

Property Rights, Environmental Services and Poverty in Indonesia

A research proposal submitted to the BASIS CRSP by Michigan State University in cooperation with the World Agroforestry Centre (ICRAF), the International Food Policy Research Institute (IFPRI), and the University of Lampung, Indonesia

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Abstract

Rewards for environmental services (RES) have potential to maintain flows of environmental services while providing marginalized social groups with greater opportunities to generate income, obtain more secure property rights, and be included in environmental governance processes. This document proposes research on rewards for environmental services related to watershed management and carbon sequestration in two sites in Indonesia. Both are sites where substantial research and development has already been undertaken by ICRAF with Indonesian collaborators under the IFAD-funded program, Rewarding the Upland Poor for Environmental Services (RUPES). This project will identify factors affecting which communities and households benefit from such rewards, assess the household impacts of such rewards, and guide the design of reward mechanisms to provide greatest benefits for the poor. The research combines qualitative and quantitative methods, building upon other components of the RUPES program and the different disciplinary strengths of the research partners from Michigan State University, ICRAF, IFPRI and Lampung University. Two graduate students from Lampung University will be trained to MSc level. The project will support USAID's strategic priorities in Indonesia. The RUPES network will facilitate the dissemination of outputs throughout Asia.

Project Narrative

1. Introduction

In a recent *Science* article, Balmford et al. (2002) estimated a global benefit-cost ratio of approximately 100:1 in favor of conserving key ecosystems, species and resources. Market failures are the chief reason why these returns are not realized. While it is clearly recognized that markets for environmental services will remain imperfect, there is strong interest in harnessing market mechanisms to better match the demand for environmental services with the incentives of the land users whose actions modify supplies of environmental services. Potential benefits of such approaches include improved resource conservation, more sustainable sources of conservation finance, greater environmental justice in the distribution of conservation benefits and costs, and new and sustainable sources of income for poor people in developing countries.

The last decade has seen a rapid increase in interest in payment for environmental services (PES) such as biological diversity conservation, carbon sequestration and watershed protection, particularly in developing countries. A number of experimental programs have been initiated, many with startup finance from private foundations (e.g. Shell Foundation, FACE Foundation, Mercedes-Benz, Dow Company Foundation) and support from development agencies including USAID. The United Nations Framework Convention on Climate Change (UNFCCC) is generating new interest in PES mechanisms that reward countries for reducing net carbon emissions.

While high profile payment for environmental service programs have emerged in Costa Rica and other Latin American countries, elsewhere in the developing world they remain uncommon. Problems of identifying and measuring environmental services remain a challenge in many contexts, and hopes for using PES to benefit poor people are balanced by fears that the

mechanisms might bypass poor land users or even make them worse off. Challenges related to high transaction costs of dealing with small landholders and the unclear property rights in areas with high conservation value would need to be overcome. Moreover, where land rights are unclear, there are concerns that PES systems might compel powerful people to usurp otherwise marginal lands and evict poor land users.

A range of PES mechanisms are operating in developing countries, particularly in Latin America, but they are still nascent in Asia. The RUPES (Rewarding Upland Poor for Environmental Services) project was established in 2001 to address possibilities for these mechanisms in Asia, with particular emphasis on potential for the upland poor to benefit. RUPES is led by ICRAF's regional office in Indonesia with major funding from the International Fund for Agricultural Development (IFAD). The RUPES project is working with international, national and local partners in building working models of best practices for environmental transfer agreements adapted to the Asian context. It conducts action research at sites across Asia to examine the provision of environmental services, who benefits, who pays, and the institutional and policy environment to enable fair and equitable distribution. Special attention is given to the ecological basis of environmental service agreements: payments should be based on real cause-effect relations between land use and environmental services. The RUPES program takes an inclusive view on payment, including rewards that provide upland farmers with enhanced land tenure security in exchange for following land use agreements. To distinguish that broader class of mechanisms, we follow RUPES in referring to Rewards for Environmental Services (RES) rather than the narrower Payment for Environmental Services (PES). (www.worldagroforestrycentre.org/sea/Networks/RUPES).

The accumulated and ongoing experience of RUPES provides an excellent opportunity

for value-added research under the BASIS CRSP. This proposal presents a research program to investigate 1) the social-spatial placement of RES mechanisms, 2) the within-village distribution of costs and benefits of RES mechanisms, particularly those related to enhanced property rights, and 3) the most appropriate institutional mechanisms to enhance the benefits of RES mechanisms for the poor. The research program will be conducted in RUPES sites in Lampung and West Sumatra, Indonesia, where RES mechanisms are being put in place for watershed protection and carbon sequestration services. The research program will be a partnership between Michigan State University (MSU), the International Food Policy Research Institute (IFPRI), the World Agroforestry Centre (International Center for Research on Agroforestry -- ICRAF), and the University of Lampung.

The *central hypothesis* of this research is that environmental service reward mechanisms may provide marginalized social groups with new opportunities for generating income, obtaining more secure rights to land and water, and being included in environmental governance processes. There are *three ancillary hypotheses*. First, due to limited spread of information and incomplete appreciation of the opportunities, there is a tendency for RES mechanisms to be located in communities with high levels of interaction with the outside world, with their ability to actually efficiently provide the environmental service only as a secondary criterion. Second, there is a tendency for the benefits of RES to be captured by well-advantaged households within communities. Third, RES mechanisms can be designed to reduce or overcome these tendencies. The research will revolve around these hypotheses.

The research will target all three priority concerns of the BASIS CRSP through its focus on an institutional innovation designed to help poor people break constraints to asset accumulation by gaining better access to capital, while enhancing their use of land, water and labor and

protecting environmentally sensitive areas. Research findings will be of immediate relevance to the design of the RES mechanisms in the two sites and contribute to analysis and design of RES mechanisms across Indonesia and other parts of Asia through the RUPES network. The sites and focus of the research match USAID's new country strategy for Indonesia (USAID 2004).

2. Research Issues and Theoretical Concerns

Environmental service reward mechanisms generally entail some shift in attitude toward rural people whose resource uses effect the environment. Traditionally, rural people living in or near protected areas have been viewed as troublesome squatters; evicting them or sharply curtailing their land use activities (through "fines and fences" approaches) were seen as the best way to improve land management. Rewards for environmental services represent a fundamental shift in perspective, with rural land users treated as land stewards who should be compensated for providing positive externalities.

Rewards for environmental services builds on the idea of creating goodwill with residents of environmentally sensitive areas and takes the additional step of providing those residents with incentives to protect the landscape. While this represents an improvement over previous approaches to protected area management, RES approaches introduce challenges of their own. One of the key challenges is that performance-based payments require the quantification of environmental services. RUPES is leading ecological assessment efforts that will provide the proposed BASIS research with a solid foundation of cause-effect relationships.

2.1 Endogeneity of Program Placement

RES systems are in their infancy and will require a lot of work to expand widely and function effectively. They presently offer an additional income source for a small number of communities participating in RES programs. How are program locations selected? Program

sites could be chosen to maximize the provision of environmental services, minimize the destruction of environmental services, or maximize the contribution to poverty reduction. A more skeptical political economy view, on the other hand, would suggest that enterprising communities or individuals will try to position themselves to capture the potential rewards from RES mechanisms. Communities best able to capture those rewards might be those that are able to mobilize the collective action necessary to ensure compliance with land use requirements. In addition, program managers might be drawn to some potential partners on the basis of considerations not strictly consistent with criteria related to expected program performance. In the initial phases of RES programs, lack of information on existing opportunities may lead to choices based on the existence of ‘links’ rather than on the strength of their ES provision *per se*. It will be important to consider this for the RUPES program, which seeks to draw general lessons from a limited number of action research sites.

The concepts of bridging and bonding social capital (Krishna, 2002) are helpful in analyzing the conditions under which communities can attract RES programs and meet the requirements of those programs. Bridging social capital – the ability of a group to establish links with other groups – may be needed to attract programs. Bonding social capital – cohesion of a group and the ability to work together – may enable a community to meet program requirements.

2.2 Who Gains and Who Loses?

Theory suggests, and experience shows, that RES mechanisms may favor larger landholders at the expense of small ones. In some areas included in Costa Rica’s PES program, for example, the majority of contracts were signed with large landowners: in some areas the top 3% of the population in terms of land holdings accounted for the majority of contracts (Subak 2000). International and national institutions and convention that govern PES are often designed in

ways that produce such outcomes.

First, where RES systems are organized as markets, large buyers will be drawn to large suppliers to reduce transaction costs. Collective action may provide a mechanism for farmers to coordinate over a large area to provide environmental services and reduce transaction costs. However, the nature of the environmental services will influence the scale and type of collective action needed, the bargaining power of smallholders, and the investment or reinvestment requirements. One of ICRAF's objectives in the RUPES program is to develop reliable assessment methods that can reduce transaction costs associated with RES mechanisms.

Second, many smallholders may have difficulty participating in an environmental services market because they must meet subsistence production requirements from small land areas and cannot afford to set aside part of their land in a long term contractual arrangement. This would be a major concern for ES contracts requiring that land be left under natural vegetation. Evidence generated through the Alternatives to Slash and Burn Program (ASB), however, suggests that multistrata agroforestry systems can generate acceptable levels of environmental services and reasonable returns to land and labor (Tomich et al., 2001).

RES mechanisms may also favor land users who have clear and secure property rights, a condition that may be associated with relative prosperity within a village. Many RES mechanisms that link private purchasers with ES providers are supported by contracts that increase accountability for performance of agreed-upon actions. Such requirements may in fact exclude groups of people and even countries from environmental service mechanisms. For example, the constitution of Ethiopia prohibits individual freehold title to land. However, there is no conceptual reason why RES should be limited to individual contracts. Contracts with individual farmers will require individual property rights, while contracts with farmer groups may be more ef-

fectively secured with group rights. Indeed, group title may be more effective for environmental services that have minimum scale and threshold effects, such as biodiversity conservation.

Insecure tenure may have the effect of excluding poor and marginalized populations from land with potential for ES provision. Greig-Grann and Bann (2003, p. 37) caution that if communities do not have secure rights in an area suited for RES mechanism, then it is possible that other more connected people will take over. Many countries consider the vast majority of their forest land as state-owned even if it is settled (White and Martin 2002), and private landowners often allow peasants access to their lands for forage and fuel (Wunder 2000: 41). It is easy to envision settlers being evicted when RES makes the land more valuable to landlords or other powerful people.

On the other hand, the necessity to have secure property rights may encourage agencies involved in the formulation of RES schemes to facilitate secure property rights. Grieg-Grann and Bann (2003, p. 37) note that “there are already signs that market development has spurred forest land tenure formalization in some disadvantaged communities in Bolivia, Costa Rica, Ecuador and India.” In the RUPES context, tenure security is used as a reward for environmental services in Sumberjaya, Indonesia, one of the study sites for the proposed research.

A final concern about the distribution of gains and losses from RES concerns possible indirect effects associated with land use changes. Changes in land use and livelihood strategies in response to RES mechanisms will change the allocation of land, labor, and capital, and potentially change the scarcity and prices of these factors of production. It is not known how such changes will affect the poor.

3. Research questions

These concerns lead to the following key questions for the proposed research:

1. What factors determine which communities obtain RES mechanisms? To what extent is program placement endogenous, favoring better-connected communities? Addressing this question requires asking three sub-questions: a) Which locations make the most sense from the perspective of efficiently supplying environmental services? b) What are the roles of intermediary organizations – which communities do NGOs, ICRAF and others approach for RES mechanisms? What role does bridging social capital play in this, i.e., are communities with more external connections more likely to participate? c) Which communities accept RES mechanisms, and in which communities do they work? What role does bonding social capital play in this? For example, does the community have to have strong internal coherence, and willingness to accept communal land rights, rather than insisting on individual rights?
2. Who gains and who loses from the introduction of RES? What changes in livelihood strategies occur as a result of changes in allocation of land, labor, and capital that result from introduction of RES? What particular issues arise when the reward mechanism involves secure land rights as opposed to monetary payments?
3. What institutional innovations and arrangements would facilitate greater participation among the poor and greater benefits for them? Pertinent subquestions include: a) What types of rewards are most preferred by potential providers of environmental services, and how do preferences vary within and across communities? b) What level of monetary payment will potential providers of environmental services require to participate in a RES program, and how does this vary within and across communities? c) What are the strengths and weaknesses of alternative institutional arrangements related to transaction costs, communication, conflict management, and enforcement of rules? (This question is now being addressed in other RUPES research in the two study sites and will not be a major focus of the BASIS project.)

4. Setting

The proposed research will be conducted at RUPES's action research sites at Singakarak Lake, West Sumatra Province, and Sumberjaya, Lampung Province, both on the island of Sumatra in Indonesia. In Sumberjaya – a site of past conflicts over evictions and increasing poverty – the RUPES project is examining environmental service rewards for watershed functions, with domestic water users and hydropower producers as the demanders of water quality and migrant farmers without land tenure as the providers of watershed services. The RUPES project is undertaking research to better understand and support the provision of (1) land tenure security for farmers to plant trees and protect the remaining forest, (2) monetary rewards for upland people for delivering (drinking) water quality for people living lower in the subcatchment, and (3) community development of riparian vegetation.

Clear land ownership and community involvement in managing forests are key determinants in securing sustainable land management in the Sumberjaya area. A recent study in Lampung by Suyanto et al. (2004) revealed that, even with the use of military force, forest policy and management largely failed to protect forest resources when local communities were not involved. In contrast, in 2000 the government initiated its *Hutan Kemasyarakatan* (Community Forestry) program, known as HKm. Under HKm, local communities have successfully rehabilitated degraded land, including land designated as state forest area, through establishment of coffee based agroforestry. The main incentive for local communities to manage land more sustainably was the expectation of more secure land rights to state forestland. In such circumstances, there is room for negotiation between the government forestry department and local communities. This indicates that land rights for local communities on state forestland can be used as a “reward” for upland farmers for their role in maintaining environmental services of forest land.

Unlike Sumberjaya, the Singkarak Lake site has a strong base of local institutions. ICRAF is working with the local people's organization and Bogor Agricultural University to examine the links between land use, provision of watershed protection and the potential for carbon sequestration. Currently the hydroelectric plant that uses lake water makes payments to the local government that have an element of reward for maintaining watershed services such as buffering and water quality. RUPES's work at the site involves developing the information and capacity required to negotiate environmental service transfer agreements, taking into account the needs of both providers (smallholder farmers) and buyers (hydroelectric company, forestry department) of the environmental service.

Land tenure in Singkarak Lake is secure and controlled under traditional customary (*nagari*) rule, which was recently revived in this area. As a result, tenure security is not an appropriate reward for environmental services in Singkarak. The RES mechanism under consideration is the redirection of current revenue paid by the hydroelectric authority as a tax for surface and subsurface water to the local community and the providers of the environmental service.

5. Study Design

The questions to be addressed in this project require a combination of qualitative and quantitative research methods, integrated with ICRAF's biophysical modeling work and the action research approach of the RUPES partners in the two sites. The research proposed to be conducted through BASIS will consist of the following activities:

5.1 Activity 1: Qualitative Investigation of Determinants of RES Program Placement (Research question 1)

Current biophysical modeling research under RUPES yields insights about the most appropriate locations for PES programs from the standpoint of potential to yield environmental services. Research proposed under BASIS will augment the modeling with improved under-

standing of the social-political factors that influence program placement.

The investigation of the determinants of program placement will follow a qualitative approach with four parts. Qualitative research will provide in-depth understanding of how program managers decide where to install a program and villagers decide whether to participate. Quantitative investigation is not feasible given the small number of program sites.

Key informant interviews with external/intermediary organizations: To identify which communities have been offered and not offered RES, we will begin by interviewing those who have been involved in designing such programs to identify the locations that can provide the services that are being demanded, and to identify other eligibility criteria. Potential respondents include the staff of government agencies, NGOs, universities, and ICRAF/RUPES who participated in program development. Particular attention will be given to social or other connections between the intermediary organizations and the participating communities.

Key informant interviews with village leaders: Corresponding information will be collected from village leaders and agents who have been involved in RES program development. This will focus on the role of particular villagers in either seeking out RES, negotiating the terms of RES mechanisms, and selecting villagers to participate. Characteristics of key individuals will be identified by their wealth, standing in the community, internal and external social networks, and the strategies they use to obtain RES. If any communities have been offered and rejected RES, we will also seek out key informants in these sites to identify reasons for not participating.

Focus group interviews in participating communities: To supplement the perspective of village leaders and agents, we will conduct focus group interviews in each study village to discuss how the project is managed within the community and obtain views on the program, including:

- social organizations in the village, past experiences with collective action and with out-

side agencies, and any role they have had in implementation of RES mechanisms;

- views on tenure security in the village, the history of previous enforcement of state property, evictions and the effects that has had;
- actual and potential impacts community members identify from the program (to be followed up in the household surveys).

Analysis of networks and the role of social capital: We will use information from the key informant interviews, focus groups, and household surveys to identify the networks among village agents and intermediary organizations, and roles those networks have played in the placement of RES programs. In particular we will examine whether communities with more external connections and bridging social capital are more likely to participate. Indicators of social organizations, past experience with collective action, and various forms of social capital from the focus groups will be combined with indicators of bonding social capital from the household surveys (following Krishna 2002). They will be used to examine the role and importance of bonding social capital in the development and implementation of the programs, particularly in securing agreement to participate and in reducing transaction costs in implementation. We will build upon the methods used by Geran (2000) to show how internally and externally oriented linkages play a role in the placement of programs within communities.

5.2 Activity 2. Household survey and analysis of impacts of land rights for social forestry program (HKm) in Sumberjaya watershed (Research question 2)

To assess the distribution of benefits and costs and poverty impacts of the HKm program, a household survey will be conducted in 10 villages in the Sumberjaya watershed, using a quasi-experimental survey and analysis design that builds on the approach of Pitt and Khandker (1998). The quantitative survey will be complemented by qualitative focus group and key informant interviews in the program villages to identify factors affecting who participates in the

program, with particular emphasis on assets, human and social capital. The criteria distinguishing program participants from non-participants will be used to stratify the sample selected in non-program communities to enhance the statistical power of the quasi-experimental design.

Data collection approach

The sample of villages will include all 5 villages in the Sumberjaya watershed where farmer groups are currently participating in the HKm program and 5 villages where the HKm program is not operating. Non-participating villages will be selected to be as similar as possible to participating villages in terms of agricultural potential, access to markets and infrastructure, population density, and average household wealth. Within each selected program village, a stratified random sample of about 50 households will be selected for the survey: 25 members of a group participating in the HKm program, and 25 of who are not. Based upon initial key informant and group interviews, researchers will identify any eligibility criteria determining participation. If such criteria are not clearly identified, analysis of the survey in program villages will be used to identify exogenous factors that distinguish participants from non-participants, as discussed below.

The criteria or factors will be used to select a stratified sample in the non-program communities, with the population of these communities stratified between those eligible (or likely to participate if an exogenous eligibility criterion is not identified) for the program and those ineligible (or not likely to participate). The purpose of this stratification will be to produce comparator groups that are as similar as possible to program participants and non-participants in the program communities.

The survey will collect information on households' endowments of physical, natural,

human, financial and social capital prior to inception of the HKM program and at the beginning of the survey year, their livelihood strategies (allocation of land, labor and capital to different activities) during the survey year, and their income during the survey year.

Analysis strategy

The direct impact of participants of participating in the HKM program may be thought of as the net income earned from social forestry activities associated with the program. However, the program may have many indirect effects, both on program participants and non-participants. For example, participants may be induced to change the way they allocate land, labor and capital (i.e., change their livelihood strategy) as a result of participation. Changes in labor allocation or land investments may also affect factor availability and costs of non-participants (e.g., reduced access to forest land, changes in wages, etc.), affecting their behavior and incomes.

We will use an econometric approach to estimate impacts on program participants. The basic model to be estimated is:

$$y_{vi} = \alpha_v + \beta P_{vi} + \gamma X_{vi} + \chi P_{vi} X_{vi} + u_{vi} \quad (1)$$

where y_{vi} is the response or outcome of interest for household i in village v (e.g., the livelihood strategy, income from different activities), P_{vi} indicates whether the household participated in the HKM program, X_{vi} is a vector of household endowments determining its livelihood strategy and income, α_v , β , γ , and χ are parameters to be estimated, and u_{vi} represents unobserved random factors influencing y_{vi} . β measures the impact of participating in the program relative to non-participants in the program villages, and χ measures the extent to which these program effects depend on household endowments. Based on the results of estimating this equation, the impacts of the program on participants of different wealth levels in affected villages will be predicted.

The main econometric problem in estimating equation (1) is the endogeneity of program placement and household participation (P_{vi}), which can cause these variables to be correlated with the error term. This problem is addressed by including village level fixed effects (α_v), which control for all fixed differences across villages, including any factors determining program placement (Pitt and Khandker 1998). Maximum likelihood estimation will be used to account for the endogenous determination of P_{vi} . The equation determining P_{vi} will be specified as follows:

$$P_{vi} = 1 \text{ if } \theta Z_{vi} + v_{vi} \geq 0; \quad P_{vi} = 0 \text{ otherwise} \quad (2)$$

where Z_{vi} is a vector of household level factors determining household participation, θ is a vector of parameters to be estimated, and v_{vi} represents unobserved random factors affecting these decisions. As shown by Pitt and Khandker (1998), identification of the model parameters is possible due to the quasi-experimental design, provided that the sample includes households in the program villages that are not participating in the program and households in non-program villages, and that some exogenous factors determine household participation. The likelihood function will account for possible correlation between u_{vi} and v_{vi} .

5.3 Activity 3: Tradeoffs in the design of environmental service mechanisms (Research question 3a)

Environmental service rewards can take several different forms, from monetary payments, to enhanced tenure security, to public services, and agricultural extension. In the Sumberjaya site, the main payment at present is enhanced land tenure security, although the action research component of the RUPES project is fostering discussions about the possibility of using community and household-based payments for following agreed land use patterns. These payments may be land or labour-based. This project provides an opportunity to inform those discussions with information about participants' preferences for different types of rewards. Conjoint analysis will be used to generate that information.

Conjoint analysis is a quantitative technique that can be used to determine respondents' preferences for the multiple attributes of a product or service. The conceptual foundation of conjoint analysis is Lancaster consumer theory (1991), which assumes that utility is derived from the properties or attributes of goods. Data for a conjoint study are generated through a survey in which respondents are asked to rate realistic but hypothetical products that have alternative levels of important attributes. Tradeoffs among attributes can be quantified and estimates developed for the marginal value of specified levels of the attributes. The survey data can also be analyzed to test whether there are significant differences in preferences among groups of respondents (Tano et al, 2003).

We propose that the utility that an individual will derive from a given reward mechanism will be a function of the attributes of the mechanism, the individual's characteristics, and interactions between attributes of the mechanism and their personal characteristics. The general form of the empirical model is as follows:

$$R = \alpha + X\beta + Y\lambda + e$$

Where R is a vector of preference ratings (0, 1, 2 ..., n), X is a vector of non-stochastic variables capturing the levels of the attributes, Y is a vector of non-stochastic variables capturing the interaction between the levels of the attributes and the respondent's personal characteristics, β is a vector of marginal utilities for the levels of the attributes, λ is a vector of marginal impacts of the interaction between the attributes and the respondent's personal characteristics, and e is a disturbance term. The marginal values β and λ are estimated from observations on R, X and Y, using a discrete choice estimator such as ordered probit (Tano et al., 2003).

Data collection approach

The study will be conducted in both study sites and will focus on the design of new RES

mechanisms. Key informant and group interviews will be conducted with potential suppliers of environmental services (ie upland farmers), intermediaries (eg NGOs, Forest Department), and potential demanders of environmental services (eg hydroelectric power company) to determine the types of mechanisms which are most likely to be compatible with the incentives and expectations of different stakeholder groups, the key attributes of those mechanisms, and the characteristics of the respondents likely to shape their preferences. Choices will need to be made regarding the relevant levels of each attribute and the characteristics of the respondents that discriminate them into sub-groups.

Profiles of a limited number of feasible RES mechanisms, incorporating different combinations of attribute values, will be developed. To best communicate with illiterate persons, the profiles will be displayed using simple verbal descriptions and drawings (following Tano et al., 2003). In Sumberjaya, the survey will be administered to a sub-sample of 200 of the households involved in the survey described in activity 2 and in Singkarak a stratified random sample of 200 households will be selected. Respondents will be asked to rate about 8 of the RES profiles, using a scale of 1 to 8. An ordered probit model will be estimated, with rating as the dependent variable and attributes and the interaction of attributes with respondent characteristics as explanatory variables. Results will illustrate attributes of greatest importance to the samples in each study site and the way that preferences vary across key sub-groups, including people of different welfare and livelihood characteristics.

5.4 Activity 4. Ex ante evaluation of willingness to accept monetary compensation for providing additional environmental services (Research question 3b)

The conjoint analysis described in 5.3 will establish participants' preferences for different forms of compensation and the way that participants' tradeoff monetary payments with other forms of payment. A willingness-to-accept (WTA) study will be conducted in the same villages

in the two sites in order to estimate the monetary amounts that potential providers of these services would require in order to participate in a program that restricted their land uses. These amounts can be compared with the funds that would actually be available through different payment mechanisms. The WTA study will also evaluate how willingness to accept is influenced by household characteristics, such as wealth and forms of land tenure. Care will be taken in the study design to ensure that the results of the conjoint analysis and WTA are complementary and not biased. The surveys may be conducted with the same households or different households.

Data collection approach

It is well recognized that contingent valuation techniques require a good deal of background information and pre-testing if data collection is to avoid potential biases of understanding / cognition, framing, starting point and strategic positioning (DeShazo, 2002). To avoid that bias, it will be important to make WTA questions as simple and clear as possible. Most research suggests that the dichotomous-choice approach is most readily understood by respondents (Mitchell & Carson, 1989; in a developing country context, Altaf and Hughes 1994), and we will follow this approach. Furthermore, many people are already familiar with the concept of payment for environmental services, having been either directly involved with programs such as the HKm, paying for maintenance of domestic water supplies, etc. And, we expect that respondents will easily understand the required changes in land use practices and/or investments needed to participate in the program. For all of these reasons, biases associated with understanding/cognition should be mitigated.

Two dichotomous choice formats that will be extensively pre-tested in order to evaluate which is better suited to our case study context: dichotomous choice questions followed by lower bound or by second-round dichotomous choice questions. The 1½ bounded approach has

the benefit that, even if it appears that a second-round question suffers some type of bias, an analysis can still be more easily undertaken on the first-round response data only, as the two starting bid values are chosen to represent best “guesstimates” of higher and lower bounds. On the other hand, if we use the first approach, the two starting bid values will both be toward the lower end.

Analysis strategy

The WTA is a measure of equivalent variation. From the standard respondent’s optimization problem, we can then state the following:

$$\Pr(\text{Yes}) = \Pr\{v[Y+P, E^1; p, Z^{HH}] + \varepsilon_1 \geq v[Y, E^0; p, Z^{HH}] + \varepsilon_0 \text{ or}$$

$$\Pr(\text{Yes}) = \Pr\{ \varepsilon_1 - \varepsilon_0 \geq v[Y, E^0; p, Z^{HH}] - v[Y+P, E^1; p, Z^{HH}] \}.$$

where $v[\cdot]$ is the indirect utility function, Y is income, E^1 is the proposed value of environmental services provided, E^0 is the current level of environmental services provided, p is a vector of market prices, and Z^{HH} is a vector of household characteristics. The probability can be expressed:

$$\Pr(\text{Yes}) = F_{\eta}(\Delta v)$$

where $F_{\eta}(\cdot)$ is the cumulative distribution function of η , $\eta \equiv \varepsilon_1 - \varepsilon_0$, and $\Delta v \equiv v[Y+P, E^1; p, Z^{HH}] - v[Y, E^0; p, Z^{HH}]$ (Freeman III, 1993; Hanemann, 1984). We can thus analyze the first-question responses using standard probit or logit models. To analyze the initial and follow-up question responses, we will use the model developed by Cameron and Quiggin (1994). Whether or not a respondent answers a second question depends on his/her response to the first question; thus the second-stage response is endogenous and a bi-variate probit (or logit) model can be employed.

6. Significance and Relevance to USAID Mission Objectives

USAID/Indonesia, in its recently released draft strategy for “Strengthening a Moderate, Stable and Productive Indonesia” refers to its “special objective” to maintain healthy ecosystems.

USAID/Indonesia is supporting local governments and communities to create partnerships for the co-management of natural areas. It is felt that this participation in land use planning decision-making will result in resolving land tenure and access issues that now result in conflict. USAID/Indonesia is also supporting activities in forestry to broaden access to forestry benefits for forest dwelling communities. This will be partially accomplished through the reforestation of degraded forestlands through replanting and agroforestry.

Although USAID will provide an integrated package of activities in a core set of districts, more focused activities will be implemented in geographic areas where the potential for significant impact is high. West Sumatra (Singkarak Lake) is one of USAID's high priority provinces. Results from this study will help USAID/Indonesia to determine how RES mechanisms might simultaneously meet their program objectives for ecosystem management, conflict resolution, and landscape restoration. The study design, progress with implementation and preliminary results will be shared with the USAID/Indonesia mission periodically during the course of the study.

7. References

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Outputs

The project will produce several outputs:

- A report on the factors determining PES program placement and effectiveness, including the role of bridging and bonding social capital, based upon the qualitative analysis under Activity 1.
- A report on the household level impacts of the HKm approach to rewarding environmental services, based on the survey analysis under Activity 2.
- A one-week training course for Indonesian scientists in theory and application of conjoint analysis held at Lampung University.
- At least two masters theses by Indonesian graduate students and a synthesis report on tradeoffs associated with the design of RES mechanisms under Activity 3.
- A report on households' willingness to accept alternative rewards for providing environmental services in the study sites, based on the analysis described under Activity 3.1.
- Several study teams trained in methods of qualitative and quantitative data collection and analysis related to social capital and provision of environmental services.
- Dissemination of research findings through local stakeholder workshops, publications, materials on internet sites, and presentations at international fora.

Timeline

Activity 1

Key informant interviews will be conducted throughout the course of the research, with initial interviews conducted to ensure good understanding of the program and its implementation. Separate field teams of two to four people will be convened in the two study sites, with input from key national collaborators and supervision from Suyanto. The teams will be trained in the field methods during the first month of the project. Interviews with the village representative groups will be conducted during months two, three and four of the first year and the outputs will be used to guide the development of the household survey instrument and sampling procedure used in Activity 2. The supervisor of the field team will then continue to conduct the focus group interviews and the historical analysis. The principal investigators will be involved in many of the key informant interviews.

Activity 2

The initial key informant and focus group interviews under Activity 1 will be used to help guide the development of the survey instrument and selection criteria in the non-program villages (if clear eligibility criteria for participation in HKm are identified). The survey will be implemented first in the program villages, requiring about two to three months. Initial data cleaning and

analysis, to enable identification of the stratification variables to be used in the non-program villages (if necessary, in case a simple eligibility criterion is not identified) will require about two months. Concurrently with this process, analysis of GIS and other secondary data will enable identification of a population of non-program villages that are similar to the program villages, which will be used for selection of the sample of non-program villages. A short census will then be implemented in the non-program villages to collect information on the variables to be used in stratifying the sample (between likely participants and non-participants); this is expected to require about one month. Implementation of the survey in the non-program communities will then require about two to three months. By the time the survey is completed in the non-program communities, final data checking and cleaning should be completed for the program communities, and an additional two to three months may be needed to complete cleaning of the data from the non-program communities. The draft report is expected to be completed by the 18th month of the project, and will be presented to stakeholders in Indonesia and at IFPRI. Based on feedback received, the report will be revised and submitted for publication, and publications subsequently disseminated.

Activity 3

This activity will be conducted through engagement with graduate students at Lampung University and possibly another Indonesian university. Modular training in conjoint analysis will be provided as a short course at Lampung University and two Indonesian graduate students selected to implement the field studies and analysis in Sumberjaya and Singkarak. Data collection for the conjoint analysis studies will be integrated with the contingent valuation study described in activity 4. In Sumberjaya, this will require a followup survey in the same study villages as those involved in activity 2, possibly with the same households. In Singkarak, a new household survey with both the conjoint analysis and contingent valuation components will be implemented in a random sample of households that are actual / potential participants in the RES mechanisms that are under development. As with the contingent valuation survey, enumerator training will be very important.

Activity 4

The time frame for this activity largely coincides with the survey described under Activity 2 in Sumberjaya and Activity 3 in Singkarak. Three additional steps need to be mentioned here. First, we need to include a specific step for recovering estimates of the distribution of willingness to accept from secondary data on land use and production costs, costs of certain forestry, agroforestry and other revegetation techniques, and from the key informant and focus group interviews. Second, pre-testing of the hypothetical questions should also occur in the second month, but concurrently with the rest of the survey. This would enable many more households to be included in the pre-test phase, since the two questions with follow-up should only take about 8-12 minutes to complete (in addition to the general discussion preceding any questions). Finally, a separate enumerator training will have to be undertaken; enumerator bias is often problematic in implementing contingent valuation surveys, as some enumerators expose, or impose, their values thereby leading to biased “responses.”

TIMELINE TABLES

Table 1. Schedule of activities for analysis of program placement (Activity 1)

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Assemble and train field assistants and finalize format of semi open-ended questions	x	x																						
Key informant interviews with external/intermediary organizations		x	x	x																				
Key informant interviews with village leaders			x	x	x																			
Focus group interviews in participating communities			x	x	x																			
Analysis of networks and the role of social capital				x	x	x	x																	
Preparation of a working paper to summarize results							x	x	x	x														
Presentation of results to local stakeholders										x														
Preparation of a journal manuscript and papers for international conferences										x	x	x												

Table 2. Schedule of survey activities (Activities 2 and 4)

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Key informant/focus group interviews	x																							
Develop survey instruments and pretest in Sumberjaya		x	x																					
Train enumerators in implementing the survey			x																					
Implement survey in program villages in Sumberjaya			x	x	x	x																		
Data entry and cleaning for program villages						x	x	x	x	x	x	x												
GIS/secondary data analysis to identify non-program villages	x	x	x	x	x	x																		
Select non-program villages in Sumberjaya							x																	
Census of non-program villages in Sumberjaya to collect stratification variables								x																
Stratify households and select sample in non-program villages									x															
Implement survey in non-program villages in Sumberjaya										x	x	x												
Data entry and cleaning for non-program villages in Sumberjaya													x	x	x									
Analysis of survey data								x	x	x	x	x	x	x	x	x	x							
Completion of report draft																			x					
Present report/obtain feedback																				x				

Key Qualifications of Researchers

Bustanul Arifin is an associate professor in the Department of Agricultural Economics and Social Sciences at the University of Lampung, Indonesia. He obtained his master and Ph.D. degrees in resource economics from the University of Wisconsin-Madison, USA, where he later served as a visiting professor. Dr. Arifin has published several books and articles on agricultural and resource economics, political economy and economic development. In addition, he is a policy analyst and has written more than a hundred popular articles in the national media. Dr. Arifin is the Editor-in-Chief of the Quarterly Review of the Indonesian Economy or in Bahasa Indonesia *Bisnis & Ekonomi Politik* (BEP), a scientific journal devoted to the study of political economy and business issues and economic decision-making process in Indonesia. He has also served as Director of the Institute for Development of Economics and Finance (INDEF), an independent research institution aimed at providing assessments on a wide-range of policy issues related to economics and finance. He was an economic adviser to the House of Representative (DPR-RI) in Indonesia for the commissions of agriculture, industry, and trade; and a senior policy analyst for the United Nations Development Programs (UNDP) and National Development Council (BAPPENAS). He has served as a consultant to JBIC, The World Bank, ILO, USAID, GTZ, WWF and numerous other local organizations in Indonesia. He is currently conducting research on the institutional mechanisms of that are being tested in the RUPES (Rewarding Upland Poor for Environmental Services) action research sites in Indonesia implemented by ICRAF.

Fiona Chandler has over 12 years experience of research program and project administration built on fifteen years of business experience in the private and public sector. She obtained her Masters Degree in Environmental Management and Development from the Australian National University and a Bachelor of Applied Science from the University of New England. Ms Chandler is currently working with the World Agroforestry Centre (ICRAF) in Southeast Asia as the Program Manager for the RUPES project (Rewarding Upland Poor for the Environmental Services They Provide). She joined the RUPES program team in January 2003 after a two-year term as the Executive Officer for an independent advisory Board to the Minister for Natural Resources and Environment in Victoria, Australia advising on strategic planning of coastal and catchment issues in southwest Victoria. Prior to her work in Australia, Ms Chandler was the Executive Officer for ICRAF based at the headquarters in Nairobi, Kenya. She provided executive support to the Director General in both his management and scientific responsibilities as well as providing support to the senior management in investor relations and to the Board of Trustees. Ms Chandler previously worked with the British Columbia Ministry of Forests Research Branch (Canada) as a Program Administrator and Acting Program Leader in Forest Genetics and before that with the CSIRO Division of Forestry (Australia) on an ACIAR-funded project looking at the sustainability of *Eucalypts* in Southeast Asia. During this time, she contributed to the work of a world-wide project on provenance trials for *Casuarina equisetifolia*.

Chip Fay is a leading member of the team working on land and tree tenure in Indonesia and the Philippines. Based in Bogor, Indonesia, he assists the Indonesian and Philippine governments to develop and strengthen regulatory decrees and legislation and implement technical guidelines for programs that enable forest-dependent communities to continue to derive live-

lihood from and sustainably manage areas of the state-defined forest zone. Mr Fay undertook British and Soviet studies at Richmond College in London and Trinity College in Wales. He also studied international politics at the University of New Hampshire (USA). From 1992 to 1995 he was a Ford Foundation program officer responsible for developing, managing and evaluating the foundation's activities on community management of forestlands in Indonesia. Between 1987 and 1992, he worked with the Environmental Policy Institute as Director of their Southeast Asia office. He has also worked with Survival International, where he developed and implemented programs for Southeast Asian countries.

John Kerr is an assistant professor in the newly established Department of Community, Agriculture, Recreation and Resource Studies at Michigan State University (MSU). For the past 15 years he has conducted research the roles of community development, collective action, property rights, economic incentives and policies in natural resource management, particularly related to developing country agriculture and watershed management. Much of his work has focused on economic and institutional aspects of watershed management in India. He also teaches classes on collective action and property rights and international development. Kerr received his PhD and MA from the Food Research Institute at Stanford University and his BA in Economics from Swarthmore College. He worked as a Principal Economist for five years at ICRISAT in Hyderabad, India, conducting research on soil and water conservation economics and coordinating a program to promote teaching and research in natural resource economics at Indian state agricultural universities. He worked as a Research Fellow and Visiting Research Fellow at IFPRI for four years, conducting an evaluation of watershed management in India and a review of the impact of agricultural research on poverty alleviation, among other projects. He has been at MSU for the last five years.

Nancy McCarthy, a US Citizen, joined IFPRI in 1996, after receiving her Ph.D. in agricultural and resource economics from the University of California, Berkeley. She has worked extensively on management of common pool resources, having done extensive fieldwork in Mexico, Ethiopia, Niger and Burkina Faso. Her main area of interest is in understanding factors that affect the ability of community members, or groups within communities, to act collectively to manage and invest in common resources and to provide local public goods – with a specific emphasis on understanding collective action and resource management in highly risky environments, e.g. semi-arid rangelands.

Ruth Meinzen-Dick is a Senior Research Fellow at the International Food Policy Research Institute, conducting research on water policy, local organizations, property rights, and the impact of agricultural research on poverty. She serves as Coordinator of the CGIAR System-wide Program on Collective Action and Property Rights (CAPRI), involving 16 international agricultural research institutions and national partners. She is a Development Sociologist who received her PhD from Cornell University. Much of her work has been interdisciplinary research on policies for water and natural resource management; water rights; gender analysis; local organizations; comparative analysis of irrigation system performance, operation of water markets; relations between farmers and government agencies; impact of agricultural research on poverty; and sustainable livelihoods. Her field work has been primarily in India, Zimbabwe, Pakistan, Nepal, and Sri Lanka. Dr. Meinzen-Dick serves on several professional bodies including the Steering Committee of the Global Water Partnership has published ex-

tensively in journals and book volumes, and is co-editor of *Negotiating Water Rights and Innovation in Natural Resource Management: The Role of Property Rights and Collective Action in Developing Countries*.

John Pender leads IFPRI's research program on policies for sustainable development of less-favored lands. His research at IFPRI focuses on the impacts of policies, institutions and technologies on livelihood strategies, land management, agricultural production, poverty and natural resource sustainability in less-favored areas having low agricultural potential or low access to markets and infrastructure. The research also seeks to understand the trade-offs or synergies among these outcomes resulting from different policy and program interventions. Most of his research has focused on the highlands of East Africa, the hillsides of Central America, and semi-arid parts of India. Pender joined IFPRI in 1995 after working as an assistant professor of economics at Brigham Young University. He received a Bachelor's degree from the California Institute of Technology, a Master's in public policy from the University of California, Berkeley, and a Ph.D. in agricultural economics from Stanford University. He is the author of numerous publications, including "Strategies For Sustainable Development in the Ethiopian Highlands", and the coeditor of the IFPRI 2020 Focus Brief series "Promoting Sustainable Development in Less-Favored Areas." He is a U.S. citizen.

Suyanto has more than ten years experience in natural resource management and institutional analysis. He has worked at the ICRAF-Southeast Asian Regional Research Programme based in Indonesia since 1994, developing a range of skills in socio-economic, natural resource economics, econometrics and institutional analysis. He conducted a study on the evolution of indigenous land tenure and tree resource management in the buffer zone of Kerinci National Seblat Park in Sumatra for his PhD dissertation. This study was part of the project "Property Right and Collective Action: A Multi-Country Project" led by Prof. Keijiro Otsuka (International Food Policy Research Institute). From 1999 to 2004, Suyanto has conducted a socio-economic study of the underlying causes and impacts of fires in Sumatra within a joint CIFOR/ICRAF project. In this study there was a focus on the relationship between fire, deforestation, land tenure conflict and community based fire management. An integrated approach of socio-economic, ecology and remote sensing analysis was applied in this project. Dr. Suyanto has strong skills and experience in conducting household surveys and also in using a RRA/PRA approach. He has excellent analytical skills on the interface of environmental economics, social livelihood analysis and institutional information.

Brent Swallow — A principal economist and Theme Leader at the World Agroforestry Centre (ICRAF), Brent Swallow is responsible for strategic planning and synthesis of activities under the center's Environmental Services Theme across the world, particularly in the area of environmental governance. He leads research on watershed management, property rights and poverty in the Lake Victoria Basin of East Africa and is a member of the executive committee of the Systemwide Program on Collective Action and Property Rights (CAPRI). Brent Swallow is a Canadian national who has worked and lived in Africa for much of his career. After completing MSc studies at the University of Saskatchewan in Canada, he conducted research at Virginia Tech University for one year and at the National University of Lesotho for three years. While in Lesotho he led an IDRC-funded research project on agricultural marketing. Thereafter he obtained a PhD degree from the University of Wisconsin-Madison,

majoring in development economics and resource economics. Prior to joining ICRAF in 1998, Brent Swallow spent seven years as a research scientist at the International Livestock Research Institute (ILRI). While with ILRI, he led research on the economic impacts of animal disease control and rangeland property rights.

Meine Van Noordwijk —As the regional coordinator of ICRAF in Southeast Asia, Dr van Noordwijk, a principal ecologist, is responsible for the overall content, relevance, implementation and efficient delivery of research and development activities in Southeast Asia. This includes liaising with partners and donors and with staff and management, managing all staff in the region and taking responsibility for the financial resources in the region. He is based at ICRAF's regional headquarters in Bogor, Indonesia. Dr van Noordwijk joined ICRAF in 1993. He was initially responsible for research on processes associated with nutrient cycling, organic residue management and fertilizer use efficiency as well as developing and refining agroforestry alternatives to slash-and-burn (ASB) agriculture. Beginning in 1997 facilitated the ASB program in Southeast Asia and led its work on biophysical (ecological) aspects. His research experience includes modeling tree-soil-crop interactions in above- and below-ground resource capture in a wide range of agroforestry technologies, biodiversity and environmental aspects of agroforestry, watershed functions and scaling of results from plot to landscape level. Before joining ICRAF he was a senior research officer in the Root Ecology Section at the DLO Institute for Soil Fertility Research in Haren, the Netherlands, concentrating on the relationships between soil fertility, nutrient use efficiency and root development of crops and trees in various temperate and tropical agroecosystems. He also worked for 2 years as a lecturer in botany and ecology at the University of Juba (Sudan). Born and educated in the Netherlands, he has bachelor's and masters (*cum laude*) degrees in biology from the University of Utrecht and a PhD from the Agricultural University of Wageningen.