest, and
3. island governments are given no more choice by the USDOI than “yes” or “no.”³

Long-term planning of resource development is rarely accomplished in the Pacific Flag territories. Although the information base is strong, it is rarely used in long-term planning of land uses. Further, contemporary use and management principles sometimes are not compatible with existing island land and sea-tenure systems.

The Pacific Flag territories do not have the history of experience with the development impacts to adequately consider them in development studies and planning. Planners commonly focus on immediate economic concerns, sometimes to the detriment of the sustainability of resource uses. A major problem is presented by the nature of development and its impacts; economic development occurs in tangible indivisibilities while resource impacts tend to be gradual and diffuse, making it less easy to identify the causes.

Historically, resource management and development planning in the U.S. Caribbean has not adequately considered maintenance of natural resources that underlie economic development activities, but

³[Statement potentially made obsolete by the Compact of Free Association]

this has changed during the past decade. The regulatory power of the governments is capable of dealing with adverse impacts under leasing, zoning, permitting, and other systems. Still, monitoring capabilities need strengthening.

While fragmentation of jurisdiction over island resource management and development is irrelevant to Puerto Rico, where agencies are well-coordinated, it is a major problem in the USVI. This is particularly acute due to the division in jurisdiction between the Coastal Zone Commission (which regulates only the 200 foot contour) and the rest of the islands covered by the planning office and other agencies. Permitting and other activities need to be centralized.

Coastal Zone Management (CZM) and other Federal programs supporting local government activities require consideration of environmental, social, and political consequences of activities. However, private undertakings may not consider these or even respond to mandates that they consider the consequences of their proposed actions. Environmental Impact Statements (EISs) and economic development impact analyses are common and well-understood, but social impact analyses are not. Developers commonly are "outsiders" investing in the islands and so do not have a feeling for public hearing issues.

Despite considerable public scrutiny of both public and private developers in the islands, there is no format or standardized measures for social impact analysis available to either public or private groups. One participant suggested that the Oak Ridge National Laboratory has a methodology/model for conducting a social impact analysis. This methodology is reported to be simple, requiring some adaptation to the islands but otherwise readily applicable. Still, the model does not include cultural considerations. It was suggested that formal mechanisms had not been applied because they were not perceived as necessary to derive adequate analyses.

Carrying capacity is theoretically understood, but there is not enough experience or political clout to oppose private developers on this basis. Skilled people hired by the local government are commonly "captured" by the private sector. Further, political criteria overshadows the use of scientific information in decisionmaking.

Suggested Options:

- Planning offices need to review proposals from corporations interested in investing in island activities to ensure that local environmental, social, economic, and political considerations are incorporated in island development.

- Further assistance with planning through the HUD A-76 Comprehensive planning program would be beneficial to all planning efforts.
- Encourage students with planning expertise to take employment with government agencies. To promote this, government agencies could provide such perquisites as guaranteed jobs, homes, and program continuity.
- Environmental impact studies and monitoring should be regularly performed and systematically conducted to determine which development projects may be reducing future productivity in immediate or nearby ecosystems.
- Encourage all Federal and local studies to incorporate social impact analysis, as well as environmental impact analysis.
- CZM programs provide the basis for integration of resource management and development information, and their development should be encouraged. However, there is an occasional need to redirect funds going into local CZM programs to respond to local needs; a mechanism to do this should be determined.
- The Federal government should assist with ecosystem simulation models for the islands to allow greater certainty in review of environmental impact statements, and to provide planners with a simple mechanism to educate the public and decisionmakers,

Enforcement

Federal programs, designed for mainland ecologies and communities, sometimes are not appropriate for the islands and may not be adaptable to island needs. Local regulations in the U.S. Caribbean tend to be more flexible than Federal programs; policies are becoming stricter, but methods to waive them are available if it is clearly beneficial. However, waivers from Federal regulations are much more difficult to achieve.

A dilemma exists: stricter regulations are needed, but this tends to increase regulatory rigidity. A public resource constituency is needed to force issues to political attention to help determine when waivers are appropriate.

Although aid to the islands already is evaluated for its impacts to some extent, review panels of Federally-funded programs rarely include a local islander, perhaps reducing their adequacy in pointing out applicability to the islands.

The Pacific Flag territories lack a strong conservation ethic and enforcement of conservation laws is hindered by extended family structures. A con-

servation ethic was not really needed until recently, however, the development of a conservation ethic may be hindered by a long-running perception of “plenty.” In some cases, police will overlook infractions of environmental regulations and focus arrests or fines on criminal laws.

Regulation is perceived as useful only until education catches up. Thus, environmental education should be a high priority for local educational institutions.

Suggested Options:

- Local representation could be required for review of federally funded projects in the islands, perhaps by law. Local governments could also create project proposal evaluation teams with which Federal agencies must cooperate.
- Because environmental education priorities are designated by Federal agencies, a program should be developed to fund and assist local environmental education.
- Guam courts directed a public awareness program of the potential prison sentences and fines given to law-breakers. This might be useful in other islands.
- Having circuit court judges (judges not part of local extended family structures) impose sentences may reduce the perceived need to ignore laws in order to “maintain good feelings.”

Resource Development Focii

In all three Pacific Flag territories, “new” resources are the resource-related planning focus. Guam is looking into eucheuma and rabbitfish culture; CNMI is studying tanga-tanga charcoal; and American Samoa is researching traditional pest control methods such as coleus intercropping. Medicinal plants are an area overlooked in this thrust. Although “new” resources are important to future development, they are not as important as keeping up with major current developments such as tourism.

For example, tourism is perceived as creating a mixture of beneficial and adverse resource impacts. It can be beneficial insofar as it increases public awareness of resource values. On the other hand, foreign labor commonly is brought in to fill higher positions due to a lack of local skilled labor; local labor commonly fills lower-wage positions, reducing potential local economic gains. Unfortunately, tourism development in Guam and the CNMI occurred too rapidly for effective control. A better system would have been to have locals trained to support development, thus slowing the “brain drain.”

Tourism is not seen as a distorting force in the U.S. Caribbean islands, but certainly as the driving force behind many activities and issues. Tourism is seen as a primary method of deriving gross domestic product and employment, although jobs often are filled by mainlanders and there is a public drive in St. Thomas (USVI) to restrict tourism development such that land remains privately owned/used. In addition, tourism is perceived as a mechanism to spread stress on resources from more developed areas (e.g., St. Thomas) to less developed areas (e.g., St. Croix).

Because of the determination to derive income from tourism, participants suggested that the real need of the islands was not to increase their self-sufficiency in terms of increased local food production, but to reduce the high cost of food. Methods of achieving this are to:

1. increase local processing of imported raw materials (taking advantage of the historical use of the islands as Caribbean-mainland transshipment points), and
2. restore barriers to importation of lower-cost down-island products reduced by the Caribbean Basin Initiative,

Suggested Options:

- First, governments need to rank the possibilities for economic development in order to: 1) rank research priorities, 2) direct Economic Development Administration-type promotion strategies, and 3) direct planning focii.
- Second, a study (or studies) should be performed for each area to uncover already known information about local resources; requiring a major literature search (including the Micronesian Area Research Council and PBDC). Then, governments should fund cooperative scientific/resident surveys of local practices to determine which resources may have potential for commercial development (e.g., raw materials for industrial use) and which resource management practices may be transferable to larger-scale use.
- Third, regional herbaria or germplasm storage centers need to be created to save opportunities offered by local plants. (The Waimea Botanical Gardens have a collection of Pacific island plants, but this may not cover the entire range of local species available.)
- Fourth, for those resources which appear to have the potential for commercialization, there needs to be university/college faculty research and publications to tap into international knowledge (e.g., the South Pacific Commission

may collect such information). Perhaps a regional information center could perform the archival search and extend into an international literature search.

- Finally, governments need to give continuing attention to the most promising products so that the “boom-and-bust” syndrome does not occur.

Grassroots scrutiny of and participation in local government activities is growing, but remains rare in the Pacific Flag territories. Guam holds public hearings on zoning variances and on specific development projects, and provides a weekly “Land-Use” column for the local newspaper. Private organizations such as the Marianas Parks and Recreation Council, Guam Science Teachers Council and a local chapter of Audubon may respond to proposed government activities, but these groups have little continuity. In the CNMI, the public land planner presents projects to the public but there is commonly little response. American Samoa has not developed much in the way of public participation. Hearings are held in Pago Pago and they are often felt unnecessary. No environmental groups have chapters in American Samoa.

Suggested Option:

- The media probably is the best form of introducing the public to the planning process, to methods of public participation and to the potential impacts of proposed projects.

Summary of Meeting With Representatives of Paku⁴

Palau’s development plans are directed toward: 1) development of a tourism industry, and 2) increasing export of island products. However, tourism impact or carrying capacity studies have not yet been performed. Although it is estimated that current fishery production can provide for approximately 16,000 tourists annually, current agricultural production is insufficient to support the additional demand.

A major constraint to development is the lack of essential air/surface transportation to the islands. Infrequent air carrier schedules inhibit tourism travel and the current airline service structure results in higher fares for the consumer. Lack of regular air cargo services inhibit the island’s ability to become an effective exporter. Certain clauses of the

Jones Act exacerbate this problem. For example, the aircraft noise restraint is applied equally to the island as to major airports in the continental United States, resulting in infrequent air schedules to the island. “Noise reducers” can curb engine noise to comply with the regulation, however, aircraft power also is reduced which prevents certain types of aircraft from using the short island runways. Currently, aircraft noise is not considered a problem in Palau compared to the economic benefits expanded air service would provide.

Foreign carriers that do service Palau are not permitted to carry local traffic between Palau and other U.S. ports (e.g., Guam, Hawaii). Clauses related to shipping contained in the Jones Act defines Micronesia as a “foreign” territory, thus, hindering the islands’ export potential.

Suggested Option:

- Congress could grant an exemption or waiver of certain clauses (i.e., aircraft noise restraint, definition of Micronesia as “foreign”) of the Jones Act for the islands.

Interest exists in encouraging foreign investments in agriculture. Currently, Palau imports approximately 75 percent of their agricultural products. An increase in the island’s capacity for food production in conjunction with providing essential transportation would sustain tourism. The Palauans have made investigations into possible markets in Japan for island products. Discussions are planned between the President of Palau and the President of Japan regarding potential Palauan exports to Japan.

Suggested Option:

- Congress could influence Japan to be receptive to island exports.

No foreign vessels are permitted to fish in territorial waters without a permit, however, Palau lacks the capacity to enforce this law over their 12-mile zone. Coast Guard vessels could provide the needed protection although it was recognized that enforcement of harvest limits would be difficult. Some local enforcement exists on a limited basis in some marine areas, although several marine species are virtually unprotected (i.e., lobster, red snapper, mangrove crab). Poaching remains a serious problem from both the local population and foreign poachers. Restocking species in reef areas is futile unless these areas can be adequately protected and poaching laws can be enforced. The Japanese International Cooperative Agency has funded research and protection of the hawksbill turtle.

Conservation regulations are a recognized need not only for nearshore resources but also for species considered “highly migratory.” It was noticed

⁴Due to logistical problems, representatives of Palau were not able to attend the workshop sessions on September 26 and 27, as planned. OTA staff subsequently met with them on September 28.

that nearshore tuna population declined when the Japanese began fishing Palauan waters. A local tuna canning plant owned by Van Camp went out of business due to the decline of available tuna. However, approximately two years after the cessation of the Japanese harvest, the tuna reappeared in nearshore waters indicating that regulation of pelagic harvest could help assure a sustainable yield.

The local government needs the flexibility to allocate funds for conservation programs which agencies have the resources to enact. Strong and numerous family ties between local offenders, enforcement forces and the judiciary make enforcement of conservation regulations difficult.

Suggested Option:

- Circuit rider judges could conduct trials and impose fines and sentences for convictions in cases where there are family ties between the judiciary and the defendant.

Methods to integrate the resource development analyses provided to Palau by various multi-lateral and U.S. governmental agencies are needed. Resource analyses are necessary to allow local planners to make wise decisions on local development projects and maintain a sustainable resource base. A number of resource assessments have been made by various U.S. agencies and regional organizations. However, many of these analyses were not designed for the needs of the local resource management agencies and some of the information collected has not become available to the local government.

Suggested Option:

- Integration of this type of information and provision of baseline data on other resources would allow local planners to identify techniques to minimize environmental damage from development projects.

Analyses of marine resources are particularly deficient, although the SPC supports good fishery projects. Necessary baseline information on marine resources (e.g., red snapper, grouper) could be gathered by a U.S. ocean research vessel and assistance for a mariculture assessment has been requested. The International Union for the Conservation of Nature and Natural Resources could provide assistance in developing management plans for protected areas.

No mining legislation exists for Micronesia islands and waters. Legislation is needed on Palau to control seabed mining, extraction of manganese and gold, and their associated impacts on ecosystems.

Suggested Options:

- Make technical assistance grants available to the islands to integrate available information in resource management plans. Five years was the suggested length of the grant which would allow time for development of the on-island expertise.
- Lack of recognition for local science experts results in a disincentive for local people to become educated in science fields. Outside studies should incorporate the expertise of local scientists and give credit for their contributions.