3 Why Ecologically Inappropriate Technologies May be Selected

Introduction

Mismatches between ecological conditions and technologies promoted by assistance organizations is currently receiving the attention of Congress and a number of public interest groups. This concern is expressed in the EESI report (Appendix B) and summarized in the Committee's request letter (Appendix A). Therefore, no detailed review of evidence for the problem is included here. In OTA's interviews, no one denied that the problem existed, although opinions differed on its relative importance. The evidence, in fact, is largely anecdotal: few recent cause-effect analyses of development project successes and failures have carefully investigated the issue of matching technologies to environment t.

Interviews for this study and the relevant literature indicate that at least three broad factors contribute to the use of ecologically inappropriate technologies. These are:

- Few, if any, sustainable technologies exist to satisfy development needs at many sites. So technologies that worked elsewhere under different conditions are chosen and some of these prove unsustainable.
- Sustainable technologies, in some cases, do exist and have been demonstrated, but unsustainable technologies still are implemented.
- Experts responsible for informing decision makers sometimes are unable to recognize which technologies will be sustainable.

Where sustainable technologies may not exist

Most developing countries are located in the tropical latitudes. Here, the common problems of rainfall extremes or irregularities, high temperatures, and lack of seasonal reduction of insects and parasites make natural ecosystems highly susceptible to self-reinforcing cycles of degradation.[1] Such vicious cycles are easily triggered by attempts to develop and use the local natural resources. Most technologies used to get high yields of goods and services from soil, vegetation, animals, and water resources have been developed in temperate regions where natural systems are generally more resilient. However, when transferred without appropriate adaptation to tropical areas, they tend to disrupt ecosystem functions beyond natural regenerative capabilities, thus reducing current and future productivity.

Further, many technologies that could be ecologically sustainable commonly require resources not readily available in developing countries. For example, the Near-East and Pakistan have, although not tropical, harsh environments for which ecologically sustainable technologies are few. Although much western U.S. agriculture and water management

[1] Degradation of ecosystems involves physical, chemical, and biological processes set in motion by activities that foster reduction in the system's inherent productivity y. For example, hillside deforestation in the humid tropics commonly leads to accelerating soil erosion, decreasing soil fertility, and disrupted hydrologic cycles. These changes, in turn, can promote further reduction in ecosystem productivity through decreased natural plant regeneration, establishment of weedy plants that displace more desirable plant species, and increased hazards to public health.

experience is relevant to development in these areas, U.S. technologies often are not suitable within their political, social and economic framework.

Similarly, principles of science and logic often can be used to make marginal improvements in long-sustained traditional technologies or to adapt technologies that have worked elsewhere. If the design is good and appropriately applied, such technologies can conserve the natural resource base. However, such adaptations of technology can become unsustainable if cultural or financial factors prevent correct application.

In cases where ecologically sustainable technologies suitable to the sociocultural framework do not yet exist, development assistance options include: 1) support for research to develop ecologically sustainable technologies, 2) definition of development goals that can be met with technologies known to be ecologically sustainable (e. g., reducing risk or improving distribution of goods and services may be more appropriate goals than increasing production), and 3) gradual technology modification with careful monitoring to reduce the risk to affected people and natural resource systems. In practice, however, project time frames and objectives often preclude such gradual development.

Where unsustainable technologies are chosen

Sustainable technologies, in some cases, are rejected in favor of approaches that are expected to achieve other, overriding goals. Thus, technologies may be chosen for which sustainability is unproven, or those known to be ecologically, culturally, or financially incompatible with local

conditions. For example, although many traditional technologies are ecologically sustainable, production gains from these may not seem adequate to resolve the identified development problem.

A variety of other reasons are given for support of projects known to deplete renewable resources rapidly. For example, an emergency condition may seem to necessitate immediate action using technologies which do not fit the local environmental conditions. Similarly, short-term economic or political goals may override ecological goals. Examples include forests cleared for timber and cattle exports to meet short-term foreign exchange requirements, and settlements established to curtail nomadism or to secure boundaries.

Choice of technology also can be skewed by economic analyses which value immediate, although perhaps only temporary, benefits more highly than distant costs and benefits.[2] For example, the present value of temporary production gains (e.g., from a reservoir) can be shown to be higher than the worth of an unending stream of modest benefits from current resource uses (e.g., subsistence agriculture). Or, for highly subsidized projects, the rationale is either that the temporary effects will resolve a significant development problem, or perhaps that foreign-source subsidies can be continued indefinitely.

[2] The Congressional Research Service ice recently conducted a workshop reviewing the state of the art in incorporation of environmental considerations into benefit-cost analyses. The draft proceedings are under review.

Such decisions in favor of unsustainable technology can seem rational. However, great care must be taken to assure that:

1) the development problem has been correctly identified;
2) the benefits and costs, including cross-sectoral conflicts, are fully accounted;
3) the lifetime of the project has been correctly estimated;
4) the project will be subsidized long enough to achieve its intended objectives; and
5) the project include a monitoring component to ensure that recipients are protected from adverse impacts.

Where sustainability is not determined

No single individual is likely to have adequate technical knowledge to assess thoroughly whether a proposed technology will be compatible with the political, cultural, economic, and ecological conditions of the development site. However, development assistance projects often have relied on technology choices made without adequate interaction among all the necessary types of experts.

World Bank and AID consultants now used for planning generally are members of a multidisciplinary group.[3] But whether such groups perform interdisciplinary analysis[4]--identifying the interactions between

[3] Multidisciplinary planning implies that specialists of several disciplincs contribute to the completed plan. However, it does not imply that they work together to identify and resolve cross-sectoral conflicts between their separate analyses.

[4] Interdisciplinary planning and analysis implies that the specialists of several disciplines interact within the framework of a tested method (see Appendix F for examples) to assure that the overall analysis is internally consistent and *that* foreseeable conflicts are identified and resolved. Typically such analysis requires a team member trained in interdisciplinary analysis techniques.

environment, technology, culture, and financial conditions--is less apparent. Without interactive, interdisciplinary analyses, it is unlikely that predictions of compatibility with local site conditions can be made with assurance, Thus, technologies may be promoted based on ‘best guesses, ’ which by definition sometimes will be wrong.