# AGROFORESTRY POLICIES CONTRIBUTE TO SUSTAINABLE LAND USE

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MESSAGE FROM USAID

This Policy Brief is a product of the Environmental and Natural Resources Policy and Training (EPAT) Project funded by the United States Agency for International Development (USAID). It is part of USAID's effort to provide environmental policy information to decisionmakers and practitioners in developing countries. The objective is to encourage the adoption of economic policies to promote sustainable use of natural resources and to enhance environmental quality.

EPAT Policy Briefs are written for development professionals and policymakers in developing countries who are responsible for establishing and implementing policies on the sustainable use of natural resources, and for civil servants, project officers, and researchers who are directly involved in the implementation of development activities. This Policy Brief focuses on how agroforestry contributes to sustainable use of many land areas, particularly where monocropping is practiced on marginal soils and hilly terrain. A range of policies is discussed for promoting the conversion from current unsustainable practices to more appropriate land uses.

The contribution of USAID toward writing, printing, and distributing this document is estimated to be $8,000. Due to financial limitations from USAID, this document is being distributed on the Internet. Copies are available from the author. The availability of this paper is being announced to more that 2,000 policymakers and professionals in developing countries.

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## AGROFORESTRY POLICIES CONTRIBUTE TO SUSTAINABLE LAND USE

Agroforestry includes all practices that deliberately combine trees and shrubs with agricultural crops and/or livestock over time or space [note 1]. Most countries have practiced agroforestry for centuries. In many parts of the developing world, it is an important form of land use and a major

contributor to land use sustainability.

Yet, because agroforestry is land use between forestry and agriculture, policymakers do not give it the attention it deserves. Here we [note 2] focus on how agroforestry adds to the sustainable use of many land areas, particularly monocropping of marginal soils and hilly areas [note 3]. We suggest that policy can encourage agroforestry to improve existing unsustainable land use practices. Readers interested in more information should check other sources [note 4].

We want to make three initial points concerning sustainability:

1. We define sustainable land use as that which produces goods and services while continuing to protect the natural resource base.

2. The goal is to maintain sustainable production of goods and services, not to continue given land-use practices.

3. Since we cannot know whether a land use is sustainable far into the future, the best method is to avoid uses that are clearly unsustainable. For example, land use that promotes excessive soil erosion is obviously not sustainable.

## Contributions of Agroforestry to Land Use Sustainability

Despite advanced technical knowledge, many land users today continue to focus on current production and not on protecting the natural resources base on which they and future generations will depend. Often this is because commonly-used technologies and production systems focus on quick production responses rather than long-term effects.

However, agroforestry largely evolved with sustainability concerns -- resiliency, diversity, and avoiding negative side effects -- in mind. It blends production with protection, and focuses on a holistic approach to land management.

Fuelwood, poles, lumber, and fodder are agroforestry tree products often sorely needed by rural people. Trees also moderate the microclimate, protect the soil, provide shade to livestock, and enhance crop production by reducing wind effects on crops.

At the same time, the role of trees in agricultural systems is not always positive. For example, trees can compete with crops for space, light, nutrients, and water, reducing the overall value of both trees and crops.

These problems require experience and careful study to find combinations of trees, crops, and livestock that maximize overall production. In some cases, this can mean no trees; in other cases, it can mean total forest cover. Agroforestry is in

between. Policies should encourage the most productive uses of land and find positive ways to introduce trees.

In this context, agroforestry can contribute to sustainability in three important ways:

1. It can increase diversity as a means to deal with economic and environmental uncertainty and the dynamics of changing needs and wants.

2. It can improve the land's resiliency.

3. It can reduce adverse environmental impacts by creating mutually beneficial land uses, both on-site and off-site.

Let's discuss each of these potential contributions.

## Increasing Diversity to Deal with Uncertainty

The future is not predictable. We cannot say with certainty that any particular land-use practice is sustainable. However, by increasing the variety of species and land-use practices, we can better cope with uncertainty (and thus help avoid unsustainable land use).

Agroforestry practices are more diverse than monocropping systems, often resulting in more efficient use of moisture, space, nutrients, and energy. By producing multiple products (such as clean water, aesthetics etc.) from agroforestry practices, the land user gains flexibility to cope with an unknown future. Because trees are perennials, farmers have flexibility in deciding when they harvest them. Thus, trees can generate current income or provide savings for later.

## Improving Resiliency

Usually, an area's average environmental conditions determine land use practices. However, drought, frost, or other extreme events can partly or totally destroy crops. The great drought of mid-America in the 1930s is an extreme example. Others occur more frequently in the drylands of Africa and Asia.

Because agroforestry systems have more than one production component and are structurally and functionally complex, they tend to be more resilient than most monocropping systems.

Examples include:

* Windbreaks help to sustain crops by conserving soil moisture for them during windy, dry periods that otherwise would destroy single crops.

* Tree fodder is available as a substitute for hay and native forage during extended periods of drought.

* A diversity of species often reduces the susceptibility of any one component to pests.

* Tree products provide income for farmers when drought or hailstorms have destroyed annual crops. This extends the farmer's survival until better conditions return.

* By combining woody perennials with forage and food crops, marginal areas that are too fragile for sustainable, intensive, monocropping systems (Some consider them wastelands.) can produce food, forage, and wood crops.

## Complementing Other Land Uses

From a watershed management perspective, agroforestry can provide both on-site and downstream benefits [note 5].

### On-site Benefits

These benefits include:

* Adding trees to cropping systems can increase soil conservation.

* Some tree species fix atmospheric nitrogen and add it to the soil, improving crop production.

* Water benefits include increased infiltration, reduced surface runoff, less soil erosion, and, sometimes, reduced evapotranspiration of crops.

### Off-site and Downstream Benefits

These benefits include:

* Reduced runoff from an area can have positive downstream effects.

* Reduced surface runoff can help stabilize streamflow by reducing peak flows from land areas.

* Stable upland soil can reduce levels of sediment delivered to downstream channels, lakes, and reservoirs.

* Trees absorb nutrients and pesticides that otherwise would enter streams, lakes, or groundwater systems, adding environmental and economic benefits.

## Policy Measures to Encourage Appropriate Agroforestry

Because agroforestry represents an array of possible land uses, policies in many sectors can affect it. For example, price supports for agricultural crops, subsidies for fertilizer and other agricultural inputs, low interest credit to farmers, and investment in agricultural education and research can also affect agroforestry. Similarly, policies that favor certain types of land use, can affect agroforestry. The differences in these types of policies are mainly a matter of degree. However, clearly, some policy measures particularly affect agroforestry and the use of trees in land-use systems. Below are examples of such measures that policymakers need to review.

## Regulatory and Legal Policies

There are a variety of these types of policies that decisionmakers can use:

* Tenure laws sometimes make trees the property of the state. In such cases, farmers have "no" incentive to plant trees, no matter how useful they would be. Such laws are often a carry-over from government ownership of forest lands and attempts to control forest clearing. Policymakers should review these laws carefully and revise them where appropriate without jeopardizing remaining forests.

* Laws and regulations that prevent farmers from harvesting farm trees should be reviewed to increase incentives to plant and manage trees as part of the total farm enterprise.

* Laws or regulations that control public forest management and use can affect the incentive for farmers to grow trees on their own land as these laws affect markets or the availability of free or subsidized wood. While policymakers have to consider such laws and regulations in a much broader context than agroforestry, they need to remember the impacts on farmer tree-growing activities when planning public forest regulations.

* Some countries, such as Japan, for many years have had social systems that regulate water use. Downstream land and water users pay upstream land users for soil and water conservation practices that affect the downstream land uses. Legal mechanisms can ease these negotiations between upstream and downstream land users and encourage agroforestry practices.

## Fiscal (Tax and Subsidy) Policy Measures

Policymakers can use several types of fiscal policies:

* Sometimes, governments apply (formally and informally) special taxes to tree harvesting on private land. This discourages tree planting. Policymakers must consider taxes in the context of broader objectives of promoting sustainable land use.

* Governments often subsidize farmers who produce tree seedlings.

These subsidies can help get local communities into small-scale nursery production and give farmers a readily accessible, cheap source of planting stock.

* Subsidies that affect the use of fuels, such as kerosene, electricity, and fuelwood, can also encourage or discourage farm planting and managing trees for fuelwood.

* Governments can levy taxes on downstream land and water users to generate revenues for upstream soil and water conservation projects.

## Public Investment Measures

Governments can also invest in their citizens:

* Public investment in training and education can encourage the spread of productive agroforestry practices. It is important that trainers and educators have a solid knowledge of the information they are extending.

* Governments can invest in agroforestry research that will also benefit agriculture and forestry research.

## Conclusions

Agroforestry practices can help farmers cope with uncertainties of drought, frost, pests, and other phenomena that can lead to serious monocrop failure.

Agroforestry can enhance farmers' financial security while providing environmental benefits to society. Using agroforestry practices to reduce nonpoint pollution from monocropping areas, by using buffer strips of woody vegetation and otherwise integrating trees into cropping systems, appears to have excellent potential.

Agroforestry is not a cure-all for making land use more productive and sustainable. Introducing trees into land-use systems can be harmful in some instances. We need to monitor existing agroforestry practices to avoid adverse practices and promote beneficial practices. We also need more research to improve agroforestry technologies and systems.

By being aware of policies that promote or discourage agroforestry, decisionmakers can develop more effective, positive policies leading to more sustainable overall land use, including agroforestry.

NOTES

1. Raintree, J. B. 1987. "The State of the Art of Agroforestry Diagnosis and Design." Agroforestry Systems 5:219-50.

2. Kenneth N. Brooks and Hans M. Gregersen are Professors, College of Natural Resources, University of Minnesota, St. Paul, Minnesota, and Peter F. Ffolliott is Professor, School of Renewable Natural Resources, University of Arizona, Tucson, Arizona.

3. Based on a paper presented at the symposium, "Agroforestry and Sustainable Systems," Fort Collins, Colorado, August 7-10, 1994.

4. A good source of current information on agroforestry is the International Centre for Research in Agroforestry (ICRAF) whose address is ICRAF House, United Nations Avenue, Gigiri, P.O. Box 30677, Nairobi, Kenya.

An additional source is Agroforestry Systems, a quarterly journal.

See Nair, P. K. 1993. An Introduction to Agroforestry. Boston, Massachusetts: Kluwer Academic Publishers.

Also McDicken, K. G., and N. T. Vergara, eds. 1990. Agroforestry: Classification and Management. New York, New York: John Wiley and Sons

5. Brooks, K. N., P. F. Ffolliott, H. M. Gregersen, and J. L. Thames. 1991. Hydrology and the Management of Watersheds. Ames, Iowa: Iowa State University Press.

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