UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
Honolulu, Hawaii

A PLANT MATERIALS MULTIYEAR PLAN

FOR HAWAII

May 2002

A PLANT MATERIALS MULTIYEAR PLAN FOR HAWAII

Introduction

This Multiyear Plan is designed to effectively serve Soil and Water Conservation District Cooperators in Hawaii. The plan is based on the needs as developed by the directors of the Soil and Water Conservation Districts and evaluated with Natural Resources Conservation Service (NRCS) personnel.

All plant materials work is with the full cooperation of the Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii, and with other state and federal agencies.

Description of the Area

The Hawaiian Islands owe their shape primarily to volcanic building. The islands have been modified by erosion under strongly localized climatic conditions. The islands range from sea level to over 13,000 ft.

Soils are derived from volcanic lava, eruptive deposits of ash, tuff and cinders, limestone, and alluvial deposits from coral reefs. Age and a variety of parent material plus an extreme range in rainfall have resulted in a complexity of soils.

Rainfall ranges from less than 10 inches to over 390 inches annually. The heaviest rains generally fall on the windward side of the mountains. Driest areas are semi-desert in character and vegetation is generally sparse. The difference in temperature between the coolest and warmest months of the year at a given location is usually not more than 6.5 degrees. Trade winds are fairly constant during the year with 15 to 25 mph winds common. Hawaii is located in the high tropics. The major islands are located between latitudes of approximately 19 degrees and 22 degrees north of the equator.

Land use is diverse and includes many acres devoted to grazing, sugarcane macadamia nuts, pineapple and diversified crops. Some of the crops produced on smaller farms include bananas, taro, beans, cucumber, watermelon, green pepper, tomato, bittermelon, sweet potato, papaya, pineapple, onion, cabbage, radish, pumpkin, guava, sweet corn, avocado, citrus, coffee, and ornamentals. The reduction in sugarcane acreage has increased the need for additional and different erosion control on former cane land, which will be converted to other uses. Much of this land has been divided into smaller units. More cost effective erosion control practices are needed for small farms.

Plant Materials Program

The Natural Resources Conservation Service provides specialized assistance in plant materials as part of its coordinated natural resources conservation program. A part of the plant materials activities of the Service is carried out at the Plant Materials Center (PMC), Hoolehua, Molokai, Hawaii. The Hawaii Plant Materials Center was established to provide a facility to effectively and systematically conduct needed observations and evaluations of plant materials to meet the needs of the conservation programs for Hawaii and the Pacific Basin. Plant materials work is done in cooperation with the Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii and the University of Guam, according to Memoranda of Understanding (MOU). Evaluation and increase sites have been established on Guam and American Samoa in cooperation with the University of Guam and the American Samoa Community College, Land Grant Program.

Major objectives of the Hawaii Plant Materials Program:

1. **To rigorously test native, naturalized, and commercially available plants to meet existing conservation needs in natural resource conservation programs.**
2. **To produce and provide seed or plants of native, naturalized and other proven species, cultivars or strains so these accessions may be made available for Seed Increase Plantings to solve resource problems.**
3. **To develop techniques for propagation, establishment, management, and use of native, naturalized and otherwise proven plant accessions.**
4. **To produce seeds and plants of promising plant selections for Field Plantings on lands of Soil and Water Conservation District cooperators and cooperating agencies.**
5. **To provide information gathered on plants and cultural techniques to NRCS Field Offices and others through plant guides, technical guides, and other means of technology transfer.**

Plan of Action

Native and naturalized plants will be selected to solve the high priority plant materials problems and needs, wherever possible. The use of plants not commonly found in Hawaii will be limited to those that are nonaggressive, sterile or non-seed producers. Examples of relatively new plants that fall under this category are Louisiana

Sunshine vetivergrass cv. Fort Polk for vegetative row barriers and hybrid napiergrass for live fascines (wattling). Commercially available plants will be tested at the PMC and in Field Plantings. This should accelerate our search for better plants particularly for uses such as green manure, living mulch, and cover for construction sites. An example is buffalograss, a native of our plains states. We will strive to make commercially available plants and seeds easier to obtain and to get more plants into commercial production. Technology transfer to the field offices will be given a high priority. Native plants will be preferred for conservation practices.

Priority Plant Materials Problems and Needs in Hawaii

I. Erosion Control on Agricultural and Non Agricultural Lands.

A. Drought tolerant plants for erosion control and grazing.

Problem - Hawaii has approximately 85,000 acres with low rainfall mostly on grazing land. Rainfall is 10 to 20 inches annually. Most of the area is less than 1,000 feet in elevation. During dry seasons, burns may occur over large areas. These areas may require re-seeding. Few plants are suitable for erosion control on critical areas and for range or pasture improvement in low rainfall areas.

Need - Perennial or reseeding annual grasses, legumes and shrubs that are easy to establish, fire resistant or tolerant, have rapid initial growth, and will withstand heavy grazing.

B. Low maintenance, shade tolerant cover crops for fruit and nut orchards and tree plantations for forest products.

Problem - A large percentage of the tree crops in Hawaii are on sloping land. Suitable permanent cover crops are needed to prevent soil loss. Rank growing, weedy species naturally establish themselves in many areas and their control is expensive.

Need - Plants that are easy to establish, make rapid initial growth, are easy to manage, require low maintenance, are shade tolerant, and do not interfere with harvesting operations. There is a need for cover crops that can survive in areas with annual rainfall as low as 30 inches. Plants suited to controlled grazing in orchards and wood lots are needed.

C. Relatively simple, inexpensive erosion control practices for small farms on steep lands.

1. Living mulch for cultivated crops.

Problem - Maintaining soil fertility and controlling soil erosion is difficult when producing crops on tropical soils using conventional clean culture. Much of the land is sloping and erosion check structures are costly to build and maintain. In addition, weed control can be costly and using herbicides increases the possibility of contaminating ground and surface waters. Field access and soil compaction are also problems when growing crops under clean culture.

Need - Plants for use as living mulch and techniques such as stunting the cover with low rates of herbicides and mowing to produce vegetables and other crops under living mulch culture. A system needs to be developed whereby the living mulch will not reduce crop yields but will compete with weeds and reduce soil loss by an amount that can be quantified and predicted.

2. Vegetative row barriers (contour or cross-slope hedgerows).

Problem-Constructed terraces and other similar methods to control erosion are often costly, require large machinery to construct, make farming operations difficult and must be maintained or they lose effectiveness over time. They may also take substantial amount of land out of crop production, a drawback that makes them undesirable, especially to small farmers. In addition, some of the farmland is too steep to construct terraces.

Need - Plants that will tolerate close within-row spacing and form a tight hedge that will trap silt and form a natural terrace over time. Leguminous shrubs may appeal to farmers because they can be used for mulch and green manure or high protein cattle feed when trimmed or hedged. However, stiff-stemmed grasses are generally considered to be better filters. Trials are needed to demonstrate this practice and determine its erosion control effectiveness.

D. Plants for bioengineered solutions to stream and slope problems.

Problem - Rapid establishment of permanent vegetative cover on critical areas such as streambanks, roadsides, and steep hillsides is often difficult because of erosion, infertile soil, and unfavorable water relations. Streambank protection is becoming increasingly

Important and plants that are easily propagated and established are needed.

Need - Plants that establish and maintain themselves under adverse conditions of low fertility, fluctuating soil moisture, and minimum maintenance. They should establish rapidly and have good root structure and strength. More testing is needed in these areas. Live fascine or wattling is a soil bioengineering technique where stems or branch parts of living plants are used as initial soil reinforcing and stabilizing material. When the cuttings root and sprout, the resulting vegetation provides long-term surface erosion control and soil reinforcement. Placement and propagation methods to ensure rapid establishment need further study. Appropriate plants are needed that can be adapted to this technique.

II. Developing Sustainable Agriculture Systems.

A. Soil improving crops.

Problem- Continuous cultivation destroys soil structure and reduces water infiltration and aeration. Diseases and insects tend to increase under continuous cultivation. Arable land is scarce in Hawaii for small farmers so they must keep their land in production. The rising cost of fertilizer also increases the need for nitrogen fixing cover crops. All farmers wishing to decrease chemical fertilizer and pesticide input are in need of green manure crops.

Need - Soil improving crops that will add organic matter and nitrogen and reduce soil insect and disease pests. The plants should be rapidly growing to compete with weeds and should be non-toxic. Green manure cropping needs to be promoted and farmers need information and demonstrations showing the benefits of using green manure crops.

B. Plants for agroforestry.

Problem - Farmers interested in practicing sustainable agriculture and those interested in using natural, organic forms of fertilizer are in need of plants for agroforestry. Agroforestry systems provide a sustainable form of agriculture through the simultaneous culture of crops and/or animals in combination with trees and/or shrubs. For example, a type of agroforestry consists of planting hedges of

nitrogen fixing trees spaced 20 to 30 feet apart and growing crops in the alleys between the hedges. The hedges are trimmed to mulch the crop plants, providing nutrients and conserving soil and soil moisture. Windbreak, fodder, fuel, shade/nurse crops, natural chemical products, and wood and food products are other uses for trees and shrubs in the agroforestry system.

Need - Trees and shrubs that are easily established, grow rapidly, re-grow well after cutting and are high in nitrogen and provide a useful product. Trials are needed to demonstrate the various agroforestry technologies and determine their economic feasibility.

C. Plants for weed control on grazing lands.

Problem - Unpalatable plant species such as brush and fountaingrass have invaded grazing lands, lowering their productivity. In addition, these undesirable plants consume precious moisture and are generally not as well suited for controlling erosion as other more desirable species. Water quality may be enhanced if plants can be found to replace chemical controls.

Need - Plants and/or techniques to control the undesirable species in pasture and range lands. Plants that are palatable yet are able to compete and grow well with weedy species. Legumes growing within less palatable species may cause animals to eat more of the less palatable plants. Their shading effect may slow the growth of the undesirable plants, making them less competitive with desirable plants.

III. Windbreaks for Water Conservation, Irrigation Efficiency, and Crop Protection.

Problem - Many areas of cropland are subject to frequent strong winds. Velocities of 10 to 25 miles per hour or more may be expected much of the time. Permanent and semi-permanent windbreaks are needed on much of this land. Fire may destroy certain tree species that do not have the capacity of renewal.

Need - Rapid-growing annual or perennial plants for windbreaks. These plants could be used as primary windbreaks and for crops requiring additional windbreaks in fields already planted to windbreak trees. They should have the capability of renewal after fire. They should produce a minimum of root competition, be relatively pest-free, esthetically pleasing, and have

a low maintenance requirement. Additionally, there is a need for windbreaks for farmsteads and feedlots and plants to serve as screens on highway medians and other areas.

IV. Plants to Improve and Protect Water Quality Primarily in Riparian Areas.

Problem - The quality of surface and ground waters must be protected from soluble and sediment-attached substances. Pesticides and fertilizers are used on much of the cropland. The disposal and/or use of effluent from animal waste lagoons and other waste treatment facilities is increasing in importance.

Need - Plants that will act as biological filters of potential pollutants. Plants that are able to utilize the excess nutrients contained in effluent. Riparian vegetation is needed that establishes quickly, has a strong root system, and tolerates fluctuating moisture conditions.

V. Source of Seed and Vegetative Materials for Plants Recommended In the Technical Guide.

Problem - Although there is need for new and better plants, there are good plants available for many areas. The maximum use of plants presently recommended is limited by the lack or unreliability of commercial seed sources. The problem is compounded by import regulations, the quarantine on millet seeds, and the quarantine on vegetative material of grasses.

Need - Readily available sources of seed and vegetative material. These materials would be of proven plants for approved conservation practices. Increase and demonstration plots are needed in areas where agriculture is changing. Native plants require special consideration to maintain their genetic integrity. It may be necessary to identify sources of natives on each island for propagating and planting on that island. Some native species that are already well-distributed throughout the island chain could be mass-produced by the PMC, in cooperation with state and federal agencies, for distribution to the public until supplies become commercially available.