Number of SA Users and SA Non-Users Visited by an Extensionist – Guatemala and Mexico

SITE	SA USERS (%)	SA NON-USERS (%)	P VALUE
Guatemala	*130 (84.2)*	*24 (15.9)*	*0.000*
Mexico	*69 (46.0)*	*16 (10.7)*	*0.000*

A Defensores de la Naturaleza field extentionist discusses with farmers progress on a field where dead barriers are being tried.

PUTTING THE FINDINGS IN PERSPECTIVE

We divide our discussion in this section into three parts that parallel our three goals: (1) the conditions under which sustainable agriculture contributes to conservation, (2) principles for using sustainable agriculture as a conservation tool, and (3) process lessons — learning to learn better. In the first two sections, we try to make sense of our findings by looking across factors and our two study sites. In the last section, we take a critical, internal look at how we planned and implemented this study.

Many of the insights and interpretations we include in this section came about from the final analysis meeting we held in August 2000. During that meeting we discussed each site individually and then compared and contrasted the two sites in an effort to determine how different characteristics might have contributed to our findings. The last day of the meeting was spent evaluating the research process itself.

The Conditions Under Which Sustainable Agriculture Contributes to Conservation

The first goal of this study was to better understand the conditions under which sustainable agriculture can be used as an effective strategy to reach conservation goals. For this portion of our discussion, we will examine our findings using the conventional wisdom as a framework. As you go through this section, keep in mind that we necessarily narrowed our sample to a fairly limited set of social, cultural, and environmental characteristics to come up with a relatively precise understanding of what makes for a successful sustainable agriculture program. While we believe that many of these insights and observations are generalizable, we also realize that they are derived from some fairly specific situations.

Area planted to subsistence crops

We found that area planted was associated with sustainable agriculture use in completely opposite ways in Guatemala and Mexico. In Guatemala, SA Users plant significantly more area to maize than SA Non-Users. In Mexico, SA Users plant significantly less area to maize than SA Non-Users. We conclude from these findings that, in Guatemala, use of sustainable agriculture does not reduce expansion of agriculture and, therefore, reduce rates of deforestation. In fact, it appears to have just the opposite effect: It appears that sustainable agriculture as practiced in the Sierra de las Minas increases agricultural expansion and, thus, deforestation. In Mexico, on the other hand, we conclude that sustainable agriculture use does reduce expansion of agriculture, and, therefore, reduce rates of deforestation.

During our analysis, we discovered that SA Users in both countries produced more maize than their SA Non-User counterparts. But this increase in production was a function of two different factors in our two sites. In Guatemala, it was a function of increased area planted because yield was equal between SA Users and SA Non-Users. In Mexico, however, SA Users planted less than SA-Non-Users, but demonstrated yields that were, on average, 1.5 times greater than SA Non-Users. In the case of Mexico, the difference in production is a function of increased yields achieved by SA Users. So, according to our user-level data, area planted is a function of the efficiency with which farmers manage their fields. Our plot-level data confirm this: in Guatemala, yield between SA Plots and Non-SA Plots was virtually the same but in Mexico the yield from SA Plots was significantly higher than that from Non-SA Plots.

In the Sierra de las Minas, farmers who used sustainable agriculture produced more maize than farmers who did not use sustainable agriculture by increasing area planted. In El Ocote, sustainable agriculture users increased production by intensifying yield.

But why then are SA Users in Mexico so much more efficient in their use of land than SA Users in Guatemala? Why was the Conventional Wisdom supported in Mexico, but not in Guatemala? What difference between these two sites would cause this divergence?

As we mentioned in our findings, area planted and yield are also a function of many other factors. But we controlled for many of the potentially determining factors in our sample selection within and between each site. In addition, there was virtually no difference between the SA User and SA Non-User samples within sites and between Guatemala and Mexico in the use of fertilizer and pesticide and access to credit. In fact, almost no farmers had access to these inputs because of their high costs.

When we looked at labor inputs, however, we found a different story. It appears that SA Users in Mexico invest proportionately more labor per hectare than SA Users in Guatemala. In fact, SA Users in Mexico use almost 10 days of labor per hectare more than their Guatemalan counterparts. One of the distinctions between the two study sites that probably accounts for some of this difference is that SA Users in Mexico use integrated pest management in addition to the two techniques also used in Guatemala — velvetbean and minimum tillage. But it is unlikely that this difference accounts for all of the dissimilarity in labor between the two sites.

So, SA Users in Mexico invest more labor in their maize fields, which leads them to achieve higher yields and require less land to feed their families than SA farmers in Guatemala. This relationship in Mexico is strongly supported by our multivariate analysis: Agricultural fields in Mexico with high yields tend to be smaller plots farmed by SA Users. So, SA Users in Mexico and Guatemala use sustainable agriculture to increase production of maize in different ways: In Mexico, SA Users use sustainable agriculture as part of a strategy of *intensive* agricultural production whereas in Guatemala, SA Users use sustainable agriculture as a strategy of *extensive* agriculture.

The differences in labor investment between Guatemala and Mexico explain much of the differences in yields and area planted between the two sites. SA Users in Guatemala ultimately invest less labor per hectare than Guatemalan SA Non-Users and Mexican SA Users and SA Non-Users. But we also saw that SA Users in Guatemala plant significantly more area to maize than SA Non-Users in Guatemala. It is clear that these SA Users in Guatemala are using their surplus labor — saved through the use of sustainable agriculture — to invest in planting more area to maize. These results support earlier work on the relationship between technological innovation and deforestation mentioned by some researchers in the literature (Kaimowitz and Angelsen 1998; Angelsen and Kaimowitz 1999).

Project managers in Guatemala conjecture that farmers with extra time on their hands are also investing it in cash crops. These project managers report that the main driver of deforestation on the north side of the Sierra de las Minas is indeed the planting of cash crops such as coffee and cardamom rather than the expansion of maize fields. In fact, we found that SA Users in Guatemala were significantly more likely to plant fruit trees and programmatically more likely to plant coffee (102 SA Users and 89 SA Non-Users plant coffee).

We thought that perhaps the desire or need to sell surplus maize might be driving farmers to increase production. Indeed, we found that SA Users were more likely to sell surplus maize than SA Non-Users. We also found that SA Users in Mexico sold about 1.5 times more maize than SA Non-Users and sold 3 times more maize than SA Users in Guatemala. It appears that SA Users in Guatemala and Mexico use sustainable agriculture as different economic strategies as well. SA Users in Guatemala seem to use sustainable agriculture to save labor that then can be used on greater agricultural expansion and investment in cash crops to generate income. SA Users in Mexico, however, use their labor to focus on maize production for household consumption and as a way to earn additional income.

What else accounts for the differences in labor input, yield level, and area planted that we found between SA Users and SA Non-Users in Guatemala and Mexico? Because the differences are so marked between our two study sites, it seems that there must be some other factor influencing farmer behavior. And, indeed, there is. It turns out that the biggest influence on increases in farming efficiency — reflected in yield level, area planted, and labor investment — is access to land for agriculture.

In the study site in Mexico, farmers in the *ejido* are given about 20 hectares of land; they do not have access to any other land. The incentive to be efficient is very high. In Guatemala, on the other hand, farmers on the north side of the Sierra de las Minas live in an area in which few community residents actually have title to their land (although they say they "own" it, ownership is more a function of claim than right). At this site, farmers actually have incentive to plant *more* area — the opposite situation as in El Ocote, Mexico. In Guatemala, government policy up to the 1980s actually encouraged farmers to deforest land to create larger agricultural plots. Farmers could claim land, including primary forest, that did not appear to be owned by anyone. According to the government, as long as farmers improved "the productive capacity" of the land — that is, used it for crops or livestock — they could maintain indefinite usufruct rights to it. Although this policy is no longer formally in effect, it still

influences farmers' perceptions and behavior related to the acquisition and use of land. In the absence of owning title to their land, Guatemalan farmers have less land security. They have every incentive, therefore, to plant more area, not less, and to make as little investment in the land as possible.

We conclude that, in tropical forest sites similar to our sample, unless access to land is limited, sustainable agriculture techniques such as those used at our two study sites will not successfully reduce the amount of area planted and, therefore, rates of deforestation. Conversely, in areas where farmers have a greater incentive to be as efficient as possible because of limited access to land, sustainable agriculture can reduce area requirements and, thus, rates of deforestation. Farmers must be secure in their rights to land and government policy must support — rather than discourage —– agricultural practices that are compatible with conservation. Adoption rates for sustainable agriculture techniques support these relationships: from 1994 to 1997, adoption in Mexico increased fivefold to 500 SA Users while in Guatemala it increased only 1.4-fold to 613 SA Users. In Mexico, farmers were more eager to try new agricultural techniques that held the promise of increasing yield. In addition, it appears that SA Users in Mexico are more committed than their counterparts in Guatemala because SA Users in Mexico tended to participate in the project longer.

Our analysis clearly and consistently demonstrates that the use of sustainable agriculture techniques is associated with reduced use of fire. As we mentioned, forest fires — many of which start as a result of poor fire management during the burning of agricultural plots — are perhaps the greatest threat to biodiversity conservation in both the Sierra de las Minas and El Ocote. In fact, 20,000 hectares and 19,000 hectares of primary forest in the Sierra de las Minas and El Ocote reserves, respectively, were lost to fire in 1998. At both sites, SA Users were overwhelmingly less likely to use fire to prepare their lands than SA Non-Users. After controlling for all other variables in our multivariate analysis, use of fire was the most important determinant of user status in Guatemala and Mexico. Similarly, our multivariate analysis also showed that older SA Non-Users were more likely to use fire to prepare their lands.

Fallow Area and Duration

We found no differences in fallow amount and duration between SA Users and SA Non-Users in either Guatemala or Mexico. Sustainable agriculture does not appear to have an impact on fallow land under the conditions found in our two study sites. We did find, however, that plots with reduced fallow times produced higher yields if farmers had previously used sustainable agriculture.

According to the results of our study, if there are no restrictions to access to land, sustainable agriculture will not work to decrease rates of deforestation.

Farmers who use sustainable agriculture are less likely to use fire. They help, therefore, to decrease the threat of forest fires and reduce the amount air pollution caused by smoke.

Contamination of the Environment

Use of chemical fertilizers and pesticides by farmers was limited in both Guatemala and Mexico. Pollution from these threats, therefore, was not a major concern in our study sites. Nevertheless, we infer that contamination of the environment from smoke was greatly reduced by use of sustainable agriculture in both Guatemala and Mexico.

Attitudes Concerning Conservation

As expected, SA Users in both Guatemala and Mexico tend to perceive more positive effects of sustainable agriculture than SA Non-Users. In Guatemala, SA Users were more likely than SA Non-Users to report that they do not use fire in order to protect the forest. According to the results of the focus groups in Guatemala and Mexico, SA Users generally perceive the importance of biodiversity conservation.

Perhaps most important is the conclusion by both Defensores de la Naturaleza and Línea Biósfera that their sustainable agriculture programs are crucial for building trust and confidence in the communities in which they work. This result is supported by field experience and the results of the focus group analysis. Both organizations believe that their sustainable agriculture programs have served as an effective *bridge approach* to reach conservation goals. In both cases, farmers originally perceived little connection between their agricultural practices and conservation and the importance of conservation alone. By working with farmers on their self-perceived priorities and building relationships with community members, both organizations were able to demonstrate to farmers the links between agriculture and biodiversity conservation. This link was supported by outreach and education programs to clarify and bolster perceptions of this relationship. At the same time, establishing these relationships enabled each organization to work on other conservation issues that were not originally perceived by community residents as top priority.

Participation in Community Organizations

In Guatemala, SA Users were more likely to belong to a community organization than SA Non-Users. In Mexico, there was no difference because everyone belonged to the same *ejido* and regional organizations.

Organizations and the organization of communities played different roles in Guatemala and Mexico. In Guatemala, communities on the north side of the Sierra de las Minas are dispersed, with little communication and interaction between them. Similarly, within communities, organization is fairly decentralized — there are few formal community structures to pull residents together. In addition, these communities are subject to a high level of conflict, perhaps due in part to their lack of organization.

At the beginning of the program in the Sierra de las Minas, Defensores de la Naturaleza found it very difficult to gain access to individual farmers because of the lack of formal community mechanisms. In this case, the sustainable agriculture program served as a catalyst for community mobilization. It increased formal mechanisms for communication within communities and decreased the amount of conflict between communities and individuals. The increased level of organization provided Defensores de la Naturaleza with the means to more efficiently work with communities on important conservation issues.

In Mexico, the level of community organization was quite high and influenced adoption of sustainable agriculture in a different way. While Línea Biósfera reports that it was difficult initially to gain access to communities because *ejido* organizations acted as a buffer to outsiders, once accepted and trusted, official endorsement by the *ejido* gave the organization virtually unlimited access to all community members. Adoption rates of sustainable agriculture were very high in Mexico compared with Guatemala.

Principles for Using Sustainable Agriculture as a Conservation Tool

Our second goal was to determine key principles that can help project managers use sustainable agriculture projects more effectively to reach conservation goals. The principles in this section are the result of our analysis of the data and discussions we had concerning conditions at each site. Although they are not meant to be a recipe that guarantees success, we offer these principles as guidelines to help you implement effective sustainable agriculture programs. These principles are derived from two sites that are very similar in many ways. We believe, therefore, that these principles can be generalized to other similar sites. The more dissimilar the site, the more unlikely it is that the principle will hold. We divide the principles as they relate to two phases of project management: design and implementation.

Design

Be clear about the threats to conservation that sustainable agriculture is designed to address. Sustainable agriculture is effective as a conservation tool only if it is appropriately directed at addressing a particular threat. We have seen that sustainable agriculture, as defined in this study, does not necessarily reduce deforestation resulting from expansion of subsistence crops. In Guatemala, we saw that, although sustainable agriculture activities focused on subsistence crops, the main threat was expansion of cash crops. In our sample, sustainable agriculture proved to be an exceptional tool for reducing forest fires — although this was not an explicitly intended objective of the sustainable agriculture program at its inception. In our sample, focusing sustainable agriculture on the reduction of pollution caused by use of chemical pesticide and fertilizer turned out to be a worthless endeavor. Had proper assessments occurred before the project began, it is likely the program would not have been designed to influence environmental contamination. Similarly, the assumption that sustainable agriculture would increase recovery of forested lands proved unfounded.

Expansion of cash crops – such as coffee – is a major threat to biodiversity in the Sierra de las Minas. In addition, the collection of firewood to fuel coffee processing and drying systems contributes to deforestation.

Be clear about the mechanism through which sustainable agriculture impacts conservation. The mechanism through which sustainable agriculture influences conservation outcome is relatively complex. There is a long series of assumed intermediate steps to get from intervention to outcome: Adoption of sustainable agriculture leads to increased yield, which leads to the need for less land, which leads to lower area planted and reduced labor needs, which leads to a reduced likelihood of cutting down forested areas to plant new fields. To make a causal link between sustainable agriculture and conservation, project managers must understand each intermediate step. We saw, for example, that adoption of sustainable agriculture does not necessarily mean increased yield or decreased area planted.

Where there is little incentive to be efficient, sustainable agriculture will not reduce the amount of area planted to subsistence and cash crops.

Do not use sustainable agriculture to reduce rates of deforestation where there is relatively open access to land. Access to land may be one of the biggest predictors of sustainable agriculture's utility as a conservation tool. In our study, where land was relatively available, the sustainable agriculture techniques adopted by farmers did not work to reduce area planted. Where access to land was limited, farmers had greater incentive to be efficient in their use of land, and sustainable agriculture was associated with reductions in area planted.

Use sustainable agriculture where farmers have greater land security. Land security — either in the form of tenure or usufruct rights — provides the opportunity for farmers to make investments for future production in their agricultural plots and is, therefore, another important factor related to the efficacy of sustainable agriculture as a conservation tool. In areas where farmers have little land security and perceive that the land they work could be taken away from them at any time, they have little incentive to make investments in their plots that might increase yield and reduce area needs. In Mexico, where there is relatively high land security, farmers were willing to make greater investments in their agricultural plots.

Consider the use of sustainable agriculture in areas where local, state, and national government policy is supportive of greater agricultural efficiency. Government policy can influence farmers to plant either more or less area. In countries where the government's policy is to exploit natural resources and promote development without consideration for conservation, it is likely that sustainable agriculture will have minimal impact on conservation. In countries where government policy encourages greater efficiency in land use and management

and where conservation is valued, chances are sustainable agriculture will be a more effective conservation tool. In Guatemala, government policy is a major driver in the expansion of agricultural fields. In Mexico, the *ejido* system actually encourages farmers to be more efficient in their use of land.

Do not assume that labor saved using sustainable agriculture techniques will be used on activities that are supportive of conservation. Over time and in some situations, the sustainable agriculture techniques adopted by farmers included in this study may reduce the amount of labor required to work a particular field, but farmers may put this saved labor to use in destructive ways. In Guatemala, for example, we saw that farmers who use sustainable agriculture techniques actually plant more total area and invest their time in other activities — such as extensive cash crop expansion without intensification — that can work against conservation.

Implementation

Begin your sustainable agriculture project by testing only a few techniques. Inundating farmers with too many tools at the beginning of a project may discourage them from participating in sustainable agriculture activities. Farmers are more likely to use a few, very effective techniques rather than many moderately useful ones. This proved to be the case in both Guatemala and Mexico. At the beginning of the program, both organizations promoted up to 15 different techniques at the insistence of the organization that trained and supervised them in sustainable agriculture. Farmers, however, only wanted to use two or three techniques. In addition, rather than assuming that each technique has high rates of return, it is important to fully test each technique on a small scale before promoting it widely. This supports earlier findings on what makes for successful sustainable agriculture extension (Bunch 1982).

A farmer in El Ocote holds up velvetbean pods – harvested for use in the next agricultural season.

Select specific sustainable agriculture techniques carefully on the basis of returns to labor. Farmers look for ways to increase productivity while reducing labor demands. They will not adopt practices that require high amounts of labor, especially if the return on labor is not favorable. In our study, farmers were more likely to use those techniques that required extremely low labor investments or that were sure to save them time over the long run. Planting velvetbean, perhaps the easiest technique to use, was the most popular in both sites. Furthermore, investing less labor in smaller areas adds to the efficiency sought by farmers. This result was clear in our regression analysis on yield.

Be prepared not to see immediate results. The effects of sustainable agriculture take time to become apparent. Investments are often incremental over multiple years, so results might be slow in coming or difficult to discern. Reduction of area planted will occur only after improvements in yields are attained, which requires significant amounts of time. In our study sites, project managers reported that the effects of sustainable agriculture were not observable for three to five years. As a project develops, it is important to keep this in mind to address potential concerns farmers may have during the initial phases. With agricultural production and yield improvements slow in coming, it will undoubtedly be longer before conservation benefits are apparent.

Establish a flexible system of sustainable agriculture extension that will adapt to local conditions. Sustainable agriculture projects must be based on the needs of local farmers to have any chance of conservation success. In addition, the way an organization works with farmers is extremely important. In some cases, as in Mexico, it may be best to work through local, volunteer promoters. In other cases, as in Guatemala, paid employees may need to be contracted to carry out project activities. When opportunities arise to promote new avenues of extension, such as cross-community exchanges, the implementing organization must be ready to make the most of them.

Integrate sustainable agriculture activities with other interventions that create the conditions for sustainable agriculture to contribute to conservation success. Sustainable agriculture, like most other interventions, will not achieve conservation on its own. Other project activities, such as environmental education or community mobilization, create the conditions necessary for sustainable agriculture to take hold, flourish, and positively affect conservation outcomes. In both Guatemala and Mexico, supplemental project activities led farmers to more readily support sustainable agriculture activities.

Use sustainable agriculture as a bridge approach to conservation — to win the trust and confidence of communities. The bridge approach provides the opportunity for an organization to gain the confidence of a community while promoting the natural links that occur between a particular activity and conservation. In effect, it builds a bridge between an intervention and conservation. In the case of sustainable agriculture, reduction in erosion through the use of cover crops, for example, may also contribute to improved drinking water quality in surrounding rivers and streams. The bridge approach may also create the conditions for future conservation actions. In Guatemala, sustainable agriculture participants formed the nucleus of natural resources management and environmental committees that were established several years into the program.

Use sustainable agriculture as a mechanism to organize communities and help reduce conflict. Sustainable agriculture can serve as a mechanism to organize communities that are highly decentralized or unorganized. In this way, sustainable agriculture contributes to the social and political conditions that are required to interact with and mobilize communities to take conservation action. It can also serve as a neutral opportunity for farmers who do not normally interact to work together to solve problems of mutual concern. In Guatemala, in particular, sustainable agriculture served this purpose.

When implementing sustainable agriculture as a conservation tool, stay focused on conservation! Sustainable agriculture interventions are necessarily highly social endeavors that have many intermediate production, economic, and social outcomes. Because so many of these intermediate social outcomes are required, there is a higher risk that project managers may lose sight of the ultimate conservation goals determined at the beginning of the project. To prevent project managers from being satisfied merely with increased yields, for example, they should constantly have conservation goals at the forefront of their minds.

Process Lessons — Learning to Learn Better

The third goal of this research – primarily BSP's in its role as organizer and facilitator of this project – was to learn how to determine the conditions under which a specific conservation tool works across multiple projects and to determine how to build capacity in local project partners to facilitate their own applied research and learning.

This project proved to be extremely rewarding to those of us who worked on it together. Working as equal partners, BSP, Línea Biósfera, and Defensores de la Naturaleza, with the support of CIFOR, constantly shared ideas, creating a strong, mutual learning environment. During our many meetings to discuss results of the study, honest and constructive exchanges allowed us to determine what was and wasn't working, and why, in the Sierra de las Minas and El Ocote sustainable agriculture programs. We were able to openly discuss successes and failures, and this level of objectivity allowed us to gain a better understanding of the conditions under which sustainable agriculture works as a conservation tool.

Sustainable agriculture projects that are designed to have conservation benefits must remain clearly focused on conservation goals.

This study provided Defensores de la Naturaleza and Línea Biósfera an opportunity to ask specific operational questions about the efficacy of one of their cornerstone programmatic interventions. It also allowed them to figure out the best way of addressing those questions in order to learn how to improve project success. It improved their capacity in applied research design and implementation and in data analysis and communications. It also sparked interest in future research to analyze other pressing issues at each site. This interest was demonstrated by Línea Biósfera's declaration that it would use what it learned from this study to research the effects on conservation of cattle and the opening of new pastures in El Ocote — a threat identified as being perhaps greater than agricultural encroachment. In the Sierra de las Minas, Defensores de la Naturaleza determined it would further investigate the role that expansion of cash crops plays in deforestation in the Reserve.

For candid self-assessments of the programs managed by Línea Biósfera and Defensores de la Naturaleza, see their respective case studies at ***www.BSPonline.org****.*

Based on our final meeting and discussions related to the process of conducting this research, we can recommend the following process principles for conducting similar inquiries.

Focus research on a specific tool. By focusing on a specific tool, we can learn about the conditions under which it is most effective. We can also come up with concrete, operational recommendations for other practitioners around the world to use the tool more effectively in the future.

Design research around the interventions your partners are most interested in learning about. Experience in implementing a specific conservation tool is extremely important. This experience allows project partners to ask the right questions, determine the best way to answer them, interpret the results of the analysis, and put the results to immediate use. Working across multiple sites provides the opportunity to look across many different conditions to determine which are most associated with successful implementation of the tool.

At both of the study sites, partner organizations had at least five years of experience implementing and testing sustainable agriculture – such as the use of velvetbean – as a conservation tool.

Work with project partners that demonstrate a high level of individual and institutional curiosity. Field-based practitioners and organizations that spend most of their time implementing and managing projects often have little time to sit back and analyze what they are doing. But the desire to improve, willingness to question the efficacy of interventions, and drive to learn are all-important ingredients in a successful joint-learning effort.

Involve project partners in all phases of the research. Include all project partners from the beginning of the research project, especially during the conceptualization and design phases. Their questions should drive the research. Constant involvement in the research and responsibility for its successful completion will help keep partners engaged throughout the process. By being involved in all phases of the research, project partners will more likely see the benefit and utility of the results and put them to good use.

Identify potential gaps in capacity and plan to fill them early on. In any joint-learning endeavor, there will be gaps in capacity to carry the work through to the end. Be prepared to fill these gaps with additional training or technical assistance. By building capacity throughout the research cycle, partner organizations will be able to conduct the research on their own in the future. If possible, work

with partners that have similar research-related skill levels to ensure that partners move through the learning process in unison. We discovered that the aspect of research most likely to be deficient in partner organizations is data analysis. If you intend to contract someone from outside to assist in data handling and analysis, hire this person at the beginning of the project so he or she can participate in the design, planning, and implementation of the research.

Select sites to be included in the study in a systematic and precise fashion to obtain specific principles. Developing the sampling framework for the study is key. To obtain relatively precise principles, you must limit your sample so you can control for potentially confounding factors that may affect the outcome of interest. To obtain principles that are also generalizable, however, your sample must be large enough to be able to look across a range of important conditions. By including multiple sites in your sample, you can vary the circumstances you are studying in order to determine the conditions under which the conservation tool of interest is most effective.

Standardize data-collection instruments and methods and analytical approaches in order to learn across sites. To learn across sites effectively, data must be collected and analyzed in a standardized fashion. To standardize approaches and instruments it is crucial to have as much time to interact as possible. To increase the power of the analysis you wish to conduct, it is essential to collect and analyze the same variables using the same analytical and statistical tools.

Develop an agreed-upon learning framework that maps out the questions you will ask, the way you will research and analyze the questions, and the results you hope to communicate. Developing a learning framework at the beginning serves as a guide throughout the life of the research project. When in doubt, project partners can always refer back to the learning framework to orient their work. This provides partners the opportunity to avoid miscommunication and misunderstandings about the goals or approach of the research. The framework must, however, be flexible. You must be prepared to modify it based on the reality of the situation as you collect and analyze data.

Develop and stick to a mutually agreed-upon workplan and timeline. Coordinating this type of research is extremely challenging. Multiple partners, sites, and instruments all add to the need to develop and adhere to a common workplan. As research moves through various phases — design, data collection, analysis, communication — it is important to keep the process going at a steady rate. We found that periodic field visits and meetings helped keep us on track throughout the learning process. We also found, however, that competing job responsibilities meant that project partners were not always available to work on this project, which caused costly delays. Managing and sticking to the workplan is especially critical for the organization that takes on the responsibility of facilitating and coordinating the learning project.

Try to keep it simple. Plan to ask what you believe to be relatively easy operational questions. We guarantee that, as you move through the learning process with multiple partners and sites, the challenge to effectively address your questions will become increasingly difficult and complex!

Conclusions and Next Steps

This project has clearly demonstrated that sustainable agriculture does not always have its intended impact. But no tool or strategy is ever completely and singularly effective in meeting conservation goals. The purpose of this study was not to prove that sustainable agriculture works or does not work. Rather, we undertook this research to determine the conditions under which sustainable agriculture serves as an effective conservation tool. The results included in this publication shed some light on these conditions.

In recent years, some conservation organizations have begun to use agroforestry as a way to increase crop yields, promote cash crops, and conserve biodiversity.

This research project also was designed to develop concrete guidance for practitioners around the world who are working with sustainable agriculture. We have addressed this goal by distilling relevant principles from our analysis. We hope they prove useful.

Finally, we had hoped to learn the best way to go about asking and answering important operational questions in conservation. During the research process, we learned many things about how to work effectively across a portfolio of projects to learn most effectively. Our learning on this theme is summarized in the process principles we present in the preceding section.

This research has generated a number of questions that conservation practitioners must address to advance our collective understanding of how to best integrate agriculture interventions into conservation projects. These questions include the following:

- What role does sustainable agriculture play in reducing deforestation and other threats when cash crops such as coffee and cardamom are involved?
- What role does household ownership of cattle play in deforestation in tropical forest areas, and how can sustainable agriculture be used as a tool to address this issue?
- Since one of the major contributions of sustainable agriculture to conservation is fire prevention, are there approaches to this goal that will engage farmers more quickly than aiming to reduce rates of deforestation through increased yields? Can we promote techniques that require less labor and that allow farmers to see more immediate results so that the effects on fire prevention are even more extensive and immediate?
- To what extent does sustainable agriculture affect other conservation-related issues such as emigration from communities to fragile forested lands? Do the investments that sustainable agriculture requires serve to encourage farmers to remain on their land rather than leaving their community in search of more productive areas?