Steven Shultz, Jorge Faustino and Douglas Melgar

Agroforestry and soil conservation: adoption and profitability in El Salvador

Watershed management projects in Central America usually focus on the transfer of soil conservation and agroforestry technologies to small-scale hillside subsistence farmers through demonstrative and participatory extension programmes. An evaluation of 20 agroforestry and 10 soil conservation projects in Central America was recently undertaken and published by the World Bank (Lutz and others 1994; Current and Scherr 1995). The general conclusions were that profitability, farm size, levels of technical assistance, and availability of resources and incentives were the critical factors influencing the adoption of agroforestry practices and that the most profitable agroforestry systems were those that combined trees and crops (taungya and alley-cropping systems). Strongly influencing the profitability of soil conservation practices were the actual site conditions, which affected crop yields and cost effectiveness, the simpler and cheaper practices were usually the most profitable.

Approximately 1 year after its completion, the Rio Las Cañas (RLC) watershed management project in El Salvador was evaluated through both an adoption survey and a financial analysis, to determine if it bore out this usual pattern. The RLC project was implemented in a subwatershed of the Rio Lempa watershed, north-east of the capital city, San Salvador. This area is characterized by steeply sloped, unstable volcanic soils of relatively poor quality, long dry seasons followed by intense rains, and growing numbers of small subsistence farmers who traditionally have not used soil conservation and agroforestry practices. Levels of soil erosion and sedimentation in the watershed have been estimated to be as high as 350 to 1000 tonnes per hectare a year. Correspondingly, crop yields and farm incomes in the watershed are quite low, while problems associated with rural poverty and resource degradation are prevalent (Rivas and others 1993).

Surveying the farmers

The project, implemented between 1991 and 1994 by the watershed management area of Centro Agrononómico Tropical de Investigación y Enseñanza (CATIE) in conjunction with the El Salvador Electricity Utility and the Ministry of Agriculture, focused on technology transfer through a combination of institutional strengthening, training events, farmer workshops and demonstrative plots. By 1995, project accomplishments included training 34 extension agents, establishing 360 demonstration parcels, directly training 560 farm families (and indirectly over 1000 families), constructing over 48 000 linear metres of contour ditches and 1300 m³ of flood control structures, planting 130 000 trees (9800 fruit trees), establishing 150 000 pineapples as live barriers, creating 150 000 individual terraces and constructing 300 fuel-efficient wood stoves.

However, in addition to these physical accomplishments, it was deemed necessary to evaluate how and why different farmers adopted specific soil conservation and agroforestry practices, which of these practices were financially profitable for the farmers, and finally, whether the relationships between soil conservation and agroforestry practices were complementary or competitive.

Such evaluations are needed to compare similarities and differences between specific watershed management case studies and the more general recent World Bank studies based on cross-sectional analyses across many case studies throughout Central America. This comparison is especially important for verifying reliability and utility because, as was the case with the RLC evaluations, in most watershed management projects there is not the time nor are there the financial resources to perform adoption and financial studies in the amount of detail and precision as the World Bank was able to do in its recent studies.

From March to June of 1995, a random sample of 144 farmers in the watershed was surveyed to quantify adoption rates of the specific soil conservation and agroforestry practices promoted by the project. The objectives were to determine the biophysical, socioeconomic, institutional, spatial and temporal factors influencing participation and adoption (Melgar 1995).

Between 1992 and 1994, a financial analysis of the project was

Dr Shultz and Dr Faustino are both with CATIE, the Centro Agrononómico Tropical de Investigación y Enseñanza in Costa Rica; Dr Shultz is in the Environmental Economics and Sociology Area and Dr Faustino in the Watershed Management and Agroforestry Area. Mr Melgar is a natural resource management consultant in El Salvador. This research was conducted in 1994 and 1995 when the authors were, respectively, Natural Resource Economist, Head, and Graduate Student in the Watershed Management Area of CATIE. The research was funded by the regional USAID-RENARM project in Central America. CATIE, PO Box 19, Turrialba 7170, Costa Rica; email: agrofor@catie.ac.cr; fax: 506 561 533

conducted with 9 participating farmers. However, the required data involving different crop activities on each of the farms (crop acreage, input values, labour values, incentives received and production income) over the entire time period were collected from only 2 farmers. With these data, net present values representing profitability of total and specific crop activities with and without soil conservation and agroforestry practices were estimated for the years 1992, 1993 and 1994 (Shultz 1994).

Dramatic increase

Adoption rates of both soil conservation and agroforestry practices among participant farmers of the RLC project were high. This can be attributed directly to the project, as the number of adopted practices increased dramatically during and after the project, and the number and complexity of conservation practices of participant farmers were considerably greater than those of non-participants.

Soil conservation practices were generally adopted more frequently than agroforestry practices. The most popular of these practices (with the percentage of farmers adopting them) were organic (chicken manure) fertilizers (90%), contour planting (85%), drainage ditches (82%) and terraces (47%). The most popular of the agroforestry practices were fruit and firewood trees (76%), live fences (44%) and green fertilizers (36%). Similar to the farmers in the World Bank study, most farmers adopted soil conservation and agroforestry practices together, indicating their complementarity in the total package of watershed management technologies.

From a multivariate statistical analysis, the factors found to significantly influence the adoption of soil conservation and agroforestry practices were age (younger farmers adopting more), land tenure (owners adopting more than tenants), and the number of extension visits (the more visits, the higher the level of adop-

tion). Again, these findings are consistent with those of previous World Bank studies. Finally, it is interesting to note that the majority of farmers (74%) stated that their main interest in participating in the project was to control soil erosion, while only 28% listed fruit or wood products as the primary reason.

The financial analysis of the 2 farmers that adopted both agroforestry and soil conservation practices throughout the complete 3-year cycle of the data collection showed that they shared a consistent pattern. In the baseline 1st year, they grew the traditional maize, bean and vegetable crops with low but positive profits. In the 2nd year, with the adoption of soil conservation and agroforestry practices, their profit levels were greatly reduced, and for 1 of them, the level was negative. In the 3rd year, however, profits associated with agroforestry practices (eucalyptus and fruit trees) were still negative, but profit levels for maize, bean and vegetable production were markedly higher, resulting in an overall increase in total farm profits. For 1 farmer, these profits exceeded those of the baseline year, while for the other, profits were slightly less.

A complementary relationship

In summary, the financial analysis showed that soil conservation practices associated with traditional crops had an almost immediate effect on farmers' profit levels. This offset the losses associated with the tree-growing components of their adopted agroforestry practices, for as expected, these do not produce any recognizable benefits in the early years after establishment. This analysis is also consistent with the World Bank study that found that the most profitable and highly adopted agroforestry practices were those combined with traditional crop production. This finding highlights the important complementary relationship between soil conservation and agroforestry practices of small-scale subsistence

farmers on highly degraded lands. In other words, it is unlikely that such farmers can afford to adopt only agroforestry practices and that for watershed management programmes to be successful they should offer farmers a combined package of both soil conservation and agroforestry technologies.

Finally, the results of the adoption and financial studies carried out to evaluate the RLC watershed management project illustrate the feasibility and importance of conducting such studies. In this case, the results—even though based on very limited data, both in quantity and temporally—yielded results very similar to those of the larger and more rigorous World Bank studies on the adoption and profitability of soil conservation and agroforestry practices in Central America. Future watershed management projects should also evaluate both adoption and profitability, even if the projects are limited in scope and magnitude. Such studies are important in confirming or revising our knowledge of the factors that influence both the short- and the long-term effectiveness of watershed management projects. ⓔ

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