

# SOUTHWEST<sup>1</sup>

## Region Description

For the purpose of this assessment, the Southwest region includes southern and central California, Arizona and New Mexico (see Figure 1). The region's climate is generally semi-arid, with variable rainfall and temperature regimes. Arizona and New Mexico receive some rainfall year-round while California receives rain only in winter. The better soils are devoted to agriculture, although soil-related problems such as salinity and water-logging limit their capacity for tree growth.

Highly productive irrigated farmland is found in California and Arizona, and the mountains of all three states support extensive native forestland. All three have large federal ownerships of timberland, and tribal lands are important in Arizona and New Mexico.

## Sustainability Options

### *Environmental*

**Soil erosion:** Water erosion has resulted from poor grazing, logging and development practices. Some areas are subject to wind erosion.

**Water quality and availability:** Fertilizer and pesticide application in farming areas has contaminated ground and surface waters. In several areas

of irrigated farmland, inappropriate water management has led to salinization and water-logging of the soil. The availability of surface and ground water has been altered by pumping for irrigation, damming, stream channelization and invasive phreatophytic weeds.

**Air quality:** Dust generated from abandoned or fallowed farmland without windbreaks leads to health problems and highway accidents in all three states. In desert areas, blowing sand creates a physical problem encroaching on highways, housing and farmland.

**Wildlife habitat:** Little undisturbed habitat, including wetlands, riparian zones and old growth forest, remain in the Southwest. While attention has focused on individual rare and endangered species, ecosystem protection may be essential for species protection.

**Non-native plants:** Competitive, invasive weedy species of Mediterranean origin have a negative impact both on agriculture and native plant communities.

**Pest management:** Monocultural crop systems are more vulnerable to pests than complex systems.

### *Socioeconomic*

**Development:** In the Southwest, land is rap-

<sup>1</sup> A summary of the report, *Agroforestry in the Southwest: A Rich Past and Promising Future*, by David A. Bainbridge, Biology Dept., California State University, San Diego, CA 92182.

idly being converted to urban and suburban uses. Development of 5 to 20 acre ranchettes are fragmenting many areas of farm, range and timberlands.

**Public health:** Diabetes is endemic in the Native American communities of the Southwest as a result of dietary changes. Fine particulates and fungal spores in blowing dust lead to lung disease and Valley Fever disease.

**Economics:** The marginal economics of rural resource management have led to the conversion of forestlands to brush and the abandonment of cropland. Poverty is a severe problem in many rural areas.

### Agroforestry Practices

**Historical:** The native peoples of the Southwest were skillful “applied ecologists” who planted and tended trees for food and other needs. The early settlement period was characterized by rapid resource extraction.

**Windbreaks:** Field windbreaks are common, and are still being planted to protect high value row, vine and tree crops. Windbreaks are also used to shelter highway and railroad lines from blowing sand.

**Intercropping:** One commercial example of intercropping is dates interplanted with citrus in the Coachella Valley of California.

**Riparian buffer strips:** The planting of riparian filter strips has not been widely adopted or promoted in the Southwest. However, riparian and wetlands restoration projects are underway in Arizona and California.

### Landowner Adoption

#### *Constraints to Adoption*

**Economics:** “Farmers are reluctant to adopt agroforestry practices until their profitability is demonstrated.”

**Emphasis on technical rather than socio/political issues:** Land tenure, a hopeful view of the future, and absence of crippling farm debt are necessary ingredients for successful agroforestry development. The importance of women in resource management is often overlooked.

**Subsidies and distorted markets:** “Economic considerations are the most critical factor in the adoption of agroforestry and sustainable resource management. People can rarely be encouraged to do something that is ‘right’ if it is not also economically advantageous.” Accounting for external costs, i.e., environmental degradation, will be a key to agroforestry development. Tax, regulatory and institutional policies may discourage the adoption of agroforestry practices.

**Ignorance:** “Simple ignorance is probably the most serious impediment to agroforestry development in the Southwest.” Relevant information on agroforestry is difficult to find, and most of it is poorly indexed and distributed.

**Over-specialization:** The narrow focus of education and research in US academic institutions contributes to the lack of information and expertise in agroforestry. Specialization also makes it difficult to get funding for innovative research.

**Separation of knowledge and experience:** Basic and applied research are often separated in the US. There is a need for more “hands-on” and problem-based learning and research.

**Limited time, vision and commitment:** Short-term funding cycles are incompatible with agroforestry research that may take 10 or more years. Differing priorities among agencies in the US affect how well agroforestry practices are promoted. Many public agencies are crippled by funding cutbacks and hiring freezes.

**Emphasis on publications:** Short-term theoretical or laboratory studies are often favored over applied, long-term interdisciplinary projects. Current academic reward systems in US universities favor publications rather than achieving practical solutions to problems.

### Needs/Opportunities/Recommendations

#### *Research & Development*

**Wild harvest:** Special forest products are the most immediate option for new job creation in the region. A wide variety of specialty products could be collected or cultivated, including mushrooms, pinyon pine nuts, berries, mesquite pods, and acorns. Traditional medicinal plants could also help reverse the incidence of diabetes in Native

Americans.

**Tree crops on cropland:** New specialty crops could be produced for the growing Asian and Latin American markets. In California, fast growing hardwoods such as paulownia could be grown profitably. The use of wastewater to reduce irrigation water costs could be useful in establishing and maintaining agroforestry trees.

**Windbreaks:** Greater use of windbreaks could be expected if their economic benefits are quantified and training and extension materials are improved. Specific benefits that need study include the potential health care savings as a result of dust control, and reduced vehicle fuel use and accidents on windbreak-sheltered highways.

**Ground and drainwater management:** An estimated 7.5 million trees on 25,000 acres would be required for regional ground water management in central California.

**Tree fodder:** The use of trees for fodder (e.g., poplar, willow, and leucaena) may be less environmentally costly and more profitable than alfalfa.

**Coppice crops:** Coppice is promising as a means to produce fuelwood, fodder and craft materials, and to provide environmental protection in the Southwest.

**Trees on range and pasture:** The most important agroforestry development on rangeland is likely to be shade and shelter for livestock. Fast-growing timber trees or nut trees could be planted in pastures to serve as shelterbelts. Other research needs include living fences, native hardwoods, and economical means for the reconversion of brushlands to productive use.

**Forest gardens:** Research and development trials are needed to suggest urban forestry designs for energy conservation, food, medicine, etc., appropriate for low income and farmworker housing, suburban homes, parks and rural ranchettes.

**Filter and buffer strips:** Filter strips are needed to reduce erosion and water pollution from irrigated cropland in California and Arizona. Live cuttings (e.g., willow) could also be used along streambanks to control erosion.

**Biodiversity:** Windbreaks, filter strips and tree plantations will also provide needed wildlife habitat, thereby improving biodiversity.

**Other research priorities:** Cooperative research on agroforestry practices should be started with Native American farmers. An inventory of useful trees and agroforestry practices appropriate for the Southwest and its climatic analogs worldwide should be undertaken. Research is needed on traditional medicinal plants.

#### *Economics & Marketing*

**Cost/benefit analyses:** Detailed economic analyses of the costs, benefits and risks associated with agroforestry practices are needed for specific sites and applications, watersheds and regions.

**Import/export:** Evaluate the potential for substitution of tree crops in import/export markets for the nation, states and regions.

#### *Policy & Funding*

**Ecosystem:** "Approach all land management issues from an ecosystem perspective."

**Regional centers:** The establishment of regional agroforestry research centers and the support of partnerships with private non-governmental organizations are needed. Inter-agency working groups focused on agroforestry should be created.

**Forest policy:** Obstacles to agroforestry in forest policy and practice regulations should be reviewed and removed.

**Tax and regulatory policy:** There is a need to assess tax and regulatory policies that provide economic disincentives to practicing agroforestry.

**Dust Buster:** Review policy to determine if a Dust Buster program is needed, similar to the Swamp Buster and Sod Buster programs.

**Funding:** Develop funding for long-term, interdisciplinary research involving basic and applied topics.

#### *Education & Training*

**Extension:** Develop agroforestry extension programs for farmers, foresters, and homeowners. A key step would be to prepare a guide to sources of agroforestry information.

**Education:** Interdisciplinary agroforestry curricula and course materials adapted for the Southwest region are needed. Alternatives to current reward systems in academia should be investigated

(i.e., that foster long-term interdisciplinary research).

**Literacy requirement:** Ecological and cultural literacy requirements should be developed for new academic positions, with hands-on training to improve skills.

*Information & Technology Development*

**Demonstration:** Establish regional and local agroforestry demonstration sites with regular tours, workshops, etc. Research plots with small

landowners could also serve for demonstration. Large-scale demonstration projects could be developed on abandoned agriculture land.

**Technical information:** Develop manuals on agroforestry for specific user groups in different bioregions and climate zones. Distribute agroforestry information to libraries, including key agroforestry journals.

**Expert systems:** Develop a "smart system" to identify appropriate agroforestry practices and predict probable costs and profits.

# THE STATUS, OPPORTUNITIES AND NEEDS FOR AGROFORESTRY IN THE UNITED STATES

Edited by  
Miles L. Merwin

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Association for Temperate Agroforestry  
H.E. 'Gene' Garrett, President  
School of Natural Resources, University of Missouri  
Columbia, Missouri

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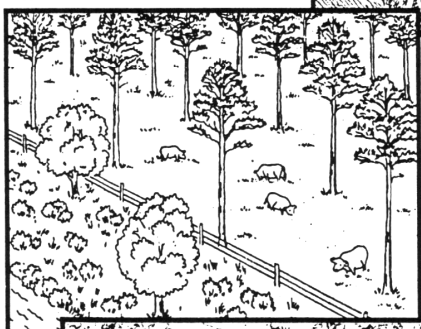
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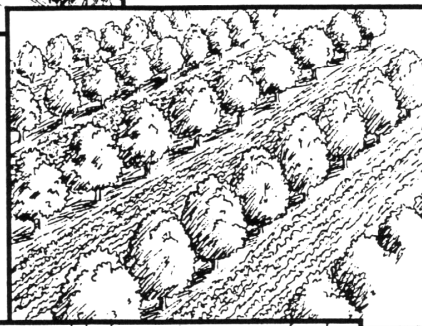
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