

THE TROPICAL NATURAL RESOURCES TECHNOLOGY CONSORTIUM: WORKING TOGETHER FOR TROPICAL CONSERVATION

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Abstract

The Tropical Natural Resources Technology Consortium (TTC) is a collaborative effort of the United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and the Land Grant Universities located in the tropical regions of the United States: the University of Florida, the University of Guam, the University of Hawaii at Manoa, and the University of Puerto Rico at Mayaguez. The TTC facilitates information exchange and technology transfer between the widely separated tropical regions of the United States and affiliated nations and between the US-affiliated tropics and the rest of the world. It is also working to provide informational materials and training for conservation professionals working in the tropics. The Consortium promotes and coordinates cooperative knowledge and technology assessment, adaptation, development and dissemination activities between NRCS technical and field staff and university research and extension staff. This paper will provide an overview of the structure, objectives and activities of the Tropical Technology Consortium including specific examples of conservation technology information and knowledge exchange.

Additional Keywords: networks, soil erosion, water quality, cooperation, conservation, tropics

Introduction

Tropical agroecosystems represent important contributions of food, and fiber products to the American economy. These production systems are diverse and often easily degraded if not properly managed. If properly managed, they represent unique production opportunities. The islands of the Caribbean and Pacific Basins, the State of Hawaii and portions of the Southern United States typify these agroecosystems.

Given the vulnerability of many tropical ecosystems, sustainable agricultural production can only be achieved through effective conservation practices, appropriate technologies and adaptive, knowledge-based resource management. Geographical, socioeconomic and ecological distances within the tropics and between the tropical and temperate regions complicate the situation. Practices and technologies for resource conservation developed in the temperate region are frequently not adapted to the tropics, such as the soil and crop parameters used in the Revised Universal Soil Loss Equation (RUSLE). In addition, the existing technical infrastructure of the Natural Resource Conservation Service (NRCS) consists of Centers that are located in the conterminous United States. Tropical conditions and technology needs have been peripheral to their mandates and have seldom been addressed. In order to address these issues, NRCS and land grant universities in Florida, Guam, Hawaii and Puerto Rico agreed to form the Tropical Natural Resources Technology Consortium (TTC) in 2000. The TTC has been fully operational since August, 2002. This paper will discuss the Consortium development process, highlight activities and accomplishments and discuss future opportunities and challenges.

Development of the Consortium

The past few years have seen an increasing awareness, both within and outside of NRCS, of the unique and important conservation and agricultural development needs in US affiliated tropical areas in both the Pacific and Caribbean Basins. The US affiliated tropics include the state of Hawaii, the southern part of the state of Florida, the Commonwealth of Puerto Rico, the US Virgin Islands, the Territory of Guam, the Commonwealth of the Northern Marianas Islands, the Territory of American Samoa, and the affiliated nations of The Federated States of Micronesia, The Republic of Palau, and The Republic of the Marshall Islands.

There is a national recognition that NRCS is a leader in natural resource conservation throughout the world and that conservation technologies developed or validated in the United States can and will have application globally. An important component of NRCS' leadership is to support the development and dissemination of appropriate tools and technologies to address tropical conservation issues. The existing NRCS technical Centers located within the conterminous United States primarily support agricultural production systems and technology development for

commercial temperate climate agroecosystems. Their emphases, operational perspectives and funding generally are focused on the soils, agroecosystems, and concerns of their respective disciplines and localities. NRCS national technical programs have provided some support to tropical regions including project evaluations (e.g. Johnson and Clearfield 1997), the National Soil Information System (NASIS - <http://nasis.nrcs.usda.gov/>) and the PLANTS online database (<http://plants.usda.gov/>). However, much of the technical information and tools has been developed for the temperate zones, hence the needs for a technical group to address tropical issues. In addition, there is an increasing internal recognition of the dependence of the agency on conservation technologies developed by other agencies, groups and organizations including land grant institutions (NRCS 2003). This is particularly true in the tropics.

Conservation challenges in the tropics

Tropical natural and renewable resources, soils, and ecosystem management concerns are vastly different from those of temperate areas. The peoples, distinct attributes, quality determinants, fragility, protection, conservation, restoration, and management requirements of tropical ecosystems are geographically, ecologically and socio-economically distant from nearly all of the conterminous United States. To properly address tropical issues requires a concerted and well-coordinated effort with dedicated and specifically focused institutional and financial resources. The effectiveness of natural resource conservation planners and practitioners in the US affiliated tropics and their success in meeting people's needs will be best supported through the dedication of resources specific to their unique needs and situations. Some of the reasons why tropical conditions often require different resource management and conservation approaches are listed below:

Prevailing conditions conditions that affect resource management in tropical island settings:

- Some of the highest rainfall erosion potentials in the world
- Agricultural operations typically occur on steeper slopes
- Year round high temperatures with little variation between day and night. These affect decomposition rates, biomass accumulation, nutrient mineralization and leaching, and pesticide degradation rates
- Dominance of oxidic and amorphous constituents in many soils which cause higher cation leaching rates, high fixation of phosphates and organic matter, and altered nitrate leaching and runoff rates
- Smaller watersheds result in shorter distance “flashy” stream systems
- Moderate to strong trade winds induce wind erosion (especially in Hawaii)
- Highest number of endangered species
- Highest diversity of minority ethnic groups
- Small farm holdings and socioeconomic constraints as a result of farm size
- Limited overall land area
- Comparatively large areas of land requiring restoration
- Unique resource characteristics make methods of resource assessment, such as NRI, more challenging.
- High pressure on soil resource for non agricultural uses

Conservation needs

Although there are major differences between tropical and temperate conditions, natural resource conservation efforts in the US affiliated tropics, can benefit greatly from experiences gained elsewhere. For example, the development of quantitative process-based hydrologic and soil erosion prediction models, their use for conservation planning, understanding and quantifying soil quality determinants and indicators, and the adoption of plant residue recycling and conservation tillage systems in these areas lag behind those in the rest of the country.

In addition to being an important part of the nation in need of conservation assistance, these areas are our nation's "window to the tropics." They encompass a substantial diversity of peoples, climates, geology, soils, biota, landscapes, and ecological settings. There is an increasing need for networking and information exchange between Florida, Hawaii, the US affiliated Pacific Basin territories and nations, and the Caribbean Basin area to address the needs of an impressive array of tropical settings, including those prevailing in many developing countries with similar climatic and edaphic conditions

Why a consortium?

There were a number of options available to address tropical conservation issue within and outside of NRCS. However, past experience of the initial consortium partners led to the idea of developing some sort of network or

consortium. Although the US-affiliated tropical regions span nearly half the globe, there has been a long history of communication and cooperative work. Informal ties and connections have existed for a number of years within NRCS including cooperative projects such as the development of resource publications (e.g. Mas and Brantly 2001). University-based scientists from Florida, Hawaii and Puerto Rico also have worked together on numerous projects, particularly related to soil management. The largest of these was International Benchmark Sites for Agro-Technology Transfer (IBSNAT) project that lasted through much of the 1980's with funding from the United States Agency for International Development (USAID). Other multi-university efforts organized under the auspices of the USDA Cooperative State Research Education and Extension Service (CSREES) included the Caribbean and Pacific Basin Administrative Groups, the Tropical and Subtropical Agriculture Research Program (T-STAR), and the Agricultural Development in the American Pacific (ADAP) project. One of the first direct calls for the formation of a network was made by Dr. Freidrich Beinroth at a 1994 workshop on Agroecosystems Sustainability in the Caribbean and Pacific Islands held in Orlando, Florida: "recommended that: a functional network be established that links institutions within and between the regions..." (Beinroth 1994, p.55). Similar calls for the development of mutually beneficial partnerships are also included in the NRCS Strategic Plan (NRCS 2003). Ongoing discussions of these issues both within and outside of NRCS led to the conclusion that a consortium of excellence formed by NRCS and universities working in the American Tropics is the most appropriate way to structure this partnership network. The NRCS brings extensive field and technical expertise in the design and implementation of conservation practices while all four university partners bring scientific and technical expertise in tropical agronomy, soils, water and land management sciences. In addition, university partners provide the TTC with a directly link to the Cooperative Extension Service and its well establish network of field staff and long experience at information dissemination. The Tropical Natural Resources Technology Consortium (TTC) was officially formed in June, 2000 with the signing of a Memorandum of Understanding (MOU) by NRCS offices in the Caribbean Area, Florida, Hawaii and the Pacific Basin along with the University of Florida, the University of Guam, the University of Hawaii at Manoa and the University of Puerto Rico – Mayaguez Campus.

Mission and vision

The first official meeting of the full Tropical Natural Resources Technology Consortium was held in December, 2002. At this meeting, representatives from all the partners agreed on vision and mission statements and two guiding principles to direct future activities. The group also identified four primary objectives of the Consortium.

Vision

Sustainable tropical land use based on sound science.

Mission

To help people in tropical regions to enhance and maintain the quality of their natural resources.

Guiding principles

- Disseminate scientific information that fosters the practice and policy of managing tropical land resources in a sustainable manner.
- Collaborate with national and international partners.

Objectives

In order to fulfil the vision of the Consortium, the initial planning group also identified four broad objectives for the TTC. These objectives were designed to align with and complement existing national NRCS national goals and objectives as well as the long-standing Land Grant university mission.

- Provide user-needed, user-friendly, science-based, locally-appropriate conservation-related information and technologies to NRCS and other agency field personnel working in the US affiliated tropics in order that they can better assist landusers in developing and implementing sustainable management systems
- Collect, analyze and transfer knowledge and information related to tropical natural resource management and conservation between university faculty, agency staff and other resource management professionals both within and outside the United States.
- Train resource professionals to anticipate and identify non-sustainable natural resource management and food production systems and to provide land managers with the information and tools they need to make positive changes in those systems.

- Strengthen institutions and human resources within and outside of the Consortium to address the challenges of sustainable agriculture and resource conservation in the US affiliated tropics and throughout the tropical regions of the world.

Scope and linkages

The efficiency and the very existence of the TTC depends on the clientele. The TTC will not only provide services to the clientele, but, equally importantly, the Consortium will continually solicit information and feedback from the clientele. This feedback will ensure that the TTC remains connected to the clientele and responsive to client needs. The primary clientele of the Consortium will be the NRCS Field Staff working in tropical areas and the state and area resource specialists. The consortium also has an explicit mandate to cooperate with and serve other organizations and institutes both within and outside of the NRCS. The consortium will be responsive to the information and technology needs of policy makers both within and outside the agency. Figure 1 shows some of the linkages and feedback loops necessary for TTC success.

Structure

The structure was designed to maximize its responsiveness to clientele needs. The full-time staff of three Tropical Technology Specialists are located in Guam, Hawaii and Puerto Rico respectively. Two of the three individuals have office space directly on their associated university campus and all three have appropriate faculty status. The USDA-NRCS provides salary support while the university partners provide office space and secretarial assistance (Hawaii, Puerto Rico). Tropical Technology Specialists are under the supervision of senior local NRCS staff and work both on technology development issues of local interest and on issues of broader, Consortium-wide impact. Consortium priorities and general direction are determined by periodic meetings of a small administrative group consisting of senior NRCS staff at both the state/area and national levels and senior university staff. A larger group of both NRCS and university-based technical professionals provides additional input toward TTC activities. Although the Consortium has focused thus far on strengthening linkages within NRCS and between NRCS and university partners (Figure 1), members are committed to expanding the scope of linkages and cooperation internationally as opportunities present themselves.

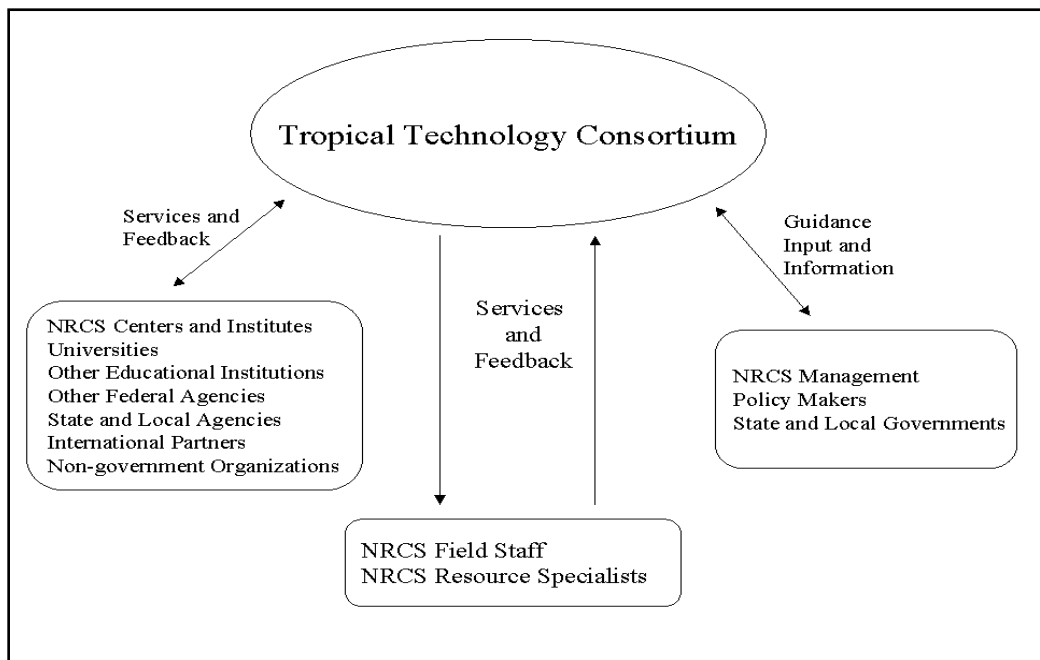


Figure 1. Tropical Technology Consortium Linkages

Activities and accomplishments

Although the TTC has only recently become fully operational with the hiring of the third Tropical Technology Specialist based in Guam, the Consortium has a number of completed and ongoing activities. These are summarized in Table 1. As shown in the table, TTC activities and accomplishments can be roughly divided into technical resource development and evaluation, and training and outreach although most TTC affiliated projects involve both components.

Table 1. Tropical Natural Resources Technology Consortium Activities

Technical resource development and evaluation		
Project	Lead partner(s)	Status
Develop Phosphorus Runoff Risk Evaluator (software tool)	NRCS-Hawaii, University of Hawaii - Manoa	Completed (including training)
Develop compact disk on fire prevention and conservation practices before and after fire	NRCS-Puerto Rico	Completed (including training)
Develop interim NRCS Standard for Multistorey Cropping	NRCS-Guam	Completed
Develop interim NRCS Standard for Crop Byproduct Transfer	NRCS-Puerto Rico	Completed
Develop interim NRCS Standard for Reduced Water and Energy Conveyance System	NRCS-Puerto Rico	Completed
Develop interim NRCS Standard for Water Facility, Solar Distiller	NRCS-Guam	Completed
Evaluate of Windows Pesticide Screening Tool (WIN-PST) for use in the tropics	NRCS-Hawaii	Completed
Develop conservation practice guidelines for wetland taro cultivation and endangered bird habitat protection and restoration.	NRCS-Hawaii, Oregon State University	Completed
Develop interactive key to identify native plants for riparian restoration	NRCS-Hawaii, Bishop Museum	Completed (training ongoing)
Develop nutrient removal by tropical crops and forages database	NRCS-Puerto Rico	Ongoing
Evaluate the Media Luna coffee planting method for erosion control and water pollution prevention	NRCS-Puerto Rico, University of Puerto Rico - Mayaguez	Ongoing
Evaluate efficacy of star grass for filter strips as a Dairy BPM	NRCS-Puerto Rico, University of Puerto Rico	Ongoing
Install conservation practice demonstration plots in Fouha critical watershed (Guam)	NRCS-Guam, University of Guam	Ongoing
Install riparian buffer effectiveness trials including fencing and native species plantings	NRCS-Hawaii, University of Hawaii	Ongoing
Develop nitrogen fate assessment system for tropical soils beginning with Hawaii	NRCS-Hawaii, University of Hawaii	Ongoing
<i>Training and Outreach</i>		
Develop TTC web page (http://www.ttc.nrcs.usda.gov)	NRCS-Puerto Rico	Completed
Articles in regional newspapers on conservation issues	NRCS-Guam	Completed
Articles in regional newspapers on conservation issues	NRCS-Puerto Rico	Completed
TTC Poster exhibition at University of Puerto-Rico – Mayaguez library	NRCS-Puerto Rico, University of Puerto Rico - Mayaguez	Completed
Teach conservation-related university classes (1 semester per year)	Trop Tech Specialists in Hawaii and Puerto Rico	Ongoing
Review Common Grasses of Puerto Rico (2 nd edition)	NRCS/CES	Ongoing
Pests in Turf and Grasses in the Caribbean Area	NRCS/CES	Ongoing

Future Strengths, Weaknesses, Opportunities and Threats

SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis is a common tool used in organizational planning to discuss the current status and likely future status of a group or organization. This paper concludes with a simple SWOT analysis of the future of Tropical Natural Resources Technology Consortium.

Strengths

The TTC has several major strengths that bode well for the future of the consortium. It has been institutionalized within NRCS in the form of three fully-funded positions staffed by scientists with tropical natural resource management backgrounds and a wide range of skills and experience. In addition, it has developed a strong cadre of interested and involved local, regional and national level staff within the NRCS and a growing set of interested university faculty. The TTC has also finalized written agreements that establish the cooperative nature of the Tropical Technology Specialist positions at the University of Hawaii at Manoa and the University of Puerto Rico at Mayaguez. A similar agreement is in process with the University of Guam. The TTC has completed some successful projects using staff time, state/area level funds and a small amount of national funding. In the process it

has gained visibility and received positive publicity within and outside the agency. The Consortium has also begun discussion of collaborative work with other local and national conservation related initiatives.

Weaknesses

Although the TTC has made significant progress in a short time, it is a new effort and still very small. As such there are a number of weaknesses that need to be addressed in the future of the Consortium. Although funding is provided to appropriate organizational units to cover staff costs, the TTC must institutionalize sources of funding. This includes developing a funding strategy with partner agencies and universities to establish stable funding for needed research, and demonstration projects. The geographic spread of the TTC is another potential weakness. Because the Consortium meets on, at most, a quarterly basis via teleconference and annually in person, it is difficult to coordinate activities and to support coordinated activities. It is possible that one or more geographic groups may choose to leave the Consortium at some point to concentrate on local issues.

Opportunities

The TTC is very well positioned to take advantage of many opportunities to expand and strengthen its role. With the establishment of a core group of partners, the Consortium is well situated to begin discussions with other potential partners both within and outside the United States. Moving beyond the United States provides a tremendous opportunity for co-learning and knowledge exchange as the bulk of the institutions, organizations and individuals working on tropical conservation are not based in the United States. There are also many additional opportunities for domestic collaboration. Work with the Land Based Pollution section of the National Coral Reef Initiative was already mentioned. Other inter-agency cooperation and collaboration holds similar promise including work with the United States Fish and Wildlife Service on wildlife habitat issues and with the United States Forest Service on resource management issues associated with managed forests and agroforests.

Threats

Even though the future holds much promise for the TTC, there are still threats to its existence and success. In spite of written agreements, arrangements with many partners are still largely dependent on personal relationships between NRCS staff and individual faculty members, some of whom are close to retirement. The TTC has yet to garner high-level institutional support at all partner institutions such as Memoranda of Understanding and other formal agreements. Budget issues at those institutions may threaten continued involvement in the TTC.

Conclusion

The Tropical Natural Resources Technology Consortium represents a new way of doing technical business at NRCS and a bold attempt at cross regional coordination and cooperation for natural resource management in the tropics. It is always risky to predict the future, especially that of an effort that has barely started; but, all indications are that the TTC will provide a valuable mechanism for the development and exchange of important and useful conservation information on into the future.

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