Study on Local Participation in Payment for Environmental Services Program in Citarum Basin, West Java, Indonesia

Patricia San Miguel, Nagoya University, Japan
Hiroaki Shirakawa, Nagoya University, Japan
Keigo Noda, University of Tokyo, Japan
Nao Endo, Kochi University, Japan
Kazuo Oki, University of Tokyo, Japan

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Abstract
Increasing literature reflects the significance of pro-poor aspects in payment for environmental services programs (PES) towards a more promising and workable program in regions like Asia. Although much effort is being made, pro-poor PES programs are still small and limited in many countries like Indonesia. More understanding particularly on the participation of the rural poor seems to be needed in order to advance and scale up programs that could generate greater impacts on the country. Different socioeconomic factors like income, and social networks are important determinants in participation, but their influences are not clear in many of the PES cases in Asia. Therefore, a comprehensive analysis on factors affecting participation in these kinds of programs, tinted with social goals like the inclusion of the poor, is necessary. This study seeks to clarify the influence of socioeconomic factors on farmers' participation in PES and their principal characteristics. Although, cash incentives seems to be an important determinant in participation, this is not the sole and most important factor as farmers concern for their environment and for non-financial aspects that enhance their community. This study also highlights the importance of social networks, which allow farmers to obtain relevant information to act together to address common environmental or social problems, as well as to participate and implement PES programs. On the other hand, weak social ties and networks due to farmers' poor situation tend to disadvantage the flow of information to activate synergies to participate in PES or other different activities in the community.

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Introduction

In Indonesia, agriculture system is very diverse due to its different demographic characteristics, where upland areas' major agricultural systems include intensive farming, among others. Depending how agriculture systems are managed, they can produce positive or negative externalities to the environment. In the case of the intensive vegetable upland farming, distributed on steep slopes with high chemical inputs, negative externalities are common, affecting flood control and water quality and quantity in the downstream areas due to soil erosion and sedimentation, and fertilizers' pollution. This system also affects environmental services like carbon sequestration, and biodiversity. It is well recognized that population pressure and poverty are important forces of overuse of steep land for agriculture, among others (Agus, & Manikmas, 2003).

Java is characterized by intensive farming systems; example of negative externalities due to such systems is found in the Citarum Basin, area characterized by its critical environmental degradation. This basin figures significantly in the overall concerns of watershed management in Indonesia. The upper area of the Citarum basin within the Bandung district is characterized by pervasive upland farming and harvest practices that lack adequate cover and protection from soil erosion. Upland farming expanded from 6,000 hectares (ha) in 1992 to 37,000 ha in 2001. This has come mostly at the expense of primary forests, which declined from 35,000 ha in 1992 to 19,000 ha in 2001, constituting more than 40% reduction. Meanwhile, urban settlements also expanded through the conversion of surrounding fields (ADB, 2007). In the last ten years, land conversion has reached almost 80% in the Citarum watershed, consequently intensifying land degradation problems, sedimentation, and water contamination, as well as increasing the frequency and severity of natural disasters, such as landslides and floods (LPM Equator, 2012; ADB, 2007; Munawir & Vermeulen, 2007).

Upland cropping system has been recognized as the system with the highest soil loss because of minimum soil protection by crops most of the year, compared to others systems as rubber plantations, agroforestry, paddy fields, shrubs and tea plantations (Agus & Manikmas, 2003). Data on erosion due to steep slope vegetable farming is abundant. In fact, erosion and sedimentation control, and flood mitigation have been central targets of the national re-greening and reforestation programs. However outcomes of these programs have fell below expectations. In the presence of ecosystem alterations that have triggered a series of negative impacts affecting human well-being, one option for environmental recovery in the basin is payment for environmental/ecosystem services (PES). PES is a market-approach instrument based on the principle of "beneficiary pays" rather than "polluter pays." The scheme consists of offering incentives, commonly cash payments, to farmers, landowners, or others entrusted, in return, with protecting or enhancing the ecosystem and thus providing an environmental service (ES). This promising tool for environmental conservation, expected to be more cost-effective than indirect financing approaches and accessible for multi-stakeholder participation (Kosoy, Martinez-Tuna, Muradian, & Martinez-Alier, 2007), has produced successful results in some Latin American countries, like Costa Rica. As a result, there is a growing interest in PES, evidenced through an increasing number of projects being implemented around the world. In Indonesia there are about eight recognizable PES programs nation wide, and two of them are located in the Citarum basin. Efforts towards understanding PES schemes in

the Asian region where programs are still small and limited are increasing.

PES have attracted substantial interest from the academia as well as from policymakers, as a mechanism for achieving conservation on private land (Engel et al., 2008; Wunder et al., 2008;). Literature in the environmental field emphasizes that "biodiversity and landscape are often more effectively approached on a scale greater than that of a single farm" (OECD, 2013,14), referring to synchronized measures to cooperate and act together in what is called collective action; as the bigger the engagement the bigger the impacts. However, the voluntary nature of PES schemes "means that the desired socially-efficient outcomes will depend on the sufficient enrollment of landowners in the relevant programs, and the fulfillment of their management requirements (Mulan & Kontoleon, 2012). This implies that it is necessary to understand the factors that determine landholders participation, while understanding who participates and why can facilitate program's design improvement.

This study seeks to clarify the influence of socioeconomic factors on farmers participation in PES and farmers' principal characteristics by answering what variables influence participation in PES? This study focuses on a first stage and necessary descriptive analysis based on primary data through a survey conducted in March, 2014. Survey included 30% of farmers' population, representing a total of 146 farmers, in addition to 25 PES farmer participants (of a total PES population of 35 members), for a total sample of 173 farmers. Further analysis is encouraged and to be continued by the authors.

Empirically based literature: determinants for participation in PES

There are diverse variables influencing participation in agri-environmental programs and in PES, which are being summarized in table 1. The review includes studies (Knowler & Bradshaw, 2007) based on quantitative approaches via logistic (logit) and probit regression from a total of 23 papers that seeks to explain farmers' adoption of particular agricultural innovations, and 5 papers based on participation in PES programs.

Table 1: Summary of variables influencing participation in agri-environmental programs and in PES

About Farmer	About Farm	External Factors
– Age – Education – Off-farm income – Debt levels – Access to information – Assets – Health – Experience – Gender	– Land size – Management system – Farm title; – Types of crops; – Expected price of their crop; – Payments offered – Slope – Distance to paved road – Distance to market – Available machinery	- Source of information (e.g.: other farmers, media) - Membership in organizations - Extension/technical assistance

Source: Knowler & Bradshaw, 2007; Mulan & Kontoleon, 2012; Zbinden & Lee, 2005; Arriagada, Sills, Pattanayak & Ferrarro, 2009; Ma, Swinton, Lupi & Jolejole, 2010; Jolejole, Swinton & Lupi 2009.

Studies regarding agricultural innovations and agri-environmental programs based on quantitative approach with samples ranging from 43 to 1425 landholders in various countries like United States (13 studies), Canada (3 studies), Latin America (Panama, Peru, Honduras)(3 studies), and Africa (Rwanda, Nigeria, Burkina Faso)(4 studies) generally show the following remarks in their findings:

- Financial viability is an important consideration and may limit interest and therefore participation.
- Other non-financial factors may be constraining further adoption, such as farmers' knowledge of conservation agriculture techniques or the availability of appropriate technologies.
- Social capital seems to be a more universally influential factor in conservation agriculture adoption. However due to limitation of the studies, they point towards further research into the influence of social capital.

Findings from studies focused on participation in PES programs also based on quantitative approach, present the following characteristics. A case study in China with small landholders involvement prove that participants tend to have higher incomes on average than non participants; participants also tend to have bigger land size (average 16 ha); and more remote villagers (distance from main road) are more likely to participate and to have more land enrolled. (Mulan & Kontoleon, 2012) On the other hand studies of PES conducted in Costa Rica demonstrate that none of the landowners participants depend on their farms to survive; legal issues also influence program participation (since land under PES is automatically protected by governmental organization which means that the property cannot be occupied by anyone); and people with high environmental awareness should be more inclined to participate, but interviews show that this is not important factor that influences participation (Arriagada, et al, 2009).

Costa Rica is a pioneer in PES among developing countries, which have provided important lessons regarding efficiency in PES programs to many Latin American countries like Mexico, Bolivia, and Brazil. However Costa Rica context is very distant from Asian realities, for example Zbinden & Lee (2005) describe that most participants hold a university degree, and were more likely to be urban-dwelling with an average income of US$ 1,000, owning land size ranged from 35 to 100ha.
As opposed to the Latin American context, the Asian region depicts rural areas characterized by high poverty ratio and high population density, where there is a large number of farmers working on small size land areas. The Indonesian context presents farm size for most farmers in Java ranging "from 0.2 to 0.5 ha while in the outer islands it ranges from 0.3 to 3 ha" (Agus, & Manikmas, 2003, 4), and other aspects that do not match the Latin American context.

On the other hand, studies regarding community-based environmental management grounded on qualitative approach emphasize on social variables rather than the opportunity cost highlighted in studies based on quantitative approach with the principal objectives on efficiency. Bodin and Crona (2009), and Bremer (2014) agree with social networks as important predicting and denominator factor in PES

participation, and in promoting sustainable development in PES programs. In some case studies, social networks were instrumental in people's awareness of and enrollment in PES. Other scholars like Lyon (2000) also emphasize the importance of social capital in resource management in a case study in Ghana. He shows that there is a wide range of circumstances where poor farmers develop cooperation or draw on existing networks, allowing them to enter into new markets and increase incomes. Boum, et al's (2008) work also shows social capital positive correlation with participation in community resource management (with the case study in India). Social Networks, generally referred as a set of links and ties among individuals or groups, and it is the most visible and clearly definable part of social capital, which along with norms and trust facilitate co-operation and co-ordination (Lyon, 2000). In the context of farmers communities, "social networks help farmers develop collective action, as well as to exchange information and leverage resources, as farmers are in favor of co-operating with their neighbors" (OECD, 2013, 12).

Different aspects influencing PES, whether financial or not, could be understand within the livelihood framework. Implementing hybrid forms of PES, like pro-poor PES particularly in Asia, implies limitations with the pure market approach, reason why different analytical lenses to look at PES are necessary. Muradian's (2013) argues that PES should be seen as an "incentive for collective action" (1155). PES has been presented as an alternative to traditional approaches, which has the potential to advance both conservation and rural livelihood development goals. Therefore, Hejnowicz, (2014) and other scholars point that it is necessary to jointly assess both environmental and social effects to ensure long-term PES validation and effectiveness. To this end, various papers use the sustainable livelihood approach (SLA) based on the capital framework.

The capital assets framework (SLA) that includes physical, natural, human, social and financial capital, has been used in diverse situations. Hejnowicz, et al, (2014) reviews 44 studies, which considered 23 PES programs. The main geographic focus was Latin America, which has historically been the main testing ground for PES. In general, studies assessed PES in terms of additionality (66%), livelihood sustainability (22%), and participation (20%). Hejnowicz emphasizes that the SLA may help reach an optimal balance between conservation and development outcomes. On the other hand, Leimona, (2011) studies about the livelihood impacts of PES in West Java, Indonesia; while McLennan, and Garvin (2012) uses SLA to evaluate landholders' access to livelihood resources. The latter findings point to the importance of locally tailored interventions that reach beyond the field of forest conservation and management. These would include interventions to strengthen rural peoples' access to resources needed to adapt livelihoods to changing socio-economic conditions.

Literature review implies that despite advances on the recognition on the importance of pro-poor or social aspects in Asia, there is no comprehensive analysis on the factors affecting participation (which may differs from Latin America and developed countries). Provision of practical lessons from case studies on PES participation is still insufficient, particularly in the Asian region. (Bremer, et al, 2014). Petherama and Campbell (2010) also highlight that PES studies have been largely addressed by economic, political and ecological perspectives, which are indeed important given the dependence of PES on market forces, however more attention is also needed on social aspects like the perceptions and preferences of local participants about PES, and

characteristics and influence of different factors and actors. Furthermore, among different factors like education, income, social networks seems to be an important determinant in participation, but its influence is not clear in the case of PES in Indonesia and other Asian countries. Addressing such gaps in the literature would be essential to build up on current and increasing literature that intends to contribute to the knowledge and evidence that socio economic factors influence participation in PES programs in Asia and support the expansion/scale up of programs like the one in Indonesia.

Findings and Discussion

Research Site and PES Program

With the intention of improving water quality and watershed service for downstream users, the project identified as its main objective the reduction of erosion caused by agricultural farming in hilly areas. In terms of environmental conservation, shifting the land use to forests would be the most efficient way to reduce erosion. However, this is not a viable option due to the area's high population density and the role of agriculture as the inhabitants' main occupation; instead, the intercropping (agroforestry) of annual crops with trees was chosen. Suntenjaya village with an area of 4.55 km2, within the Lembang sub-district of the Bandung regency was deemed appropriate to address sedimentation and erosion problems and was selected for PES scheme development. The PES project was initiated through the support of an Indonesia NGO (LP3ES) known as the Institute for Social and Economic Research, Education and Information (In Indonesian: Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi Sosial) initiated in 2009.

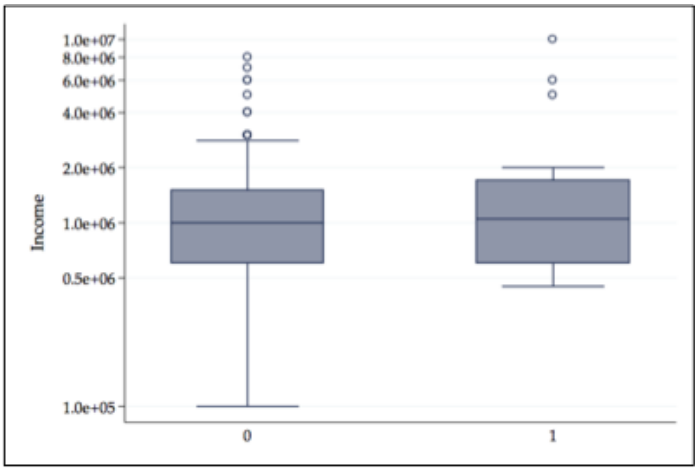
Income (part of financial capital)

Income regarded as one of the most important variables in most of the studies of participation in environmental programs, including PES, is also accounted in this study as an indicator of financial capital. Based on a descriptive analysis PES-participants may have a slightly higher income than non-participants. However the difference between the groups is not as significant as revealed in other studies. Further analysis is needed in order to understand how significant income is as a determinant for PES participation. Other indicators like assets, debts, savings and so forth part of the financial capital will also strengthen the view on the financial aspect. Following table 2 and plot box 1 illustrate part of the findings. PES participant' minimum household monthly income represents 450,000 Rupiah while Non-PES participant' minimum household monthly income represents 125,000 Rupiah, which is quite low. Although PES programs in Asia, considered as pro-poor program, suppose to encourage participation of the poor, the poorest of the poor may not be eligible due to their landless condition, and others. Regarding maximum monthly income, one PES participant's has a maximum of 10,000,000 Rupiah, which is considered high within their context; on the other hand, one Non-PES participant' has a maximum of 8,000,000 Rupiah, which is also a significant amount.

Table 2: monthly income of PES participants and non-participants in Suntenjaya village

		PES participants	Non-PES
Monthly income (Rp.)	Min	450,000	125,000
	Max	10,000,000	8,000,000
	Avg	1,800,000	1,300,000

Plot box 1: monthly income of PES participants and non-participants in Suntenjaya village



Social networks (part of social capital)

This variable reflects the highest difference between the two groups, in this study. PES participants value and perceive positive benefits from community interaction, like learning and sharing ideas and information about issues related to agriculture, to loans, to processing coffee, and others. High perceptions most likely lead to join social networks and facilitate collective action. For non-participants, their lower perception is related to their low experience in actually joining groups. Others factors may influence their perception, such as location of their homes, financial constraints, and others. Table 3 describes the results concerning social networks and perception about interaction within the community.

Table 3: social networks of PES participants and non-participants in Suntenjaya village

	PES participants			Non-PES		
Involvement in associations	**%**	N°		**%**	N°	
	72%	18		**18%**	28	
Perceived benefit from interacting with the community	Yes	No	Little	Yes	No	Little
	72%	16%	12%	**58%**	38%	3%

Education and training (part of Human Capital)

Although income level should be co-related to education level, the following results show how PES participant whom tend to have a higher income also tend to have lower education level compared to non-participants. In terms of trainings, PES participants tend to have more trainings than non- participants. Types of trainings involve coffee grow from extension workers from local office, and other farming related issues. It might be assumed that extension workers would contribute to farmers' conservation knowledge, which might raise their environmental awareness. It was also emphasized from interviews that the head of farmer association and leader of PES have significant trainings. Many farmers stated that he is a trustworthy and capacitated person to lead the PES. Table 4 contrast both group of PES and non-PES participants where the majority's education level reach elementary school (above 80% of the sample in both groups).

Table 4: education and training of PES participants and non-participants in Suntenjaya village

		PES participants	Non-PES
		%	%
Level of Education	Elementary	**88%**	**82%**
	Junior H.	**8%**	**14%**
	Senior H	**4%**	**3%**
	Bachelor	**0%**	**1%**
Training related to agriculture		**36%**	**20%**

In summary some characteristics of the two groups based on some variables suggested by empirical literature are presented in the next table 5. More variables are expected to be included in further analysis in order to build up a more comprehensive view concerning the characteristics of the two groups.

Table 5: characteristics of PES participants and non-participants in Suntenjaya village

Variables			PES participants	Non-PES
Farmer	Age	Min	22	27
		Max	86	76
		Average	51.5	45.6
	Level of education	Elementary	88%	82%
		Junior High School	8%	14%
		Senior High School	4%	3%
		Bachelor	0	1%
	Monthly Income	Min	450,000Rp	125,000Rp
		Max	10,000,000Rp	8,000,000Rp
		Average	1,800,000Rp	1,300,000Rp
	Social networks	Associations/groups	72%	18%
		Perceived benefits from interacting with community	72% (yes) 16% (no) 12% (little)	58% (yes) 38% (no) 3% (little)
Farm	Farm tittle	Community land (state owned)		
	Crop type	broccoli, potato, cabbage, tomato, cauliflower, banana, coffee		

Conclusion

Although cash seems to be an important incentive for participation in a rural area context where farmers have low income, this is not the sole and most important factor as farmers concern for their environment & consider their association as part of group members (non-financial aspect).

This study also highlights the importance of social networks, which allow farmers to obtain relevant information to act together to address common environmental or social problems, as well as to participate and implement PES programs. On the other hand, weak social networks tend to disadvantage the flow of information to activate synergies to participate in PES, or even consider further aspects like collective action.

As further steps: the first level of descriptive analysis allow us to see different signs that point toward the consideration of social variables in PES programs in Asia. More indicators of different capitals need to be included to strengthen the comprehensive analysis within the capital framework. Further analysis intends to cover a multiple regression based on survey's data and qualitative analysis based on interviews and group discussion.

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