Environmental Degradation, Poverty, and Local Participation in Pro-Poor Payment for Environmental Services: The Case of the Citarum Basin, Indonesia

by

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To Shin and Mia

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BPS	*Badan Pusat Statistik* (Statistics Indonesia)
BPLHD	*Badan Pengeloaan Lingkungan Hidup* (Regional Environmental Management Agency)
CIFOR	Center for International Forestry Research
CSR	Corporate social responsibility
ES	Environmental/ecosystem service
ESPH	*Empresa de Servicios Publicos de Heredia* (Heredia Public Service Enterprise)
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographic Information System
ICRAF	International Centre for Research in Agroforestry, known as World Agroforestry Center
ICWRMP	Integrated Citarum Water Resources Management Program
IDDRI	*Institut du développement durable et des relations internationals* (Institute for Sustainable Development and International Relations)
JICA	Japan International Cooperation Agency
LP3ES	*Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi Sosial* (Institute for Social and Economic Research, Education and Information)
MOE	Ministry of Environment
NGO	Non-governmental organization
OECD	Organization for Economic Cooperation and Development
PES	Payment for environmental/ecosystem service

QGIS	Quantum geographic information system
RUPES	Rewarding the Upland Poor in Asia for Environmental Services
SLA	Sustainable Livelihood Approach
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
WDR	World Development Report

CHAPTER 1

INTRODUCTION

1.1 Motivation of this Study

Approximately two thirds of the natural services provided to humankind are deteriorating worldwide, and such pressure is estimated to increase globally, creating enormous threats to societies' wellbeing (Millennium Ecosystem Assessment, 2005). Challenges are particularly prominent in the Asian region, where approximately two thirds of the population lives and where the rural areas are exposed to an increasing trend of destruction (Leimona, 2011). To respond to the necessity to address environmental alteration, is important to note that a solution does not rest in a simple, isolated, and evident manner; thus, efforts highlighting some progress in the field of environmental conservation are highly valued and critical to be extended in a wider scope. Market approaches for environmental services to address environmental problems such as loss of biodiversity and support for environmental conservation and climate change mitigation have become an alternative approach, with high potential to support environmental recovery as well as being well highlighted in the international development agenda.

Payment for environmental/ecosystem services (PES) is a market instrument based on the beneficiary-pays rather than the polluter-pays principle, expected to be more cost-effective than indirect financing approaches. The scheme consists of offering incentives, commonly cash payment, to farmers, landowners or others entitled to then in return for protecting or enhancing the ecosystem, thus providing an environmental service (ES). It is an accessible tool for multi-stakeholder participation in which its significance recognizes the involvement of private businesses as an important and supplementary source of funds for environmental

protection (Engel, Wünscher, & Wunder, 2007; Kosoy, Martinez-Tuna, Muradian & Martinez-Alier, 2007; Forest Trends, The Katoomba Group & United Nations Environment Programme, 2008). This promising tool with high potential to make a difference in environmental conservation has shown successful results in some Latin American countries, such as Costa Rica, Mexico, Brazil, and Ecuador.

"Costa Rica was once one of the most deforested countries in the world" (World Bank, 2000a, p. xvii), however, by 2002 the country recovered 45% of its forests (Porras & Neves, 2006c, p. 1). Along with different reforms, PES (based on efficient-designed goals rather than pro-poor aspects) was an important tool that directly influenced the country's reforestation, a successful scheme evolving into a national program providing various environmental services. In this sense, Costa Rica became a pioneer in PES in developing countries, laying important foundations for structuring PES schemes. In this case, some scholars underscore that Costa Rica also proved that equity was not easily achieved, where payments were mostly given to wealthy landowners and part of the local poor were not able to participate as most of the time they own no land and could not bear transaction costs. This is where we see a clear separation between efficiency and equity within the PES conceptualization. While some scholars consider these instruments "for improving the efficiency of natural resource management and not necessarily for alleviating poverty" (Muradian, Corbera, Pascual, Kosoy, & May, 2010, p. 1203; Engel, Pagiola & Wunder, 2008), in practice, Wunder (2007) and other scholars and practitioners note that PES schemes indeed "face intrinsic contradictions", having the necessity to balance efficiency goals with fairness considerations (p. 53). It is noteworthy that PES schemes in developing countries are framed in areas targeting the poor or vulnerable social groups where the perception about fairness (benefit sharing) is a key factor to determine feasibility and become accepted and

legitimized (Muradian et al., 2010). Poverty's relation to environmental degradation must be addressed together, thus reconciling both efficiency and social equity within one scheme. Although achieving this goal becomes a real challenge for both practitioners and academia, this is the trend in current studies and pilot projects in many Asian countries; moving from an originally pro-efficient designed PES (like the ones found in Latin America) towards a more fair or pro-poor one.

In Asia, PES schemes are in the initial stage. Indonesia, a country with the second highest biodiversity in the world and also one of the most populous countries, faces the constant challenge of effectively addressing environmental issues regarding loss of biodiversity due to high deforestation rates and pollution, while needing to support people's livelihoods and the country's economy. Incentive mechanisms like PES have high potential for environment conservation while possibly meeting social aspects in the country, the reason why some scholar propose a pro-poor PES. Most of pro-poor program are not considered pro-efficient, and in this respect some scholars (Leimona, Joshi, & Van Noordwijk, 2009; Van Noordwijk et al., 2007) acknowledge that for the poor to fulfill environmental services, realistic targets must be applied due to the various obstacles they face to efficiently deliver the ES. Therefore pro-poor PES payments should consider, not only the efficiency of ES delivery, which is hard to achieve, but sellers' compliance, which ultimately should contribute to the overall improvement of the ecosystem. Certainly understanding and considering the realities of different countries is fundamental in the realization of these programs, rather than mere replications.

The implementation of these schemes in other contexts has been characterized by gaps between the theoretical framework and the reality. Implementation of PES with pro-poor or fairness characteristics also pose questions regarding the delivery of the ecosystem service

and the sustainability of the program if it does not achieve the desired environmental improvement. Attempts to achieve an efficient and fair PES have been conducted in some Southeast Asian countries, proving that preconditions for the Coasean thoughts of PES could not be met, while also demonstrating no measurable changes in the livelihood of participants regarding poverty alleviation. Pagiola, Arcenas, and Platais (2005) also contribute to the understanding of pro-poor PES and recommend not to fall into the temptation of designing primarily a poverty reduction tool that could become ultimately self-defeating. As Bremer, Farley, and Lopez-Carr (2014) state, where poverty is embedded within areas critical for ES provision, assuring that the program includes and benefits the poor one is fundamental for promoting long-term success. As PES mechanisms evolve, Van Noordwijk, Villamor, Leimona, and Hoang (2006) propose future considerations of different approaches to conditionality and levels to measure the ES. Hence, aiming for a balance between ES improvement and a fair involvement of the poor seems to be the focus in many Asian countries.

Since this is a program based on voluntarily participation, understanding farmers' reasons to participate in PES is essential for designing effective and fair programs. Findings of Bremer et al. pointed that social capital in the form of social networks and community organization is important in predicting PES participation patterns, and in promoting sustainable development in PES programs. An example of studies necessary for the comprehension of factors influencing participation in PES is the research of Arriagada, Sills, Pattanayak, and Ferraro, (2009) that aimed to understand the motivations of participants, in this case wealthy landowners, to participate or not in the PES programs in Costa Rica. Among the reasons to participate in the program were lack of more profitable land use alternatives (e.g., high slope, poor soil quality); legal restrictions to land use changes towards more

productive activities on high slopes; and reduced prices of export beef as a conjuncture, which leads landowners to abandon cattle and livestock activities to plant trees. PES payment represented an important source of income, and the application process was simple through NGOs' and authorities' assistance. These kinds of studies were very much promoted and well utilized, not only by academia in Costa Rica, but also by authorities leading PES programs. Since the characteristics of participants and poverty are different in Latin America and Asia, it is expected that reasons for participation and non-participation would be different and highly influenced by socio-economic and contextual factors. Therefore, comprehensive analyses like the ones conducted in Latin America are also needed in Asia, with special emphasis on pro-poor aspects.

Encouraging fairness in pro-poor PES, like stakeholders' active participation in decision-making and the entire process, is not ignored. Leimona's (2011) work on Indonesian PES confirms that this element is not only a part of the form, but integration of local knowledge could help clarify many issues that at first hand implementers could not be aware of. Although part of Leimona's work could not be empirically judged, the recognition of a multiple knowledge system in the early stages facilitated communication and negotiations among stakeholders. Thus, case studies require better unfolding in terms of description and understanding regarding this aspect.

As part of the pro-poor elements, access and participation, as well as the process and decision-making in these kinds of programs, become fundamental points to be deepened and bridge the gap in the conceptual framework as well as on the empirical ground. Additionally, the understanding of the continuity of these programs as a method to achieve sustainability in time assuring desired outcomes for both the environment and stakeholders is vital too. This

point supposes the understanding of the risk and vulnerability farmers face as possible constraints to continue the program, which is absent in the specific literature of PES.

In order to analyze the present case study, different factors affecting participation and collective action in PES, a program that eventually intends to address environmental issues as well as poverty, are considered. Such factors, grouped in capitals and understood in the structure of the sustainable livelihood framework, designed "as a way of linking socioeconomic and ecological considerations in a cohesive" arrangement towards poverty eradication (Krantz, 2001, 6), serves to model the structure and understanding of programs like PES. The capital framework has been used in diverse situations, for instance Hejnowicz, Raffaelli, Murray, and Piran, (2014), which reviews 44 studies, of which 23 considered PES programs (p. e4). The usage and perspectives of this framework in different PES studies have varied according to the study purpose, as seen in studies presented by Leiomna (2011), and McLennan and Garvin (2012). The present study employs the mentioned framework as an approach to evaluate available capital that affects participation and continuity in developmental objectives towards achieving environmental conservation and households' livelihood.

1.2 Research Questions and Assumptions

The purpose of this study is to identify and understand factors that influence the participation in PES program and its workability and expansion regarding pro-poor aspects without completely jeopardizing environmental service delivery. The main research question of this study is stated as follows: how socio-economic factors influence farmers' participation in pro-poor PES program and the program's workability and expansion.

Sub-questions

1. What are the characteristics of the PES program and the principal gaps between theory and practice? This question alludes to one of the pro-poor aspects, 'process', as well as to the workability of the program to deliver the environmental service.

2. What are the characteristics of participants and non-participants, and what kinds of variables influence participation in the program? This part attempts to focus on both the 'access' and 'decision-making' aspects of the pro-poor PES.

3. What kinds of factors influence farmers' viability to continue the program, and how do farmers cope with vulnerability and other constraints towards PES workability? This questions aims to elucidate the importance of not only participating in the program, but also continuing it as part of an approach to achieve desired 'outcomes' and aspire for expansion.

Assumptions

1. As a bottom-up program implemented in a developing country, the participatory approach and fairness characteristics are expected to be fostered, even within the imperfection of an experimental stage. Gaps between theory and practice are also expected; as stated by Wunder, there are various programs presenting such gaps. Nonetheless, contextual variances require caution to not compromise the program's nature in delivering or enhancing the ecosystem service, and risk its sustainability.

2. It is assumed that the weaker or lower the social networks and cooperation, the less probability of participation (Leimona – interview, 2013). Elements from social capital and collective action may play an important role in negotiation and decision making, and low or

no cooperation may constrain both participants and non-participants. Other characteristics of the farmers, such as income levels and physical assets, may differentiate both groups and may also influence participation.

3. Exclusion of poor stakeholders from the design of schemes could void a sense of ownership and mismatch between the needs of the locals and actual provisions. (Petherama, & Campbell, 2010, p. 1140). Nonetheless, the poorest of the poor may not be able to continue this kind of programs due to the high risk they need to bear. Other challenges to continue the program and bear risk may be: lack of guidance and support throughout the duration of the project, and also lack of accountable intermediaries close to the locals (vertical cooperation); and a lack of understanding and diffusion about PES and its gains.

1.3 Significance of the Study

This study aims to address gaps in the literature by contributing to the knowledge and evidence of how socioeconomic factors influence participation in pro-poor PES in Indonesia, responding to not only why pro-poor PES is important, but how to work it out. Within the theoretical literature, currently there are limited studies regarding participation in PES in Asia, and non-existing in terms of the continuity of such programs. While Latin American cases highlight financial viability as an important determinant for participation (Knowler & Bradshaw, 2007), in the case of Citarum, factors like social networks seems to play a fundamental role in participation. However, in the case of viability to continue a pro-poor PES program, as the literature on poverty and its examples of vulnerability among farmers state (Eakin, Tucker, & Castellanos, 2006; World Bank, 2000b), this study confirms that financial capitals seem to be fundamental for the continuity of the program, but this is not

highlighted in Latin American cases, as most of the farmers are wealthy landowners. This case also provides a description of the scheme and gaps between the literature and practice; although this case study could be considered at an experimental stage, it serves to understand implications for implementation, as Wunder (2008) expresses about PES facing difficulties in the execution stage in many regions.

From an empirical point of view, by understanding farmers' characteristics and necessities and the current socio-economic situation framed in different capitals, like education, social networks, land size, distance to market or the main town, and income that influence participation and continuity, program developers could tackle more realistic and sustainable PES program that would increase the number of participants, generating a wider impact on environmental and poverty alleviation issues. This study also intends to use a case study, which are scarce in the literature of PES in Asia, towards strengthening understanding of current programs in terms of their descriptive elements and opening doors for possible determinants like social capital, which although it plays a fundamental role in the access of these programs, it is not the panacea that guarantees the successful continuity of the scheme. Although the case of Citarum basin provides important lessons, the intention is not to provide generalizations, but rather provide a first step to develop more tailored-fit and effective programs that once understood could eventually be translated into policies that would scale up at higher levels, like at the national level.

1.4 Methodology

This research employs a case study, as it best fits the aims at understanding a real life phenomenon encompassing important contextual conditions (Yin, 2009), relying on qualitative and quantitative approaches. Regarding the field of environmental management

and the commons, case studies has "been a significant source of contribution related to collective action for the management of common pool resources", and "addressing issues like the implications of group characteristics for collective action in environmental management, and the implications of resource characteristics for collective action" (Poteete, Janssen & Ostrom, 2010, p. 45). Data collection was conducted in Jakarta, the capital city, and in the research site, Suntenjaya village (Lembang sub-district, Bandung regency, West Java). This study employs confidentiality measures in order to protect the identity of interview sources.

1.4.1 Methods for Data Collection

Semi-structured and in-depth interviews

Different fieldwork periods permitted the collection of data from different interviewees, like the ones listed below.

Table 1.1: List of Interviewees

	Jakarta	**Suntenjaya**
Direct stakeholder	(i) Institute for Social and Economic Research, Education and Information (LP3ES), NGO in charge of the program.	(i) ES sellers/ PES participants.
Others	(iii) Representative of the Ministry of Environment (MOE). (iv) PES specialists from International Centre for Research in Agroforestry (ICRAF).	(ii) Non-PES participants. (iii) Local authorities.

Source: Author

Group discussion

This method includes key informants like the leader of farmers association and others. The group discussion was facilitated by the author with the assistance of a translator (with prior training, and who assisted all the fieldworks from 2012 to 2014). It included approximately 20 people, both PES participants and non-participants. The objective was to listen to the voice of locals about challenges they face engaging in PES and common livelihoods, and brainstorm a variety of solutions. This supports sub-questions two, and three.

Household survey

Three surveys were conducted during the research period. The first survey was conduced in November 2012 as a pilot survey, translated from English into Bahasa Indonesia. This survey included farmers and non-farmers, and although most of the data could not be processed for the purpose of this dissertation in a quantitative approach, it provided important insights about the socio-economic and cultural context of Suntenjaya village. It also allowed for the training of enumerators and translators and learning practical lessons for coming survey undertakings.

The second survey was conducted in March 2014, designed to incorporate livelihood variables framed into the capital/assets framework, as well as basic information regarding the program access and others. Part of the pre-coded questions' variables included wages; assets; status of land ownership and farming practices; education level and training; social networks and associations; knowledge about PES and PES satisfaction level. Examples of this method used in PES studies are found in Arriagada et al. (2009), who evaluated economic motivations for participation. The survey included 30% farmers, representing a total of 148 farmers, in addition to 42 PES farmer participants (of a total PES population of 45 members) and 13

farmers who obtained information about PES, but did not participate in the program, for a total sample of 203 farmers. A complete sample (45) for PES members could not be reached; one of the members passed away and his family could not provide exact information about the program and his engagement, another member temporarily moved away from the village, and the third member refused to participate in the survey and interviews due to health problems.

The third survey was conducted in December 2014 with the purpose of confirming existing data and collect new information, basically the focus of chapter 5. The survey included 42 PES participants (both those who continue [33] and those who quit the program [9] during the contract), out of a total of 45 farmers originally engaged in the program.

Secondary data

Others methods include secondary data, like the review of documents and protocols related with PES in the country, and the village's statistical profile.

1.4.2 Methods for Data Analysis

Qualitative approach

The procedure of data analysis followed a systematic path of initiating the transcription of all recordings, categorizing information, and understanding the story that embraces the data. Sources comprised the survey, interviews, group discussion, and informal talks, along with observations and corresponding notes during the stay in the village and visits to Jakarta. Qualitative material supports numerical examination by matching and complementing the contextual analysis.

Quantitative approach

Statistical description of data: is provided as basic information for the reader to corroborate essential features of the data collected and used in the following different approaches.

Multiple Regression and probit model: the objective to employ this tool is to measure the relation among variables like education, income, distance, social networks, assets like tools or cattle (independent variables) and their effect in participation and continuity (dependent variable). This is a supporting tool to check the validity of the surveys and interviews that was managed by the Data Analysis and Statistical Software, STATA (release 13). Examples of application of this method in PES studies include Arriagada et al. (2009), and Ma et al. (2012).

Correlation: analysis among variables was also checked, as part of a fundamental step for regression analysis in order to measure whether changes in one variable will bring changes in another. If the relationship among variables is high, then variables will have to be discarded. This examination is provided along with each probit model both in chapter 4 and 5.

T-test: this tool is employed in chapter 5, since it examines differences of two populations means typically used for small samples. This hypothesis test looked at different aspects like t-distribution, the degree of freedom and probabilities that served to determine the differences of two populations. This analysis helped to identify possible factors that determine the differences between those who continue in the program and those who abandon it and draw relationship among such factors like income, land size, education, off-farm job, and types of livestock and farmers livelihood strategies. Results of the t-test are obtained through STATA software, and they are displayed and analyzed in the findings and discussion section of chapter 5. Supporting examinations for the stated chapter are also found in appendices.

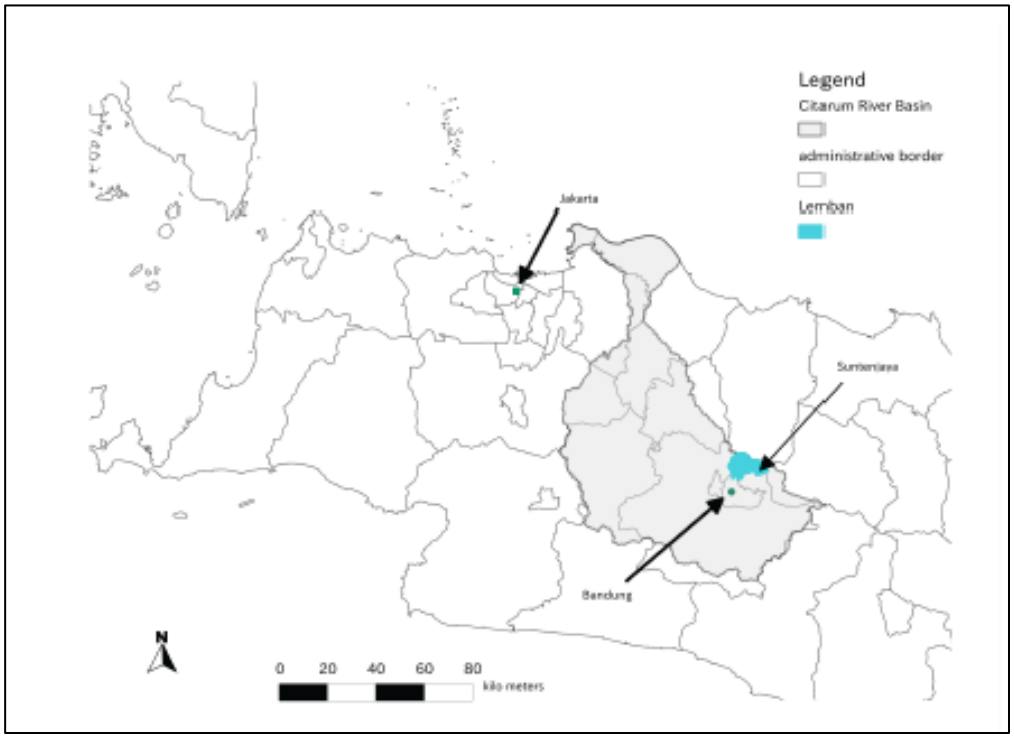
1.5 Delimitations

Six rounds of fieldwork were conducted from 2012 to 2014, including the following periods: September 2012, November 2012, September 2013, December 2013, March 2014, and December 2014. Part of the data collection was attained through collaborative research activities that the author joined as a researcher, part of a project[1] team of the Department of Environmental Studies in Nagoya University.

Research area and PES program: research was conducted in Suntenjaya Village, a place with an area of 4.55 km^2 located within Lembang sub-district (*kecamatan*), Bandung regency, with a population of 7,032 inhabitants in 2006 (Coba, n.d.). One of the advantages of this site for a researcher is that the PES project implemented is small enough to be managed by a single researcher but significant enough to draw lessons from its analysis. Besides that, there is access to information through statistics from local authorities, and documentation like the PES protocol outlined by the national government. Consultation with experts, particularly from the World Agroforestry Center (ICRAF) and Center for International Forestry Research (CIFOR), leading research centers in designing and implementing efficient and fair PES projects in Indonesia and other Asian countries, is also viable. As part of the references from this case, it is available in Pirard and Billé's (2010) study, and the report from the LP3ES – an NGO in charge of leading the PES program by Munawir (2007). In the following map, figure 1.1 presents the geographical location of the research site.

[1] Projects were based on the *Development and Practice of Advanced Basin Model in Asia: Toward Adaptation of Climate Changes* and the *Study on Compensation Mechanism of Water Conservation in Citarum River Basin Indonesia.*

Figure 1.1: Research Site, Citarum Basin



Source: Author, QGIS Software. *Note.* Suntenjaya village is within the Lenbang sub-district – Bandung regency, West Java.

Limitations: PES participation and continuity is analyzed through the capital livelihood framework, as part of the most suitable structure to pursue this dissertation's purpose. Nonetheless, the ample range of variables that could be comprised in this framework are not considered due to various limitations, like the sensitivity of the questions. For instance, respondents seemed unwilling to directly answer questions regarding their savings, loans and other related issues, and also due to the lack of information that the majority of respondents could have. In addition, this study copes with the limitation of literature references regarding the issues of continuity of PES programs in the Asian region.

1.6 Organization of the Study

The next chapter, the literature review, draws upon the understanding of PES programs, referring to successful examples like the ones in Latin America, and the dilemma of the initiation of pro-poor PES in Asia. This section presents reasons for the usage of the Sustainable Livelihood Framework, among other important concepts to be used in this dissertation. Chapter 3 introduces the case study, providing important details and contrasting the reality of the program versus theory, offering first insights. Chapter 4 looks at the characteristics and determinants for local participation in the program, both from a qualitative and quantitative approach, reinforcing the contribution of this study, particularly within the Asian region. Chapter 5 examines the socio-economic factors influencing the continuity of the PES program and how farmers cope with risk and vulnerability towards the program development. This constitutes an important section since it has not been approached before, proposing important findings at both the conceptual and empirical level. Finally chapter 6 restates the main insights provided throughout this study, where I first emphasize the importance to understand motives for PES participation in Asia, through the case study of Suntenjaya village. Although economic incentives cannot be disregarded as they represent important reasons found in various academic studies of PES participation, I argue about the importance of social networks as part of social capital, and as a significant influential factor for participation. Nonetheless, its (social networks) importance diminishes when considering farmers' ability to continue a lengthy (seven year) program like the PES project in Suntenjaya. Indeed it is not uncommon to see farmers abandoning the program before the agreement ends. Since participation itself is insignificant if otherwise connected to the understanding of the program's continuity, contemplating PES members' financial capitals and assets and vulnerability to poverty is fundamental for a complete picture of participation

in pro-poor PES. Thus, this research distinguishes between influential factors for participation and influential factor for continuity, as part of the workability and meaningful participation of the program.

CHAPTER 2

CONCEPTUAL EXPLANATION OF PRO-POOR PAYMENT FOR ENVIRONMENTAL SERVICES THROUGH THE LENS OF THE SUSTAINABLE LIVELIHOOD FRAMEWORK

2.1 Gaps between PES Concept and Implementation

2.1.1 PES Theoretical Studies

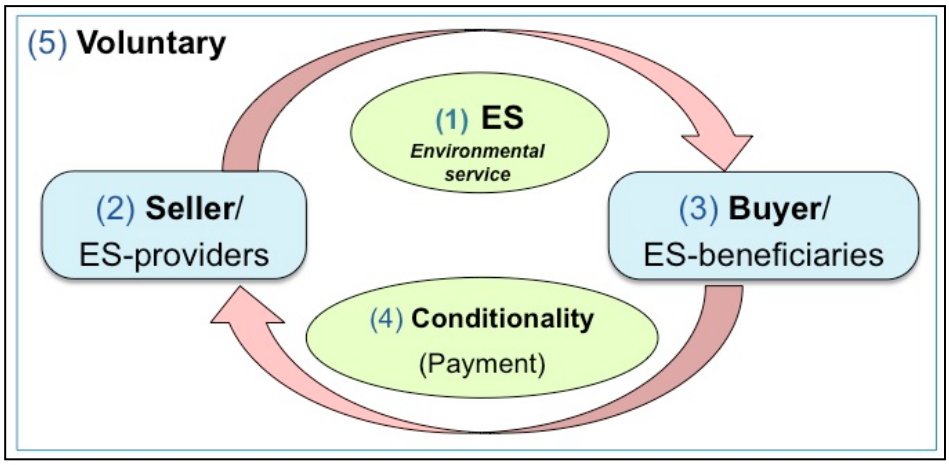
According to the 2005 Millennium Ecosystem Assessment, deterioration of biodiversity is reaching a record rate, with an extinction rate "1,000 times higher than what has been typical over most of the earth's history", and this loss highly threatens the wellbeing of human societies (Chichilnisky & Proctor, n.d., p. 1). Challenges are predominant in the Asian region, where most of the world population lives and where the rate of damage is accelerated. Multiple and complex causes are behind environmental degradation, mostly highlighting market imperfections and policy distortion that have disregarded the social and economic value of the environment (Leimona, 2011). To respond to the necessity to address environmental degradation, particularly in this time in history when there is a high and rapid deterioration of biodiversity that affects the wellbeing of societies, market-based mechanisms have become an alternative with high potential to support environmental recovery.

Market approaches include regulatory systems like fines and sanctions that are associated to traditional and well-known command-and-control regulations, to the laissez faire concept as well as incentive tools like subsidies. Although markets oftentimes fail to reflect the true total value for environmental goods and services, instruments based on market mechanism, that is, buyers (demand) and sellers (supply) voluntarily coming together into an exchange process that could determine an equilibrium price and an efficient allocation of

resources (Turner, Pearce & Bateman, 1993), could achieve environmental improvement. In payment for environmental/ecosystem services (PES) the commodification of the environment reflects a possible financial price for an ecosystem that has not been comprised before. The articulation of the market apparatus in solving negative externalities through voluntary schemes, as opposed to control and command tools, may achieve social and environmental improvement (Leimona, 2011) as one available tool to be considered.

PES is a market approach instrument based on the beneficiary-pays rather than the polluter-pays principle. The scheme consists of offering incentives, commonly cash payments, to farmers, landowners or other entitled beneficiaries in return for protecting or enhancing the ecosystem, thus providing an environmental service (ES), which is classified into four ES types: carbon sequestration, biodiversity protection, watershed management, and maintenance of landscape beauty. According to PES conceptualization, Wunder (2005) developed a five-criteria definition framework that portrays the scheme: (i) with a well-defined environmental service; (ii) with at least one ES provider or seller; (iii) with at least one ES beneficiary or buyer; (iv) meeting conditionality in payment and ES service delivery, and (v) based on a voluntary transaction (p. 3) (see figure 2.1). This is an accessible tool for multi-stakeholder participation in which its special relevance recognizes the involvement of private businesses as an important source of funds for environmental conservation, and it is expected to be more cost-effective than indirect financing approaches (Engel et al., 2007; Kosoy et al., 2007; Forest Trends et al., 2008).

Figure 2.1: PES Definition Criteria



Source: Adapted from Wunder (2005), p. 3

2.1.2 Empirical Studies

This promising tool with high potential to make a difference in environmental conservation has demonstrated successful results in some Latin American countries such as Costa Rica, Mexico, Brazil and Ecuador. The case of Costa Rica is very much highlighted, as it "was once one of the most deforested countries in the world" (World Bank, 2000a, p. xvii). From 1950 to 1983 the Costa Rican primary forest decreased from 72% to 26%, mainly due to agro-export policies supporting agriculture and livestock, like cattle (World Bank, 2000a, p. 1). By 2002 the country recovered to 45% (Porras & Neves, 2006c, p. 1). Along with different reforms, PES- based on pro-efficiency- in Costa Rica was an important tool that directly influenced the country's reforestation. The successful scheme evolved into a national program providing various environmental services. In this sense, this nation became a pioneer in PES in developing countries, laying important foundations for structuring these schemes. Cases in Latin America, particularly Costa Rica, inspired other countries to pursue this program, thus growing interest in PES has been evidenced through an increasing number of

projects around the world. By 2006, Porras et al. (2008) documented 123 initiatives in developing countries, wherein 57.72% of the approaches exist in Latin America, followed by Asia, representing approximately 29.26%, and Africa with 10.56% of the approaches (p.13). Other sources document more than 300 initiatives around the same period (Mayrand & Paquin, 2004, p. ii).

2.1.2.1 Cases in Latin America

Costa Rica and Ecuador case studies are among the most successful PES examples concerning environmental conservation. Costa Rica is particularly well recognized for its capability to implement a national PES program, where many PES cases are recorded and providing all four types of ES. These cases exemplify their focus on efficiency of environmental conservation rather than on poverty alleviation issues. Illustration is offered as follows.

There is a case of watershed management well illustrating the five criteria of PES, localized in Heredia province, in the north central part of Costa Rica. Heredia Public Service Enterprise (ESPH), a private water utility entity through public concession that obtains its water from five micro-watersheds, has collected an environmental fee attached in the water bill from water users to protect the watershed, mostly through direct payments to upstream landowners, since 2002. Porras and Neves (2006a) document that the scheme is on a voluntary basis; a study revealed that 90% of citizens (customers) of Heredia supported the idea to pay up to 10-12 Costa Rican colones/m3/month (approximate USD 0.20) for a well-defined ES, maintaining water quality and regulating flows (p. 1). The buyer is a private water utility company of Heredia, while sellers are represented by private landowners in the upstream of the watershed and surrounding small basins of the rivers. The program comprises

1,900 hectares and includes 21 landowners, but by 2008, 6 more landowners decided to participate supplying 1,190 hectares to the scheme (p. 1). Conditionality governs users' environmental fee, US$0.01 per cubic meter. Providers receive on-going cash payments for: (i) conservation and natural regeneration: about US$90 per hectare per year, over ten years; and (ii) for reforestation, approximately US$172 per hectare per year for the first five years of contracts. (Porras & Neves, 2006a, p. 1) ESPH also provides technical support and environmental education and continuous monitoring done through the geographical information system (GIS) and visits to the zone where PES is implemented. "Impact has been quite positive and benefits are clearly worth the cost" (Porras & Neves, 2006a, p. 4). This program has slight impact on poverty reduction, as most participants are wealthy (this area holds the highest score in Human Development Index in the country) and most of them obtain their income from other non-land related activities (75% of the population in this area are considered urban and semi-urban dwellers) (p. 3). "This benefit is particularly useful for wealthy landowners who keep forests and have second homes there, but do not spend most of their time in the area" (Porras & Neves, 2006a, p. 3). A part of the positive environmental effects are found as the following: i) establishment of limits and preservation of forests in the highest part of the watershed that help biodiversity; and ii) additional protection of important catchment areas in the mountains (Porras & Neves, 2006a, p. 3).

A similar case is also found in Ecuador in a watershed management service to improve quantity and quality through conservation and regeneration of natural forests (United States Agency for International Development - USAID, 2007). This is a voluntary system where buyers consist of 1,350 households and different companies in Pimampiro municipality, located in the Andes of northern Ecuador, "with water meters, which pay a 20% surcharge on their monthly bills (non-paying water users, including irrigators, can be considered free

riders)" (USAID, 2007, p. 161). A municipal account of approximately US$15,000 includes a special budget to make payments to members of the Nueva América Cooperative who complete their duties stipulated in the contract. Monthly payments have ranged from US$0.50 per hectare for previously cultivated land to be reverted to natural vegetation to US$1.00 per hectare for pristine forests and paramo. (USAID, 2007, p. 161) In addition to compensation, there have been persistent transaction costs that include monitoring, administration, and related tasks, and these costs sum to US$1.57 per hectare per annum (USAID, 2007, p. 161; Echavarria, Vogel, Albán & Meneses, 2003). Sellers constitute landowners of high-altitude lands, members of Nueva América Cooperative. Conditionality has been enforced through sanctioning participants who do not fulfill agreements, for instance, from 2002 to 2004, payments were suspended to households that did not obey the agreement, however, they were allowed to reenroll later once they were willing to fulfill their duties. By 2007, 19 contracts were in effect, covering 550 hectares. (USAID, 2007, p. 161) "Accordingly, PES enrollment for five years was offered to all owners of high-altitude lands, with contracts renewed in early 2006" (USAID, 2007, p. 161).

Although Pimampiro is a poor rural municipality, it could be argued that farmers receiving PES were relatively well off (Porras & Neves, 2006b, p. 4). All the members participating in ES schemes have individual title to their land, the size of properties varies from 12 to 119 hectares, while the association has a total of 638 ha. (Echavarria et al., 2003, p. 19 & 20). The transaction cost is high. Nonetheless, it is difficult to exactly assess the transaction costs due to the sensitivity of this information, and due to the fact that it is the first project of its kind in the country that has heavily subsidized other programs (Echavarria et al., 2003). About environmental issues, in 2000, prior to the initiation of PES, 198 hectares (31% of the watershed) had been cleared for farmers' use. With the program, cleared lands mainly

used for agriculture has fallen to 88 hectares, or 14%, with a corresponding increase in the area reverting to natural vegetation. (Porras & Neves, 2006b, p .4) Timber extraction has fallen and the threat of persisted degradation has been largely limited. Overall, there was a real improvement in water quantity and quality. There has also been an additionality with the reduced intervention in forest and paramo land. (Porras & Neves, 2006b,)

These two cases demonstrate the willingness of government institutions to institutionalize ES. The case in Pimampiro prompted the municipality to administer environmental regulations, motivating the national authority to act, a process that is essential for effectively creating environmental management capacity (Echavarria et al., 2003). The case of Costa Rica also reflects the important inclusion of legislation that has been passed to protect the nation's forests, including the environmental law and others (World Bank, 2000a). Part of the successful factors reflected in this case embrace the enforcement of the contract; the administration of fees collected only invested in ES activities; the good service delivered: the enhancement of quality water through an effective system; and the mechanism that used existing capacity, characterized by simplicity and transparency (Porras & Neves, 2006c).

The replication of these schemes in other contexts has not been easy, but characterized by gaps between the theoretical framework and the reality. PES conceptualization dominated by Coase's and pure market approach has not been easy to generalize and implement on the ground (Leimona, 2011). Wunder (2008) –the scholar responsible for PES theoretical framework development– avers that in practice many schemes fall short of satisfying all criteria, accounting around 287 'PES-like' cases noted in a global review; while in contrast, there is "no more than a couple of dozen of experiences globally" that fit all the previously mentioned five criteria (p. 280). In order to respond to contextual differences and to make programs workable and effective, a number of scholars and practitioners have gone beyond

mere schemes replication, considering local context and expressing the necessity of new ways to balance efficiency and equity in terms of benefit sharing and participation, especially in rural areas of developing countries. In fact, this scheme has high potential for having a positive impact on the social sphere, such as poverty alleviation, since it provides an alternative source of income to the providers of the environmental service, who oftentimes are the poor from rural communities.

PES literature presents a debate regarding changes in PES' original designed objectives. Some scholars consider these instruments "for improving the efficiency of natural resource management and not necessarily for alleviating poverty" (Muradian et al., 2010, p. 1203; Engel et al., 2008), and assure that attempts to achieve poverty reduction through this tool may weaken the ultimate goal (Shapiro-Garza, p. 2013). On the other hand, other scholars and practitioners note that in practice PES schemes indeed "face intrinsic contradictions" having the necessity to balance efficiency goals with fairness considerations (Wunder, 2007, p. 53). The poor or vulnerable social groups' perception about fairness (benefit sharing and participation) is a key factor to determine feasibility and become accepted and legitimized (Muradian et al., 2010). Grieg-Gran, Porras, and Wunder. (2005) highlights that "the impacts on the poor are both moral and pragmatic" and these instruments are often perceived as effective complements to public regulation (p. 1512). Because adjusting PES to pertinent realities is indispensable in order to realize programs with positive outcomes, this research concurs with the importance of studies highlighting the necessity to incorporate pro-poor aspect, that are in fact been implemented in various countries of the Asian region. Thus, the present aims to analyze an implemented pro-poor PES program in Suntenjaya village, Indonesia and motives that influence participation and program's workability.

2.1.2.2 PES in Asia

Although most of the cases studied in Asia are characterized by insufficient analysis, partly due to their early stage, the following are examples of PES schemes conducted in Asian countries, offering basic features of a case in Vietnam, Philippines, and Indonesia.

The case in Vietnam, Lam Dong province demonstrated the necessity to implement a pilot PES program in 2009 due to the increase of negative impacts of deforestation in the watershed areas, resulting in loss of human lives and assets. Although payment was low, according to Dillaha et al. (2007) farmers were willing to voluntarily participate because many were seasonally unemployed, and they recognized the importance of the training provided. Other scholars, such as Catacutan, Leimona, and Van-Noordwijk (2012), observed the "exclusion when official landowners were selected to participate in the PES program creating a disincentive for the landless people to participate in forest conservation" (p. 3). This is a watershed management environmental service that sought to enhance water provision, soil protection, reduction of erosion, protection against sedimentation of reservoirs, and ecotourism. Buyers for this market mechanism involved two hydropower companies, two water supply companies, and nine ecotourism companies. ES sellers "included 13 state actors (forest companies and management boards), 564 households assigned legal rights to forest, and 3,342 households contracted to protect forests" (Quang Tan, 2011, p. 18). As for meeting conditionality of this contract, although there was some skepticism about the implementation of the monitoring system, it could be accomplished (Thuy, Minh Ha, & Campbell, 2008), helping to protect the forest and reduce the incidence of violations and encroachment in forestland (Chiramba, Mogoi, Martinez, & Jones, 2011).

Another case worth mentioning is the one located in the municipality of Bakun, northwest Benguet province, in the Philippines. This scheme was assisted by the Rewarding

the Upland Poor in Asia for Environmental Services (RUPES) project along with the local authorities of the area, striving for a more holistic project in terms of fairness. Deforestation and water pollution were among the major problems of the watershed inducing the introduction of the PES scheme, where upland indigenous tribes were identified as potential sellers while the hydropower company directly obtaining benefits from the watershed was identified as the beneficiary or ES buyer. Although this case is superficially studied and it still requires more development, the RUPES project highlights their work in providing capacity building to intermediaries and ES providers to negotiate and handle the reward's mechanism, as well as raising awareness of the importance of environmental services in their area and helping to follow up the implementation of their plans (ICRAF, 2013).

Sumberjaya, a sub-district of the West Lampung District of southern Sumatra, is a location that represents a PES implementation in watershed management. During the 1980s, deforestation and land conversion to coffee farming started to increase in the forested area of the watershed and the government saw this as a threat to watershed functions. ICRAF could show that in a well-managed system, coffee farms could control erosion, beginning in this way the implementation of a PES scheme with this research center as an intermediary. ES sellers were composed of coffee farmers who voluntarily engaged in the program; however, it was noticed that non-participants were likely to face pressure from participants (USAID, 2007). ES beneficiaries consisted of the state forestry department and state hydroelectric power company. As for conditionality, payment modalities included cash payment for sediment reduction by the hydropower company, whereby payments depended on the amount of sediment reduction, and land tenure permits issued by the state forestry department (ICRAF, 2013).

PES in Vietnam structured in a top-down approach could incorporate larger areas to be tackled for environmental conservation; however, there are still doubts about the fairness of implementation procedures and outcomes. A similar situation is presented in Sunberjaya case. All three cases require more information and analysis than merely a report from implementers.

In Asia, PES schemes are at an initial stage. Indonesia, with among the highest biodiversity in the world and also one of the most populous countries with 237,641,326 inhabitants in 2010 (Badan Pusat Statistik, n.d.a), faces the constant challenge of effectively addressing environmental issues regarding loss of biodiversity due to high deforestation rates and pollution, while also needing to support people's livelihoods and the country's economy. Incentive mechanisms like PES have high potential for environment conservation. In view of this situation, there are about eight recognizable ongoing projects (see table 2.1 that list some PES project; figure 2.2 illustrates the geographical location of the programs) (Suyanto, Leimona, Permana, & Chandler, 2005). Two pilot schemes exist in the challenging area of the Citarum basin: one located in Cikole village, the other one in Suntenjaya village. The latter location is the subject of this research. Despite the willingness of the Indonesian government to take the next step towards developing PES in the country, their efforts on the design of a PES protocol to provide direction for its implementation, and the recognition of ecosystem services under Law 32/2009 on Environmental Management, programs are on a very small scale (Ecosystem Services Partnership International Conference, 2013). More understanding seems to be needed in order to advance and scale up PES programs in the country.

Table 2.1: PES Projects in Indonesia

# PES Scheme	Location	Supporting Organization
1. Tahura Ir. H. Djuanda, (2011)	Grand forest park in Bandung, West Java	Danish International Development Agency (DANIDA-KLH)
2. Gunung Rinjani Lombok Barat	Lombok Island in Wet Nusa Tenggara province	World Wildlife Fund (WWF) Mataram Chaper
3. Sungai Wein Balikpapan	Protected forest of Wain river, East Kalimantan	Provincial authorities
4. Danau Singkarak, (2004)	West Sumatra	RUPES program by ICRAF and others
5. Citarum, (2009)	**1.Suntenjaya village,** 2. Cikole village (in Bandung regency, West Java)	**LP3ES**
6. Cidanau, (2002)	Banten Prince, Java	Lembaga Swadaya Masyrakat Rekonvasi Bhumi, ICRAF and LP3ES
7. Sumberjaya, Sumatra (2005)	West Lampung District of Southern Sumatra	RUPES program by ICRAF

Source: LPM Equator (2012); Leimona (2011); Munawir (2007); Suyanto et al. (2005), p. 26

Figure 2.2: Geographic Locations of PES Projects in Indonesia

Source: Indonesia map. Adapted from Google map, 2013

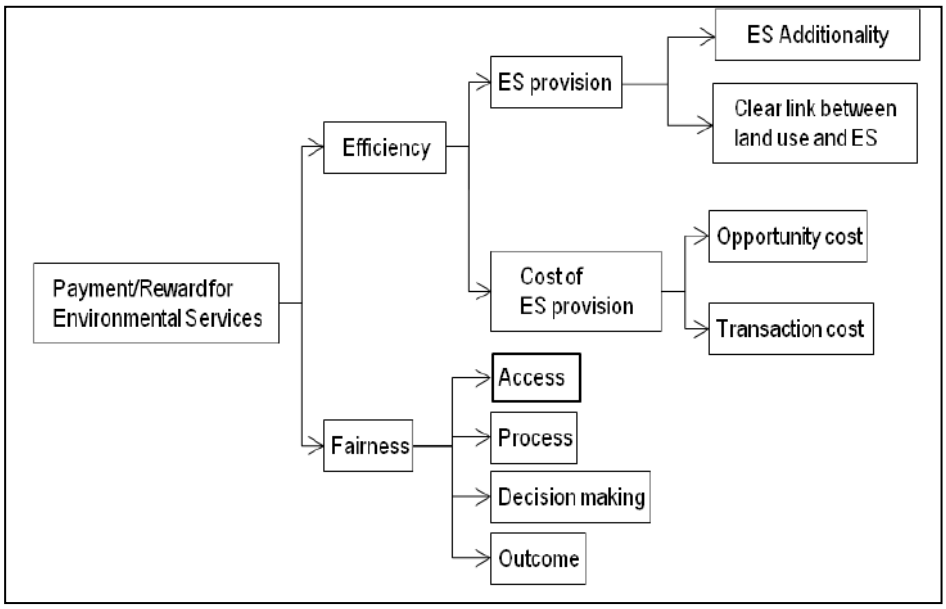
The critical condition of the Citarum basin in Indonesia is highlighted as one of the most polluted rivers in the world. Factors like pervasive hilly farming (40% of the population engages in agriculture), and high rates of land conversion have intensified land degradation problems, sedimentation, water contamination, and the increased frequency and severity of natural disasters, affecting the environment and well-being of societies (Asian Development Bank, 2007, p. 14). Poverty also constitutes an important challenge. Poverty headcount represents 2.8 million (9.7% of the basin population), an important figure with poverty levels of the total populations ranging from 1.5% to 4.8% in the municipalities (urban) and 2.9% to 26.4% in the districts **(**ADB, 2007, p. 15). Poverty affects the environment (e.g. deforestation and water quality) and to some extent the implementation of projects, as seen in numerous environmental projects that have failed. In light of the importance to address issues in the Citarum basin, an area that accounts for approximately 748,460 ha, there is significant potential since the river is an important source of water for 25 million people, for irrigation networks and reservoirs in West Java (Juwitaningtyas, n.d., para. 2). PES has been considered

in the area.

2.2 Pro-poor PES, Participation, and Poverty as a Factor Affecting the Program's Continuity

Recently, the consideration of the potential of PES to address the poor and the environment has led to the promotion of 'pro-poor PES' programs. Although debate about the objectives of PES continues, within this area of study, it is particularly important to refer to Leimona's (2011) study, which contributed to the understanding of PES in the Asian context and its necessity to balance PES with pro-poor issues as opposed to Latin America contexts. The case of Costa Rica illustrates how payments were mostly given to a reduced number of wealthy landowners with large property, e.g.: 50 –100 ha (Zbinden & Lee, 2005, p.256), where part of the local poor were not able to participate as most of the time they own no lands and could not bear transaction costs. Zbinden and Lee (2005) describe that most participants in Costa Rica hold a university degree, and were more likely to be urban dwelling, with an average income of US$ 1,000 (p. 256).-As opposed to the Latin American context, the Asian region displays rural areas characterized by high poverty ratios and high population density, where there is a large number of farmers working on small land areas, e.g.: 0.3-0.5 ha in the case of Suntenjaya village, West Java (according to the author's fieldwork). Fairness or pro-poor elements in PES refer to "opportunities given for marginalized actors of the scheme in participating, planning, designing, implementing and monitoring the scheme, and getting benefits from it", while efficiency refers to creating ES additionality by cost effectiveness (Leimona, 2011, p. 6). Figure 2.3 exemplifies elements of efficiency and fairness within the PES program.

Figure 2.3: Elements of Efficiency and Fairness within a PES Scheme



Source: Adapted from Leimona (2011), p. 6

Attempts to achieve an efficient and fair PES have been conducted through the Rewarding the Upland Poor in Asia for Environmental Services (RUPES), a program initiated in Southeast Asian countries, proved that preconditions for the Coasean thoughts of PES could not be met. Part of the reasons were a absence of data and ability to measure, map, model, value and monitor ecosystem services on numerous scales; unclear property rights; lack of stable funding; and close connection between poverty and environmental degradation. Case studies in Indonesia did not demonstrate a drastic change in the livelihood of participants, but rather evidenced some small contributions towards social and human capital. Likewise, the importance of non-financial incentives to ES providers was highlighted, while there is still no sufficient scientific proof to assess the impacts of the environmental services.

Pagiola et al. (2005) also contribute to the understanding of pro-poor PES and provide some recommendations from empirical analyses. Part of the recommendations are to design a mechanism that does not exclude poor land users by "keeping the transaction costs as low as

possible, and being creative in response to problems such as insecure tenure or lack of titles" (Pagiola et al., 2005, p. 237). Such objectives are easier to achieve when there are strong local organizations like NGOs that facilitate organization and communication activities among farmers. Furthermore, when designing pro-poor PES it is important to not "fall into the trap of considering the program as being primarily a poverty reduction tool; making poverty reduction objectives predominate is understandably attractive, but would prove ultimately self-defeating" (Pagiola et al., 2005, p. 253). Alternatives to provide support to poor farmers, including technical assistance or access to inputs and credit, would also facilitate the implementation of PES. Tschakert (2005) also recommends the support for institutional structures to encourage participation and boost benefits for the poor. She argues that "multi-level institutions should encourage information exchange and experimentation, thereby enhancing social learning and capital formation; this is essential if farmers want to enhance their technical knowledge base" (Tschakert, 2005, p. 84).

2.2.1 Pro-poor PES Programs and Participation

Where poverty is embedded within areas critical for ES provision, "ensuring that PES programs include and benefit marginalized smallholders is vital for enhancing social equity and promoting long-term ecological success" (Bremer et al., 2014, p. 123). Thus, understanding farmers' reasons to participate in PES is essential for designing effective and fair programs. A study of Bremer et al. found that social capital in the form of social networks and community organization has been found to be valuable in predicting PES participation patterns, and in promoting sustainable development in PES programs. Some researchers have shown social networks are indeed important and common factors in the field of environmental management where stakeholders need to come together to solve problems (Bodin & Crona,

2009). The study of Bremer et al. also showed that while most participants expressed that cash payment was attractive, non-monetary motivations like enhancing water supply and pro-conservation attitudes were also key motivations for participation. Another factor influencing participation was education, as some cases show that lack of participation is due to low education levels or scarce opportunities to interact with program managers, like in developing countries such as Mexico (Bremer et al., 2014), and Vietnam (Petheram & Campbell, 2010). In the case of a developed country, a case study in the United States revealed that education generally promotes participation; "one more year of education increases the probability of considering the PES by about 3%" (Ma et al., 2012, p. 618).

As an example of studies necessary for the comprehension of factors influencing participation in PES is the study of Arriagada et al. (2009) that aimed to understand the motivations of participants, in this case wealthy landowners, participating or not in the PES programs in Costa Rica. Among the reasons to participate in the program were lack of more profitable land use alternatives (e.g., high slope, poor soil quality); legal restrictions to land use changes towards more productive activities on high slopes; reduced prices of export beef, which leads landowners to abandon cattle and livestock activities to grow trees; PES payment representing an important source of income; and a simple application process through NGOs and authorities' assistance. Reasons to not participate were mainly explained by general low payments and high transaction and maintenance costs. These kinds of studies were very much promoted and well utilized not only by the academia in Costa Rica, but also by authorities leading PES. Since characteristics of participants and poverty are different on the two continents, it is expected that reasons for participation and non-participation would be different and highly influenced by socio-economic and contextual factors. Therefore, comprehensive analyses like the ones conducted in Latin America are also needed in Asia,

with special emphasis on pro-poor aspects. This research deepens the participation issue as part of one of the pro-poor elements described in the literature, 'access', in chapter 4.

Empirically Based Literature: Determinants for Participation in PES

The voluntary nature of PES, along with its significant potential to address environmental recovery, has been enough reason for the initiation of various studies on the issue of participation. Replication of these programs around the world has raised concern about more equitable measures for the program to be adopted in regions like Asia, which have strengthened the necessity for research to go beyond assumed economic interests as the main reasons for adoption of a more comprehensive understanding of PES participation. Currently, case studies in the Asian region are still insufficient. Hence, the present study contemplates case studies of different countries as a source of general reference, while prudent with contextual differences, not only between developed and developing nations, but also across different countries.

There are diverse variables influencing participation in agri-environmental programs and in PES, and the common ones that explain participation in these types of programs are summarized in table 2.2. The review includes various studies. Some of the works are (Knowler & Bradshaw, 2007) based on quantitative approaches via logistic (logit) and probit regression from a total of 23 papers that seek to explain farmers' implementation of specific agricultural innovations, and five papers based on participation in PES programs (p. 25).

Table 2.2: 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 and Bradshaw (2007); Mullan and Kontoleon (2012); Zbinden and Lee (2005); Arriagada et al. (2009); Ma, Swinton, Lupi, and Jolejole (2010); Jolejole, Swinton, and Lupi (2009)

Studies regarding agricultural innovations and agri-environmental programs based on a quantitative approach with samples ranging from 43 to 1425 landholders in various countries like United States (13 studies); Canada (three studies); Panama, Peru, Honduras (three studies); and Rwanda, Nigeria, Burkina Faso (four studies); and other brief case descriptions generally show the common following remarks in their findings:

- Financial viability is an important consideration and may inhibit interest and therefore participation in both developed and developing nations.
- Variables like education and farm size tend to be influential factors. Larger land

areas are usually enrolled and preferred by administrators or beneficiaries of the program. In developed countries, education tends to positively influence participation, as for instance the case conducted by Ma et al. (2012) in the United Stated. In developing countries, lack of participation is usually due to low education levels or scarce opportunities to interact and learn from program managers, like in the specific case of Mexico (Bremer et al., 2014), and Vietnam (Petheram, & Campbell, 2010).

- Other non-financial elements may be influential for further adoption of the program, such as farmers' knowledge of conservation, agriculture techniques, and the accessibility and possession of appropriate technologies and tools.
- Some of the studies based on quantitative approaches highlight that social capital seems to be an important and more universally influential factor in conservation. However, due to limitation of the studies, they point toward further research into the influence of social capital.

Findings from studies, which focus on participation in PES programs based on a quantitative approach present the following characteristics. A case study in China with small landholders' involvement proved that participants tend to have higher incomes on average than non participants; participants also tend to have greater land size and are located in more remote villagers (distance from main road) (Mullan & Kontoleon, 2012). Studies of PES conducted in Costa Rica demonstrate that none of the landowner participants depend on their farms to survive; legal issues also influence program participation (since land under PES is automatically protected by a governmental organization, which means that the property cannot be arbitrarily occupied by anyone). People with high environmental awareness were more disposed to participate, but interviews show that this was not an important influential

factor for participation (Arriagada et al., 2009).

On the other hand, studies regarding community-based environmental management grounded in a qualitative approach emphasize social variables rather than the opportunity cost highlighted in some studies and their efficiency focus. Bodin and Crona (2009) and Bremer et al. (2014) agree that social networks are important for predicting PES participation, and in promoting sustainable development in PES programs. In some case studies, social networks were instrumental to 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 are various examples of circumstances where poor farmers develop cooperation utilizing existing networks that allows them to have access to new markets and increase opportunities to raise their incomes. The work of Boum et al. (2008) also shows social capital's positive correlation with participation in community resource management (in a case study in India). Social networks, generally referred to as a set of links and ties among individuals or groups, are 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 farming 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" (Organization for Economic Cooperation and Development- OECD, 2013, p. 12).

Different aspects influencing PES, whether financial or not, could be understood within the livelihood framework. Implementing hybrid forms of PES, like pro-poor PES, particularly in Asia, implies limitations with the pure market approach, the reason why different analytical lenses to look at PES is necessary. Muradian (2013) argues that PES should be seen as an "incentive for collective action" (p. 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 et al. (2014) and other scholars point out 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.

2.2.2 Process and Decision Making on the Ground for PES

As part of pro-poor elements, the process and decision making in these kinds of programs are also fundamental. Participatory approach literature and the bottom-up approach in project implementation favor the consultation and active participation of stakeholders, providing lessons about the benefits of short-term implementation as well as sustainability. To encourage fairness in pro poor PES it is critically important to have the stakeholders' active participation in decision-making and the whole process. Leimona's (2011) work on Indonesian PES confirm that this element is not only a part of a formality, but integration of local knowledge could help clarify many issues that at first implementers could not be aware of, as in the case of a watershed service. How the service is provided, who are responsible for such provision, who are the beneficiaries and how it impacts in the present, all must be considered. This help should be balanced and integrated in a multiple knowledge system that also includes experts in order to increase the fairness dimension and offer unbiased forecasts about environmental service. Although Leimona's work could not be empirically judged in totality, the recognition of a multiple knowledge system in early stages facilitated communication and negotiations among stakeholders. As specificities and development in pro-poor elements is desired, the analysis of pro-poor PES is still in an early stage. In this sense, chapter 3 attempts to explain and describe the process of the current program of study.

2.2.3 The Desired Further Step: Continuity of the Program

Finally as part of the last pro-poor element, 'outcome', there is insufficient literature that develops this point, which still is vaguely defined. Leimona (2011) refers to this component as benefits stakeholders obtain from the program; implicitly, tangible and intangible assets are supposed to be part of such gains. For the latter, Leimona's reports commonly refer to the benefit of grouping together ES providers, gains from sharing information, bonding together, and others. As part of the tangible benefits, poverty reduction is one of the goals to be achieved, yet her studies and others could not quantify such gains. From the current ongoing scheme, subject to study in this research, it is still early to achieve such quantification. On the other hand, Wunder (2008) and others scholars (Muradian et al., 2010; Engel et al., 2008; Shapiro-Garza, 2013) warn about focusing too much on the poverty aspect of pro-poor PES program, as such emphasis on poverty reduction could obscure the principal goal of ES delivery of PES programs. In this sense, when referring to the broad term 'outcome', this research argues that the continuity or sustainability of the program could be one of the appropriate interpretations. The latter supposes that farmers engage on a voluntary basis and continue the program only if they feel somehow satisfied with the conditions and ongoing stages, which would imply that the ES would be delivered, assuming the program was well structured, providing benefits for both the stakeholders involved, and as ultimately desired, for the environment. Chapter 5 develops upon this aspect of continuity.

2.2.3.1 Poverty and Vulnerability in the Rural Context

According the World Development Report (WDR) 2008 (World Bank, 2008), nearly half of the population of the developing world lives in rural areas and more than 80% of them depend on agriculture (p. 35). The poor live mostly in this rural world where land and other

factors are critical resources that affect people's livelihood (Rigg, 2006). As many reports note, life in the rural areas of developing countries is characterized by poverty and risk (Klasen & Povel, 2013). "Households with vulnerable livelihood systems have neither enough assets, nor the capabilities to create or access them" (Niehof, 2004, p. 325). These households are often burdened with obligations that prevent them from providing basic needs for their family members and coping with critical situations (Niehof, 2004). Such vulnerability may affect households in various aspects of their lives and development, as well as their role in society.

In the case of West Java, population growth, a pressing matter, is a common characteristic of the rural areas, particularly in Asian developing countries. Specifically in the Citarum region, the population was 17.8 million with 4.1 million households, 30% - 40% derived livelihood from agriculture, 25% from industry, and about 45% from services, in 2003 (ADB, 2007, p. 11). Increase in population has lead to increase in settlement areas; in the upper Citarum region settlement areas were 25,000 ha in 1992, reaching 46,000 ha in 2001 (ADB, 2007, p. 11 & p. 13). Poverty is a related problem of overpopulation and lack of mechanisms to control the expansion and correct infrastructure of settlements. Many unsuccessful projects are due to the insufficient incorporation of measures to tackle poverty, like educational programs to raise awareness about villagers' important role in environmental conservation. Poverty headcount represents 2.8 million (9.7% of the basin population), an important figure with poverty levels of the total populations ranging from 1.5% to 4.8% in the municipalities (urban) and 2.9% to 26.4% in the districts (ADB, 2007, p. 15; ADB, 2009b). As of 2014, the national poverty line was set at 292,951-312,328 rupiahs per month (~$24.4) (World Bank, n.d.c, Indonesia Investment, n.d.)

Environmental challenges are intertwined with various social issues like rural poverty and agricultural development. Adverse environmental results from many commodity development actions include the expansion of agricultural lands over forest and the loss of many ecosystem services, pollution (including both organic and non-organic sources), uncontrolled use of water resources, and malpractices leading to the loss of soil nutrients and poor site selections. Lack of opportunities for the poor may also lead to exploiting and destroying natural resources, threatening environmental and livelihood sustainability (ADB, 2006; Leimona et al., 2015). This section provides a snapshot of these issues towards a comprehensive understanding of the realities of PES projects in the country.

Although progress has been made in the rural areas of Indonesia and the agriculture sector provides income for the majority of the households, poverty remains and constitutes a significant challenge in the rural context. According to country's poverty standard, 13.8% of the rural population is considered poor, in contrast with 8.2% of the urban population in 2014 (International Fund for Agricultural Development, 2015, p. 1). By 2014 it is estimated that about 28 million Indonesians still live below the poverty line (Aji, 2015, p. 3). In addition to internal challenges the nation faces to tackle poverty, the Asian economic crisis contributed to the number of poor people and still today absolute poverty is one of the major challenges for the country. Indonesia is a large and heterogeneous country, administratively divided into 26 provinces, 341 districts, 4,044 sub-districts, and 69,065 villages, and while the highest incidence of poverty in rural areas is reported in Eastern Islands like Sulawesi and Papua, the majority of the rural poor lives in densely populated areas of Java (Wie, 2010; ADB, 2006; IFAD, 2015, p. 2).

It is well known that the majority of the poor and vulnerable is in the agriculture sector, both before and after the Asian crisis. Figures indicate that farming is the main

occupation and farmers are 2.1 times more likely to be poor than those working in different occupations, as IFAD states, “three out of five Indonesians live in rural areas” (IFAD, 2015, p.1). Two thirds of Indonesians living below the poverty line live in rural areas, and it is estimated that in 2002 about 38 million people were categorized as living below the poverty line, 65% of them living in rural areas (ADB, 2006, p. 54). Geographic isolation and lack of education and access to main services, as well as lack of investment in a management system to expand production, are some of the causes that aggravate poverty in rural areas (IFAD, 2015; Wie, 2010).

2.2.3.2 Vulnerability and Different Approaches to It

Much of the research on poverty dynamics and on risks and management strategies line up together to develop part of the literature of vulnerability to poverty (Klasen & Povel, 2013). The concept of vulnerability is contentious, tackled by different measurements, and although it offers an advanced discussion, it is open for enhancement when linking the concept and its empirical implementation (Klasen & Povel, 2013). Gaps in the usage of the term vulnerability not only range from field to field, like climate change, natural management, poverty reduction and development, but even in each field the definition may depend on the context and policy action (Tiani et al., 2015; Alwang, Siegel, & Jorgensen, 2001; Klasen & Povel, 2013). Therefore various frameworks could help enrich understanding of this area and foster multidisciplinary cooperation, as Alwang et al. (2001) highlight, although a fits-all application to measure vulnerability to poverty would not be viable.

The WDR 2000 focus on empowerment, security, opportunity and poverty brought the concept of risk and risk management and its relationship between poverty and vulnerability to the policy table, the latter a concept that very much proliferated (Alwang et al., 2001). The

WDR 2014 about risk and opportunity continuously uses the terms vulnerability and risks and discusses the way to overcome them and pursue opportunities (World Bank, 2014). As Klasen and Povel (2013) remark, the term vulnerability has been extensively used since the new millennium; in this sense, the importance of this topic is explicitly recognized in the development of the rural context. Although risk and vulnerability are related, they are not synonyms, as "risk refers to uncertain events that can damage well-being" (World Bank, 2000b, p. 139). According to Klasen and Povel (2013) and the resume of common elements of different literature about vulnerability, it "refers to the concept of poverty combined with risk and the efforts and capacities to manage risk; also, it is an approach of thinking dynamically about poverty and switching from an ex-post to an ex-ante perspective" (p. 22). "A household's vulnerability to poverty is measured as a risk or probability that the household will be poor in the near future, implying that households have greater or lesser degrees of vulnerability" (Suryahadi & Sumarto, 2010, p. 37). Vulnerability to poverty could affect anyone and could be caused by different events, for example bad or no harvest, a lost job, an unexpected expense, an illness, and many other risks (Suryahadi & Sumarto, 2010).

In the economic and poverty-related literature, the term vulnerability is at times implicit, but focuses on risk, such as price and weather variability. Economic measurements include metric methods that use income and expenditure as common variables, and other alternative indicators of well-being, like landholding size, household heads, and distance from markets (Alwang et al., 2001). The impacts of many of these indicators have been researched and have resulted in many clear-cut concepts in this literature (Klasen & Povel, 2013). However, many studies have recognized the complexity of poverty and vulnerability and the need for additional non-monetary indicators and approaches to capture the many facets of this subject (Alwang et al., 2001). It is also important to note the limitations of collecting

empirical data. While most of the literature suggests that frequencies and longitudinal data is suitable and sufficient, other disciplines criticize this (Alayande & Alayande, 2004).

The asset-based approach to poverty refers to poverty as caused by inappropriate access to assets, both tangible and intangible ones, and the ability of households to manage risk. "Risk management is achieved by allocating assets before and after a negative event" (Alwang et al., 2001, p. 9). Households with more income and investment in assets are less vulnerable to risk events, either by utilizing assets to prevent or mitigate risk or through investment over time that could increase income. Nevertheless, the details and specificity of assets in reducing vulnerability have not been empirically established, often offering too general and implicit outcomes; for instance, investments in social capital may contribute to idiosyncratic risk, but may not assist effective management of covariate risk. (Alwang et al., 2001)

The sustainable livelihoods literature closely influenced by Amartya Sen's work refers to the concept of vulnerability as the probability that livelihood stress will occur in a forward-looking and ongoing state. The concept considers the external risks and the internal ones that refer to the lack of means to cope with stress. However, there is not much practical discussion about measuring vulnerability with respect to this literature. This literature focuses on structural vulnerability or chronic poverty in the economic field, as those households that present characteristics, such as age and headship, that make them vulnerable. It is important to recognize that conditions for vulnerability are changeable or part of a process. Thus, changes can affect the classification of risk management strategies, for instance activities identified as post coping could become ante mitigation ones and be adopted as norms. The focus on adaptation as a risk response is important as well as the description of livelihood vulnerability. Nonetheless, many of the empirical assessments have been site-specific, making

it difficult to apply or compare across populations. Although case studies have been discussed, part of the literature's limitation is the lack of proposal for indicators (Alwang et al., 2001).

Despite limitations, many studies highlight the livelihood analysis as fundamental to understanding "how rural communities and households respond to environmental and social change" (Eakin et al., 2006, p. 157). Through this analysis, the engagement of households and their resources for survival in the dynamic socioeconomic context and shocks is documented. Application of this framework is seen in a good number of studies of rural development, and also refers to coffee growers and their vulnerability, like the work of Eakin et al. (2006).

Other schools of thoughts that also refer to the livelihood literature are sociologists and some environmentalists. Many sociologists adopt the term vulnerability as a dimension of poverty in relation to socials aspects rather than using a money measurement. They also include aspects of livelihood security, attempting to look for indicators based on the asset approach that could facilitate the understanding of the term. Yet, relationship among risks and response outcomes are difficult to determine in measurable metrics. Recently, part of the environmental literature has strongly used the livelihood-based work, describing vulnerability as the exposure of people to livelihood pressure as a consequence of different environmental changes (Alwang et al., 2001).

2.2.3.3 Examples of Vulnerability Among Coffee Growers

While literature on vulnerability could seem abstract due to the mentioned limitations in its measurement, challenges farmers face could be better appreciated in the contextual basis of empirical works. In the case of coffee growers, a crop of close concern to farmers in Suntenjaya, Bacon (2005) describes how "small-scale family farms produce over 70% of the

world's coffee in 85 Latin American, Asian, and African countries" (p. 497). "Most coffee producers live in poverty and manage agro-ecosystems in some of the world's most culturally and biologically diverse regions" (Bacon, 2005, p.497).

The investigation of Eakin et al. (2006) in three different countries of Latin America (Mexico, Guatemala and Honduras) exemplifies how smallholder coffee growers, who tend to have few resources to cope with changes, have been particularly vulnerable to global economic transformations. In the face of the coffee crisis, most of the farmers from the three mentioned countries abandoned part of their coffee cultivation and adopted more secure crops to different extents. Decisions varied according to contextual backgrounds. Although Mexican farmers had more access to governmental assistance, their longer experience growing coffee influenced them in the adoption of different crops, as they have seen how the coffee crisis could take even a decade for prices to recover. On the other hand, farmers from Honduras with less experience were more optimistic, but also had diverse subsistence and livelihood options to cope with crisis. Guatemalan farmers engaged in organic coffee production as a strategy to cope with the crisis. Their previous ability for eight years and support obtained from an NGO helped them engage in such a practice.

Factors influencing farmers' decision making when facing crisis vary significantly; however, material wealth, access to market and technical information and enough land and financial resources for diversification were important in all three cases (Eakin et al., 2006). As seen in previous examples, and also pointed out by Ellis (2000), diversification and livelihood strategies have always been present in rural areas of developing countries as a means for survival. The concept of livelihood often could be seen as too general or vague. The dictionary defines it as 'means to a living', which implies not only income but also the different manners of how a living is obtained. Within the livelihood context, the definition of

diversity refers to the presence of many different income sources. On the other hand, diversification regards the creation of diversity as a continuing economic and social process, which farmers seek for.

2.3 Conceptual Framework: Capital Assets of the Sustainable Livelihood Approach (SLA)

The capital assets framework, basis of the SLA, has been used in diverse situations. Hejnowicz et al., (2014) review 44 studies, which encompassed 23 PES programs (p. e4). 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%) (p. e4). Hejnowicz et al. emphasize that the SLA may help reach an optimal balance between conservation and development outcomes. Scholars like Leimona (2011) studied PES' impact on farmers' livelihood based on five capital factors in West Java, Indonesia, while McLennan, and Garvin (2012) use the framework to evaluate landholders' access to livelihood resources. The latter findings point to the importance of locally-tailored involvement that is able to reach beyond the field of natural science like forest conservation and management. But, these would include interventions to actually strengthen rural peoples' ability to access to basic resources necessary to adapt livelihoods to rapid changing socio-economic conditions.

The SLA is a representation of the "multiple capital" approach that evaluates the available capital towards considering sustainability and the vulnerability context that affects such capital and households' livelihood strategies and outcomes (Morse & McNamara, 2013, p. 28). This framework has been used in various studies, like analyses of poverty and environment relation, poverty alleviation, and policy examinations in rural areas (Ellis, 2000).

More concretely, this framework has been employed to (i) ensure considerations before imposing a plan; (ii) facilitate understanding of capital available to households, their vulnerability, institutions involved, and what can be done; and (iii) promote developmental objectives: improving livelihood sustainability by understanding and enhancing capital contributions (Morse & McNamara, 2013). The present study also employs the described framework as an approach to evaluate available capital that affect participation and continuity in developmental objectives towards achieving environmental conservation and households' livelihood.

This framework has also been criticized for its difficulty in measuring capital and its simplicity for disregarding policy and institutional contexts. Particular points made by some critics involve the lack of clarity of accounting for all indicators proposed by the framework or only few of them, and the difficulty of measuring social capital indicators like trust. (Morse & McNamara, 2013) Such limitations are yet to be overcome by researchers. However, the implementation of the capital framework attempts to offer a more comprehensive view toward understanding multiple aspects of realities, particularly in the implementation of PES in developing countries, where it is assumed that not only economic aspects will prevail in understanding participation with high potential of program expansion.

Some main concepts that this study refers to are placed and defined in a conceptual framework that intends to elucidate the flow and relationship among different ideas in this study. Figure 2.4 illustrates how environmental degradation and poverty affects households' capabilities. Capabilities formed by different factors, like education, social networks, income and others affect participation and collective action in pro-poor PES, a program that eventually intends to address environmental issues as well as poverty, and that has the potential to also influence the different capabilities of those who come together to participate

in the program.

Elements interacting in the conceptual framework are defined and elaborated as follows.

Environmental degradation and poverty linkage: the orthodox view implies environmental degradation and poverty as a cause-effect relationship that occurs in a 'downward spiral or vicious cycle' in which poverty pushes people to overexploit natural resources that would ultimately degrade the environment, which affects people's livelihood, pushing them into greater poverty (Forsyth, Leach, & Scoones, 1998; Jabeen, 2012). Poverty is a central cause of global environmental problems, thus it is futile to attempt to manage environmental problems without the inclusion of factors underlying poverty and inequality (WCED, Brundtland Commission, 1987). For example, in rural areas, environmental degradation, such as deforestation and erosion, are caused by people's short-term rent seeking that worsens the poverty situation (Shirakawa, Noda, San Miguel & Oki, 2014). On the other hand, new perspectives believe that different examples could illustrate contrary results from the downward spiral, challenging the conventional approach. Yet, only a few examples contradict this vicious cycle, and there are serious doubts whether they are just a few exceptions rather than generalities. However, it would be incorrect to discard this approach, since there are still strong differences among those who accept, and those who reject it (Forsyth et al., 1998). Overall, this scenario of environmental degradation and poverty reflects a negative impact on households and communities if otherwise addressed.

Capabilities: reference obtained from Chambers and Conway's inclusion into the sustainable livelihood approach (Krantz, 2001; Ellis, 2000) refers to human capital, social capital, financial capital, natural capital and physical capital. Human capital refers to the "labor available to the household, like education, skills, and health" (p. 33). Social capital is

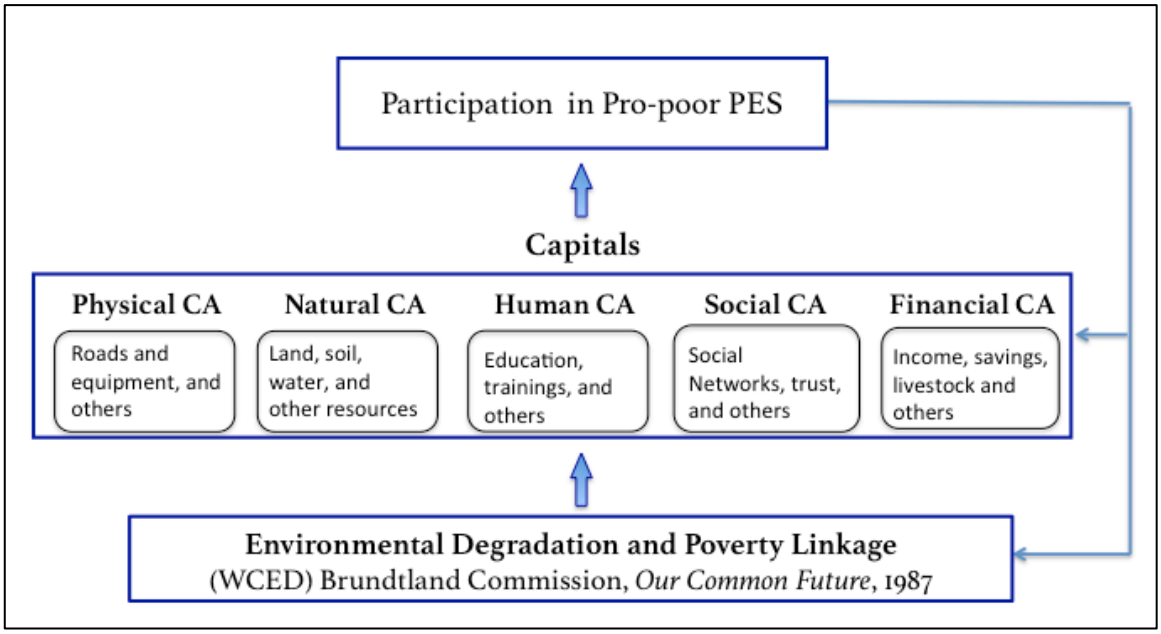
defined as “reciprocity within communities and between households based on trust deriving from social ties” while nurturing networks, the latter referring to relationships among social entities (p. 36). Financial capital involves money which households have access to, and other funds held for such purposes like saving, access to credit and also assets like cars or motorbikes, livestock, and many others. Natural capital refers to environmental resources used by people to generate their ways of survival. Physical capital refers to producer goods, man-made, or capital created by economic production processes like infrastructure that usually facilitates livelihood diversification. (Ellis, 2000, p. 33 & p. 36)

Different types of capital assets formed by different factors or indicators affect participation and collective action in PES, a program that eventually intends to address environmental issues as well as poverty. This portion represents the focus of the current study, as variables categorized in different capital forms are to be used as a way to explain their influence on PES participation. It has been highlighted that PES also has the potential to influence the different capabilities of those who come together to participate in the program, as was pointed out in Leimona’s (2011) study.

Participation and collective action in pro-poor PES: these programs have gained popularity and they offer the potential to address environmental degradation and poverty (direct relationship), where the greater the participation and collective action, the greater the impact. Regarding collective action, it is understood as “advancing the individual's self-interest”, aiming for the group’s improvement or common interest. In the natural resource management literature, “the positive relationship between density and joint action” is highly supported (Bodin & Crona, 2009, p. 368) from the celebrated strong analysis of collective action made by Olson in 1965, considering the effects of group size and impact in large-scale public areas (Miller, 1992, p. 23). The management of environmental services involves social

dilemmas, in other words, individual interests whose welfare is interconnected with different stakeholders. Thus, as in the management of common resources analyzed by Ostrom in environmental services provision, collective action is an efficient way to enforce monitoring costs, coordinate actions over a large area, and encourages good performance (Muradian, 2013). Swallow, Meinzen-Dick, and Van Noordwijk (2005) point out that collective action enable farmers to coordinate their efforts and actions over a large area to control and possibly provide environmental services. It could also strengthen the bargaining power of smallholders (negotiation process), and help to overcome transaction costs. Scholars continue to discuss in greater detail how to measure collective action and how to encourage it, as it represents a key factor in the management of common environmental resources (Crawford, Kotval, Rauhe, & Kotval, 2008). Bremer et al. (2014) states an example where in some cases NGOs are unwilling to help disorganized and unconnected communities based on the idea that this could intensify problems, while they support the well-organized and high synergized communities that could bond and act collective faster.

Figure 2.4: Conceptual Framework: Adoption of the Sustainable Livelihood Approach in a PES Study



Source: Developed by the author, adapted from Sustainable Livelihood Framework, Department for International Development (1999)

Finally, the structure of the sustainable livelihood framework, designed "as a way of linking socioeconomic and ecological considerations in a cohesive, policy-relevant structure" towards poverty eradication (Krantz, 2001, p. 6), serves to model the structure of the present study.

The literature review implies that, despite advances in the recognition of the importance of pro-poor or social aspects in Asia, there is no comprehensive analysis of the factors affecting participation, which may differ 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) point out that PES studies have been largely addressed from 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. Different factors like education, income, and social networks seem to be important determinants of participation, but their influence is not clear in the case of PES in Indonesia and other Asian countries. Frequently a gap is found between theory and practice in different cases studies addressed in the PES literature (San Miguel, 2014; Pirard, & Billé, 2010; Wunder, 2008; Muradian et al., 2013) that also stress the necessity to advance understanding in practical issues of participation. Addressing such gaps in the literature would be essential to build on current and increasing academic work that intends to contribute to the knowledge and evidence that socio-economic factors influence participation in and continuity of PES in Asia and support the expansion and scaling up of these programs.

The social network is one element of social capital, a concept that has different approaches according to the different current views. For instance, sociological literature accentuates features of social organization such as trust, norms of reciprocity, and networks of civic engagement. Economic literature takes the point of view that people want to maximize their personal utility, whereby they interact with different social groups and invest in their social strategies (OECD, 2001). As cited by the OECD (2001) "virtually every commercial transaction has within itself an element of trust" (p. 39) and it is the element of trust accompanied by the complexities of social embeddeness and power relations that set apart PES's pure market approach perceived in the implementation and practice. Many scholars in the PES literature highlight social capital as a key factor conditioning PES, a mechanism that is suppose to reconnect stakeholders in their decision making and the land use management process through cooperation in a process mediated by existing institutions that include property rights, legal frameworks, social perceptions and values (Muradian et al., 2010).

Lessons on initiatives targeting pro-poor schemes in Asia with rewards matching people's needs constitute a positive response toward rewards in forms of "of human capital, social capital and physical capital – or what are often referred to as non-financial incentives" (Leimona & De Groot, 2010, p. 9-10). Literature on collective action in natural resource management indicates that high levels of social capital among community members influences the degree of transaction costs (associated with lower cost), and this can be a positive point in the common literature, stating the common trade-off between efficiency and fairness. Other examples confirmed the importance of the role of intermediaries in PES schemes in developing countries mainly due to the limitations of ES providers. Thus, "honest and trusted intermediaries" are "one of the key factors of success" (Leimona & De Groot, 2010, p. 10). It is also important to have transparent processes at all levels, making those in charge of the management accountable, and to build up a database and provide information to the public regarding the process of selection, valuation, and payment. "Transparency is also thought to be necessary in schemes in which collective action is required, given that transparency is linked to verification, which is in turn related to trust and the latter is required for successful collective action" (Tacconi, 2012, p. 33). Overall, the importance of good social capital to encourage meaningful community involvement and strengthening ties toward the generation of benefits to the community itself is not questioned. However scholars try to discuss in greater detail how to measure it and how to encourage it (Crawford et al., 2008), particularly in PES programs where discussion is lacking.

On the other hand, when examining other capital like financial ones, discussion is very prominent in cases of Latin American PES, targeting program efficiency. Financial viability is considered an important factor to encourage participation in these programs (Knowler & Bradshaw, 2007), as well as the consideration of participants' financial capitals, mostly of

wealthy landowners (Zbinden and Lee, 2005), particularly in some cases studied in Costa Rica. Nevertheless, the role of financial variables specifically when encountering poor participants in many developing countries' contexts falls short in discussion, commonly addressing the necessity to obviously provide cash gains or at least to cover opportunity costs for the participants. The poor's financial situation and vulnerability may indeed influence their engagement in such kinds of programs, understanding that their vulnerability is high as their income is extremely variable (Ravallion, 1988); and the risk it takes for them to engage in new activities is high, since any small mistake could make them fall into deeper poverty (World Bank, 2000b).

CHAPTER 3

PAYMENT FOR ENVIRONMENTAL SERVICES: CONCEPT VERSUS PRACTICE IN INDONESIA'S CITARUM BASIN

3.1 Introduction

The Citarum is considered the world's most polluted river, and it figures significantly in the overall concerns of watershed management in Indonesia. According to the government's 2005 State of the Environment Report, "65 of the country's 400 watershed areas are in critical condition (doubling from 32 in 1992)" (Munawir, 2007, p. 5). Seventeen of these are in Java, where the majority of the country's population of 221 million people live (Munawir, 2007, p. 5). 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 a more than 40% reduction. Meanwhile, urban settlements are expanding through the conversion of surrounding paddy fields. (ADB, 2007, p. 14) 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, p. 14; Munawir, 2007).

In the face of such ecosystem alterations, which 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 theory has gradually been refined and improved. Costa Rica's successful example contributed heavily to PES conceptualization,

in particular to the five-criteria framework developed by Wunder (2005), which defines the scheme as (i) a voluntary transaction, (ii) possessing a well-defined environmental service, (iii) at least one beneficiary or buyer, (iv) at least one provider or seller, and (v) meeting conditionality (p. 3). These are the fundamental criteria necessary to achieve efficiency as a market-based instrument. However, field experience has proved that meeting Wunder's five criteria is difficult, prompting a consideration of contextual differences, focused on the aspects of equity and fairness within the programs. In developing countries, PES schemes are established in areas that target the poor or other vulnerable social groups. In these cases, the perception of fairness (i.e., access and benefit sharing) is a key factor in determining the scheme's feasibility and achieving acceptance and legitimacy (Muradian et al., 2010).

Programs may even have an impact on reducing poverty. Attempts to achieve efficiency and equity have been seen in the Rewarding the Upland Poor in Asia for Environmental Services (RUPES) Program, initiated in Southeast Asian countries, but no evidence on poverty alleviation has been collected yet. Through RUPES programs, Leimona (2011) introduces the idea of pro-poor aspects to be considered in what it could be called pro-poor PES or programs that aim to emphasize on fairness. 'Process, access, decision-making, and outcome' and benefits to the poor are part of such consideration, that although not yet well-developed theoretically and empirically, are valuable factors for future PES programs. This is where a distinct separation can be observed between efficiency and equity within the conceptualization of PES. Specifically, some scholars consider these instruments as intended "for improving the efficiency of natural resource management and not necessarily for alleviating poverty" (Muradian et al., 2010, p. 1203), whereas others support the inclusion of social aspects such as equity. Whether the schemes focus on efficiency, which has proven to be hard to achieve in many developing countries in Asia, or strive for a more balanced PES

that incorporates aspects of equity, the viability and sustainability of on-the-ground PES programs remains uncertain.

Although the literature concerning PES is expanding, particularly those studies that emphasize the advantages of investing in natural capital that can make economic, social, and policy sense (Salzman, 2005), there is still a dearth of case studies that can provide practical lessons. In Asia, PES schemes are still in the preliminary stages. Indonesia, a world leader in biodiversity as well as population (approximately 238 million people in 2010) (BPS, n.d.b), faces the constant challenge of effectively addressing environmental issues. Incentive mechanisms such as PES have high potential for environmental conservation, which is why there are about eight identifiable projects being implemented nationwide (LPM Equator, 2012; Leimona, 2011; Munawir, 2007; Suyanto et al., 2005, p. 26). Two of these are in the Citarum basin, a challenging situation for which studies are still limited. Considering the importance of addressing issues in this area, this study aims to contribute, using practical examples, to the understanding of how the PES concept is translated into practice and how arrangements are made to match the realities of the context, which may diverge from the PES theoretical framework.

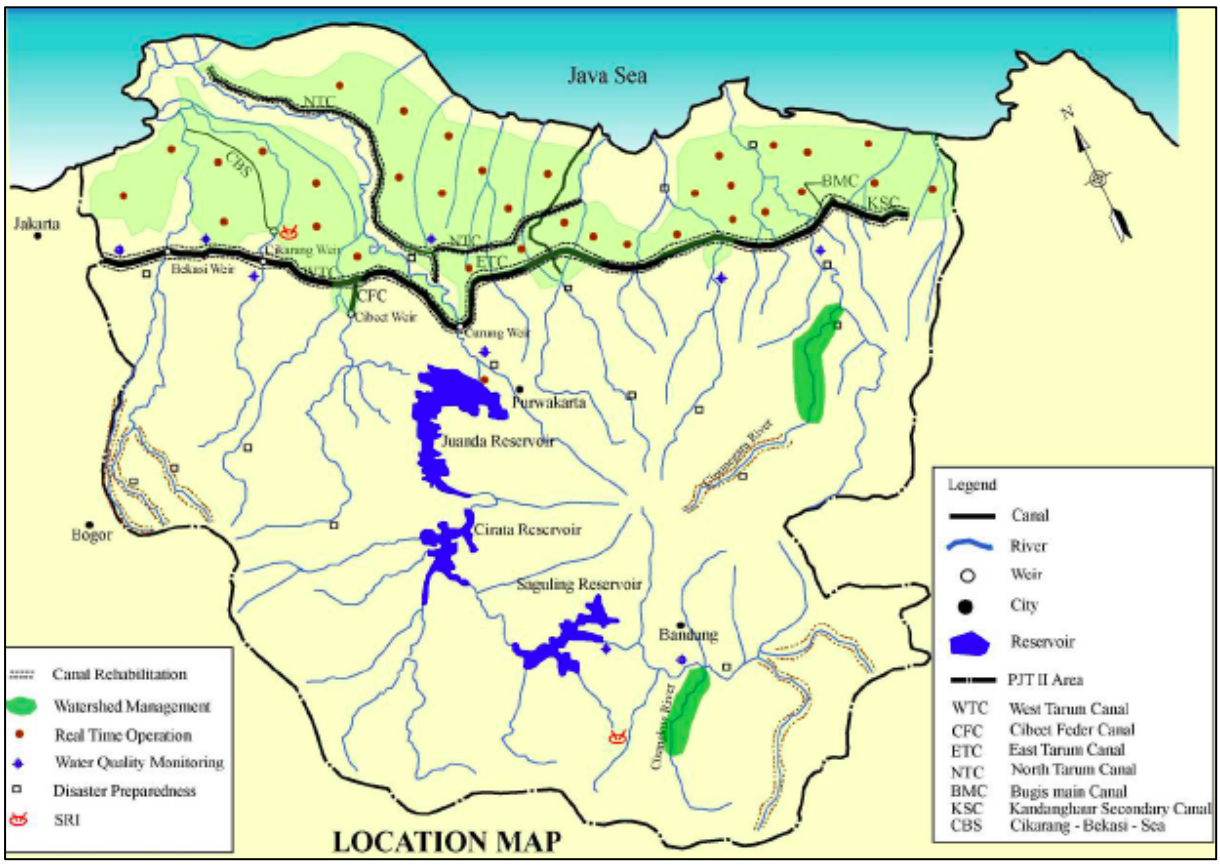
This study uses the conceptual framework developed by Wunder (2005) to contrast the reality of current schemes in the Citarum basin with accepted PES theory. Therefore a qualitative method is employed utilizing secondary data like census and village reports, among others, and data obtained from interviews with farmers in the area where the program is being implemented and with the programs' main implementers and intermediaries. This study also describes the PES program considering fairness dimensions for environmental services providers or pro-poor aspects, specifically the process of implementation, as introduced in part of the literature (Leimona, 2011; Muradian et al., 2010). The following

section introduces the schemes in place in the Citarum context. There are two schemes being implemented in Citarum basin, one in Suntenjaya village and the other in Cikole village. This study focuses on the first village as a case study, as the second village presents constraints on information. Although Cikole village is not the focal point of this study, basic information is provided as a reference to gain contextual understanding about PES program implementation in the Citarum area. Subsequent sections present current PES schemes with respect to the gaps between concept and practice, and the real-life factors that necessitate a divergence from the rigid implementation of the theoretical framework. Finally, the chapter ends with the conclusions and lessons drawn from PES practices in the Citarum basin.

3.2 Characteristics of the Citarum Basin and the PES Program

The Citarum River, the largest in West Java, plays a crucial role in the basic well-being of the areas's people and its economic activities (Adnyana & Setyanto, n.d.). This river is a source of water for about 25 million people spread across nine counties and three cities in West Java (Juwitaningtyas, n.d, para. 2) The river irrigates more than 240,000 ha and is also a source of water intake for three hydropower dams (Jatiluhur, Cirata, and Saguling, in descending order of size) serving Java and Bali (Juwitaningtyas, n.d; LPM Equator, 2012, p. 15). Nevertheless, the river is being undervalued, as evidenced through various forms of degradation that constitute an overall challenge in Indonesia. Degraded catchments causing watershed erosion and sedimentation is a grave problem, causing landslides and floods, among other disasters. Flooding in Bandung has become more recurrent and serious due to multiple reasons like watershed denudation, effects of the river re-alignment, groundwater over-pumping, clogging of drainage due to garbage, and pollution-generating algae (ADB, 2007, p. 19). The following figure depicts the Citarum basin located in West Java province.

Figure 3.1: Citarum Basin



Source: ADB (2007), p. 9

PES Program Initiatives

Although PES is not a panacea, it does offer a strategy for environmental management that could bring aggregated benefits, such as additional income for poor communities. Inspired by the success of payments for watershed services schemes in other developing countries such as Costa Rica, and taking into account other PES initiatives within the country such as the Cidanau scheme, the Institute for Social and Economic Research, Education and Information (LP3ES: *Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi Sosial*) initiated a PES pilot project as a facilitator with the financial assistance of the Asian Development Bank (ADB, 2008). With the intention of improving water quality and

watershed service for downstream users (hydropower dams, among others), the project identified as its main objective the reduction of erosion caused by farming in hilly areas. The upper reach of the Citarum catchments experience soil erosion of about 27.5 ton/ha per year (ADB, 2009b, p. 4) in areas where vegetable-based systems have the highest sediment yield (Agus & Manikmas, 2003). 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 of annual crops with trees was chosen. Two sites within the West Java region of the Citarum basin were deemed appropriate to address sedimentation and erosion problems and were selected for PES scheme development. According to information obtained from the village statistical reports (Profil Desa Suntenjaya) and information obtained from fieldwork, these sites are described as follows:

1. Suntenjaya village *(desa*) is an area of 4.55 km² located within Lembang sub-district (*kecamatan*), Bandung regency, with a population of 7,032 inhabitants in 2006 (Coba, n.d. p. 18). Most of the land in the village is occupied by agricultural fields, approximately two km² (201 ha), and settlement areas that covers approximately 1.25 km² (125.6 ha) (Profil Desa Suntenjaya, 2011, p. 3). This village experiences land conversion to farming fields, principally increasing after the Asian crisis in the late 1990s. According to local statistics, about eight km² of the surrounding areas of the village correspond to protected forest; the report also indicates degradation in forestall lands and natural resources evident in water and air pollution, landslides and erosion, extinction of flora and endangered species, loss of water resources and water catchment areas, and wildfires. The main economic activity in the area is farming. Crops include beans, cassava, chili, tomatoes, potatoes, cabbage, and peppers, and fruits like bananas, avocado, orange, and strawberries, among others (Profil Desa Suntenjaya,

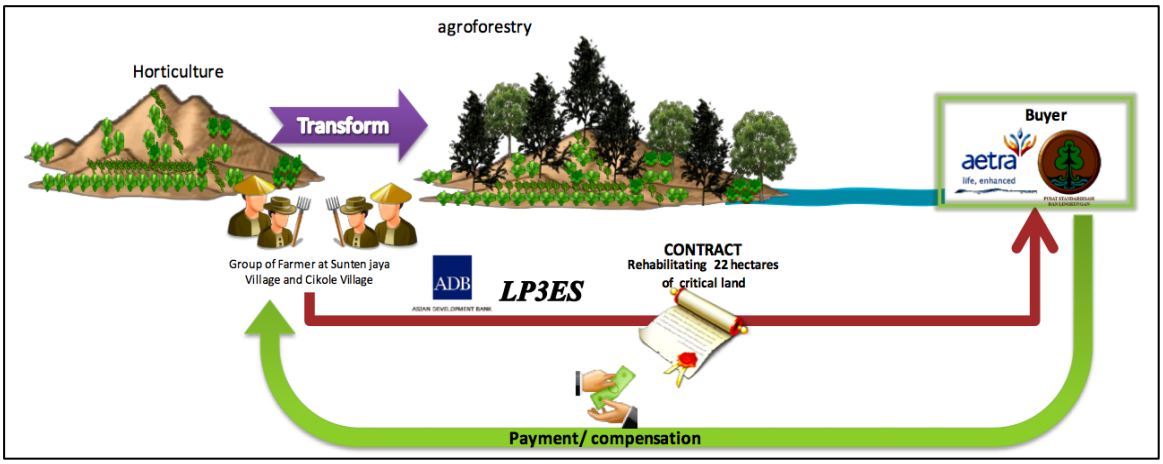
2011, p. 6). Some crop commodities are sold to middlemen or taken to nearest market and sold to retailers or directly to consumers. In terms of livestock, the most representative in the village are cattle, chickens, ducks, sheep, geese, rabbits, and parrots (Profil Desa Suntenjaya, 2011, p. 10).

The majority of the population complete some level of elementary school. The local census found in the village statistical report (Profil Desa Suntenjaya, 2011) indicates that about 1,214 villagers between seven and 18 years old have at least attended school for one year; on the other hand, the census counted about 145 villagers who had never attended school (p. 19). The village statistical report (2011) indicates other figures as the followings. Education for men and women is relatively even, showing 1,711 males enrolled in education versus 1,559 female students (p. 17). 100% of the population are Muslim and majority belong to *Sunda* ethnicity, about 1% of them are from Java, and five people are from Bali (p. 18). The villagers' main occupation is farming, and many work their own farms or as farm laborers or breeders. Villagers diversify their income through other activities such as bus driver, mechanic, shopkeeper and others. (p. 17) There are about 75 (46 male and 29 female) villagers employed as government officers (p. 17). More description of the villagers' characteristics is found in chapters 4 and 5.

2. Cikole village *(desa*) is an area of 3.42 km² located within Lembang sub-district (kecamatan), West Bandung regency, with a population of 11,305 inhabitants in 2006 (Coba, n.d.). This village, with a higher population density than Suntenjaya, also faces the challenge of land conversion mainly to build up land. The main economic activities in the area are based on the production of dairy products, farming, and the recent development of ecotourism; the latter is a latent opportunity for the creation of other future PES schemes.

According to information collected in the field, after some negotiations, schemes were initiated in 2009. In the case of Suntenjaya, parties include a group of sellers comprising approximately 45 farmers who belong to an association called *Kelompok Tani Syurga Air* (Farmers' Water Heaven) and a private water company, PT Aetra Air Jakarta, as a single buyer. PT Aetra Air Jakarta is a water-service company that supplies water from the Jatiluhur, a dam seriously affected, in terms of its capacity and useful life, by sedimentation. Their terms, which are sealed through a signed agreement, include the payment of a total amount of 50 million rupiah (IDR) for 22 ha, where agroforestry is to be managed by farmers offering the ES. This contract is valid for seven years, whose terms include 50% of the payment during the first month, followed by two more disbursements of 25% each during the following six months after initiation (PT Aetra Air Jakarta, 2009b). The following illustration represents the PES scheme in Suntenjaya village.

Figure 3.2: PES Scheme in Suntenjaya Village

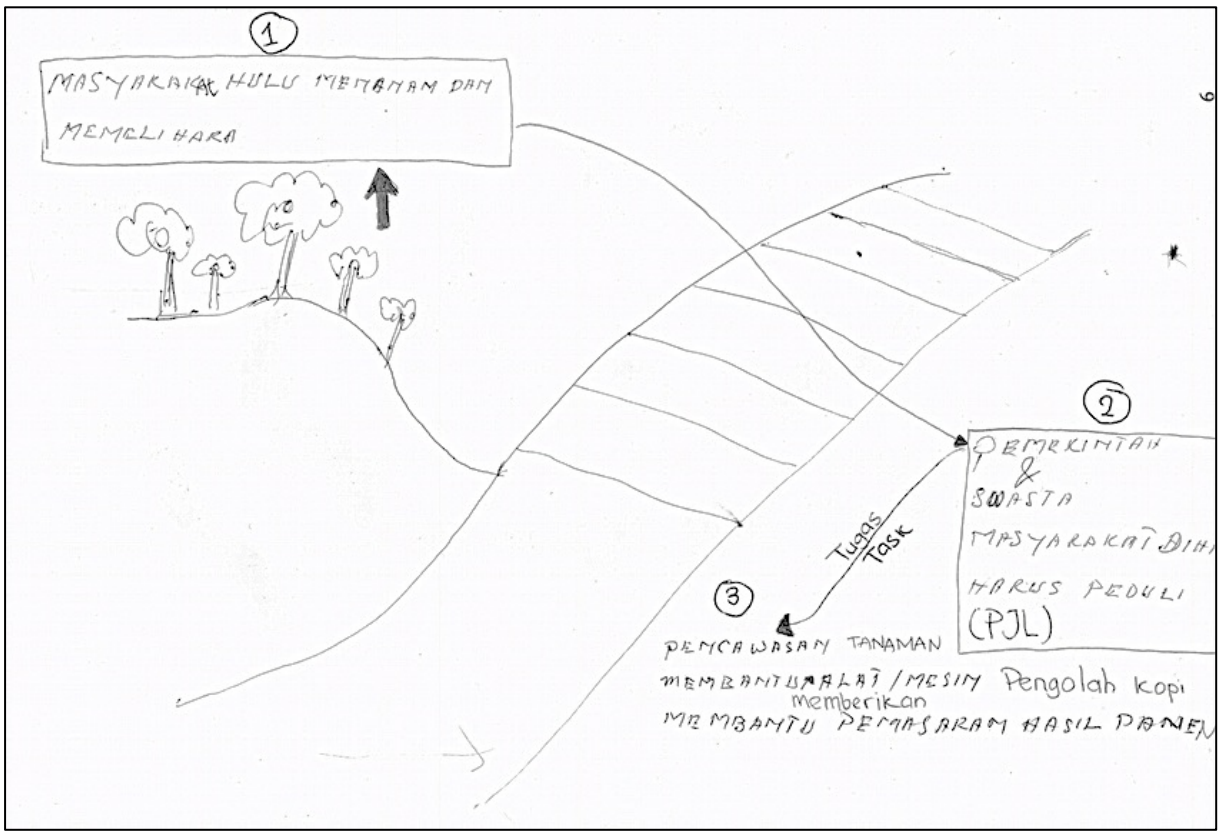


Source: LPM Equator (2012), p. 15

In order to validate the understanding of farmers engaged in the program, PES farmers were asked to sketch PES program in their village. The succeeding drawings reflect the PES

project in Suntenjaya village according to PES members' that volunteered in this activity. Both drawings represented in figure 3.3 and 3.4 clearly distinguish farmers' responsibility for enhancing the environment to mitigate soil erosion through landscape restoration (agroforestry implementation). According to the author of the first drawing in figure 3.3, first, community in the upstream is assigned to plant and maintain trees absorbing water and erosion prevention. Second, government, private companies involved in this kind of PES scheme, in this case the water company, and community in the downstream are concerned about the environment so they implement the PES program. Third, the task of government, private, and the people residing in the lowlands is to provide assistance for coffee cultivation. They should also supervise plants, provide processing machines or tools, and help in marketing the harvest. (PES member, male 52 years old, December 2014)

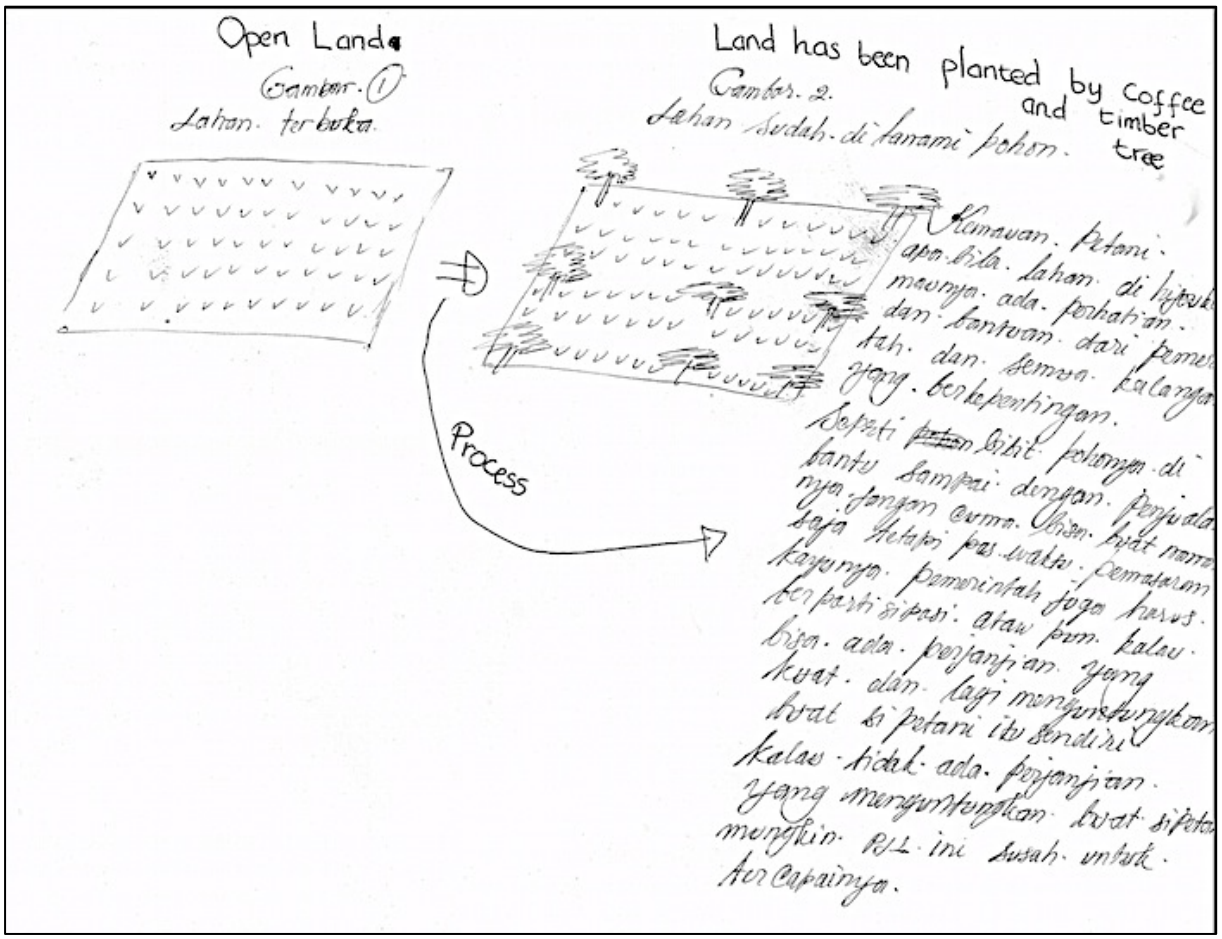
Figure 3.3: PES Drawing No.1 by PES Member



Source: Author's fieldwork. Drawing from PES member, male, 52 years old. December, 2014

The author of the second drawing in figure 3.4 explains that, open land must be planted by trees that have large shade to prevent erosion. If the land is overgrown with trees then erosion can be reduced. Attention and assistance from the Government and all circles concerned is required. The assistance in the form of provision of coffee seed and marketing should be available too. It is not only about planting and wait, but the government must also intervene in handling results of plantation to benefit all parties. If there is no mutual agreement among and with farmers, the PES will face difficulties to develop. (PES member, male 50 years old, December 2014)

Figure 3.4: PES Drawing No.2 by PES Member

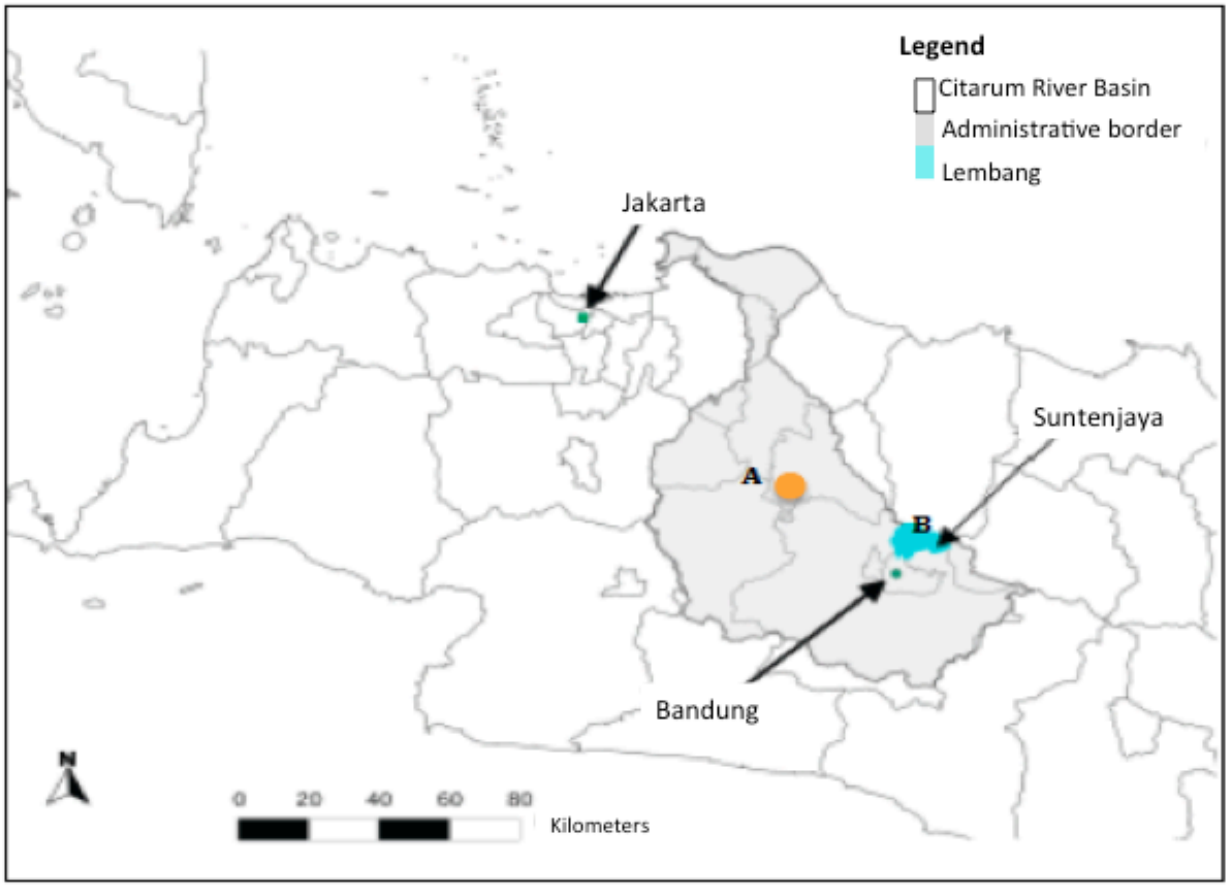


Source: Author's fieldwork. Drawing from PES member, male, 50 years old. December, 2014

In Cikole, negotiation occurred between 84 farmers belonging to the association *Giri Putre* (Cikole Village) as sellers, and an entity of the Ministry of Forestry as a single buyer or beneficiary. In this case, the beneficiary also agreed to negotiation for the enhancement of a watershed service through the reduction of erosion. The contract validity is for five years, including a total payment of 40 million rupiah for 33 ha, where agroforestry will be practiced, with 50% of the amount paid during the first month, followed by a 30% and 20% payment made during the six months after initiation.

The following map, figure 3.5, illustrates the location of the parties involved in the Suntenjaya scheme and the considerable distance between the two parties (buyer and sellers). "A" identifies the location of the Jatiluhur dam, where PT Aetra Air Jakarta (buyer) has its main operation, and "B" identifies the area where the farmers of Suntenjaya (sellers) are located. The approximate distance between the two parties is 80 km, an area in which not all the eroded soil reaches the dam. A numerical simulation model is required to estimate the influence of the distance. There is no reference map for the Cikole scheme due to insufficient information on where the buyer situates and monitors its ES

Figure 3.5: Suntenjaya PES Scheme Buyer and Seller Locations



Source: Author, QGIS Software, 2015. *Note.* A: Jatiluhur dam; B: Suntenjaya village

3.3 The PES Concept Versus Actual Programs in the Citarum Basin

In order to examine how PES is translated into reality, this chapter takes Wunder's (2005) definition framework as the main model for assessment. This evaluation takes an individual view of both schemes existing in different localities of the Citarum, one in Suntenjaya and the other in Cikole, within the Bandung regency, references that up to now have been approached in a unified manner in the literature, disregarding important individual differences, and thus prone to confusion. Table 3.1 compares the PES schemes implemented in both sites according to Wunder's criteria and presents observable gaps between theory and reality.

Table 3.1: PES Assessment According to PES Definition Criteria

Criteria	Suntenjaya	Cikole
1. Voluntary	Voluntary	Voluntary
2.Environmental service (ES)	Reducing erosion through agroforestry, 22 ha (2009) Service not quantified (water quality and quantity) and not well defined	Reducing erosion through agroforestry, 33 ha (2009) Service not quantified (water quality and quantity) and not well defined
3. Seller	45 farmers, mostly organized in farmers association, Kelompok Tani Syurga Air	84 farmers organized in farmers association, Giri Putre
4. Buyer	PT Aetra Air Jakarta	Entity of Ministry of Forestry (Pustandling)
5. Conditionality	7 year contract: 50 million IDR for 22 ha Terms: 50% (1st month), 25%, 25% (approximately after 6 months) Monitoring: non-existent	5 year contract: 40 million IDR for 33ha Terms: 50% (1st month), 30%, 20% (approximately after 6 months) Monitoring: non-existent

Source: Author's fieldwork

Gaps between theoretical frameworks and reality are expected. Wunder (2008) himself states that, in practice, many schemes fall short of satisfying all criteria. In his global review, Wunder found 287 "PES-like" cases, while "no more than a couple of dozen of experiences globally" fit all five criteria (p. 280). Ambiguity exists as to whether the Citarum PES cases meet some parts of the fundamental PES criteria, in particular (i) environmental service definition, (ii) conditionality, and (iii) the buyer's role. The following analysis aims to identify the causes of such variances and their effects on program realization, clarifying to

what extent variation may lessen the program's efficiency and to what extent it may risk the program's overall viability.

3.3.1 PES Program Gaps and Stakeholder Relationships in the Citarum Basin

3.3.1.1 Vague Definition of Environmental Service

Vague ES definition is principally due to two main factors: the inability to prove the impact of the ES and a weak causality linkage.

Concerning the first factor, agroforestry has been chosen as the main strategy for reducing erosion, but it is difficult to prove its impact. Agroforestry is an approach to land use that deliberately includes woody perennials (trees, shrubs, palms, bamboos, etc.) in the same land-management area as agricultural crops and/or animals. These complex systems are characterized by ecological and economic interactions (Ramachandran, 1993). In the Citarum PES schemes, agroforestry is practiced as a technique that allows intercropping between harvested vegetable areas with ranges of cedar trees, eucalyptus trees, and coffee, an arrangement negotiated between farmer leaders and implementers, and the necessity of providing fair measures to farmers so they can secure cash income from valued commodity crops, like coffee. Milder, Scherr, and Bracer (2010) found that agroforestry is one way to attract land stewards who will want to participate (if they perceive their involvement to be economically favorable). Agroforestry was successfully introduced in various PES programs in Costa Rica in 2005, and it is described by the Food and Agriculture Organization of the United Nations (FAO) as a significant measure to be integrated into national strategies and policies to aid farmers, communities, and industry (2013). However, although erosion can be reduced through agroforestry, it can be a very lengthy process depending on variables such as the grade of the slope and soil conditions. In the Citarum schemes, agroforestry was chosen as

a procedure according to its positive attributes, but no technical assistance was provided to participants beyond mere information sessions.

Indeed, agroforestry, considered a beneficial strategy for ecological stability, has a generally positive effect on the environment, but, as Ramachandran (1993) has noted, "with the wrong choice of species combinations, management practices, and lack of peoples' motivation and understanding, agroforestry may indeed fail just like any other form of land use may fail, and it will still be agroforestry in the objective sense of the word" (p. 13). In an analysis of PES schemes, agroforestry offers no clear impact on the desired ES production (i.e., water quality and quantity due to sediment reduction). No specialists are involved in measuring the impacts on soil erosion reduction. This reality highlights the importance of scientific support throughout the entire process, planning, implementing, and follow-up of PES schemes. The adoption of unclear objectives, as stated by Kosoy et al. (2007), causes inefficiency and an increase of costs.

Another problem is the weak causality linkage in PES schemes in the Citarum basin. That is, multiple actors are causing the problems of erosion and sedimentation, and few of them are willing to address sedimentation issues. At the same time, multiple actors are freely enjoying the benefits of ES without having to contribute to them. PT Aetra Air Jakarta, the buyer in the Suntenjaya PES scheme, supplies water to part of the capital city Jakarta from the Jatiluhur, a dam used by multiple parties and which has been directly affected by the environmental degradation of the upstream (above Bandung area) users, through West Tarum Canal intake or Kalimalang. Upstream areas such as Suntenjaya village, where intensive farming is practiced in hilly areas, are targeted by PES to address erosion problems; yet, they only represent a small number of the total actors affecting the water flow for the Jatiluhur dam. The remaining untargeted actors, who carry on their negative practices, offset the efforts

made by PES sellers. It is important, therefore, to set clear causality relationship strategies and possibly widen the inclusion of PES sellers to generate a bigger ES impact.

Unclear ES is also present in the Cikole scheme, and agroforestry as a practice has been misrepresented as the correct strategy for efficiently reducing erosion. In this case, the selection of agroforestry is not completely appropriate as it lacks precise plans that support the reasons explaining why the buyer would like to reduce erosion instead of other ES (e.g., carbon sequestration). Furthermore, it lacks the right connections to the assigned target areas and the means to evaluate its impact on the ES. The Ministry of Forestry may, however, still gain some benefits through the general advantages of agroforestry, particularly if these are part of re-greening public policies.

Despite the lack of evidence to deliver an efficient ES, it cannot be neglected that farmers who have converted their intensive cultivations to agroforestry are contributing to the enhancement of the ecosystem. This contribution must be rewarded as Van Noordwijk, Villamor, Leimona, and Ha Hoang (2006) express in their investigations where they suggest adding realistic goals as part of important dimensions for a pro-poor PES realization. Because external and unexpected factors can affect the ES delivery, recent PES schemes evaluations propose that emphasis should be on administrative compliance instead of an actual provision of quantified ES (Van Noordwijk, Villamor, Leimona, and Ha Hoang, 2006) and this would add to the realistic consideration needed in the program.

3.3.1.2 Weak Conditionality

Weak conditionality is a persistent characteristic both in Suntenjaya and Cikole, where full payments are typically made during the first year of the program, regardless of the contract's long-term validity (seven and five years, respectively) and the apparently non-

existent monitoring system to control service delivery and impact on water quantity and quality. Payments at the initial phase are important as they support participation costs for project engagement as well as attract potential ES sellers. This procedure, however, must be carefully managed so as not to distort the basic principle of PES's market approach, wherein there must be a buyer eager to obtain a paid-for service and a seller seeking the agreed remuneration for the service he or she is selling. Although monitoring can be costly, the absence of it risks the effectiveness of PES in the long run. Successful cases, such as schemes in Ecuador, underscore that a strong focus on both ES and conditionality seem to be key factors for success in terms of efficiency. Monitoring is an essential part of the ES delivery process, unless the outcomes produce drastic changes that are too obvious to be ignored.

3.3.1.3 Unclear Buyer's Role

The issues that have been previously addressed have been associated with the role of the buyer. Despite the fact that the presence of a buyer meets one criteria of the PES definition in both schemes, the position of the buyers appears to be ambiguous due to the weak demand for ES delivery. In the Suntenjaya scheme, the buyer is a private water company, PT Aetra Air Jakarta, whose purchase adheres to the principle of corporate social responsibility (CSR) (PT Aetra Air Jakarta, Annual Report, 2009a), and the company, therefore, is classified as a "philanthropic buyer" (Milder et al., 2010). Certainly, this is a significant way to raise funds and create awareness among the private sector. Yet, this particular case does not reflect a clear engagement of a buyer demanding an efficient ES since there is no follow-up process after the completion of payment. On the other hand, the Cikole PES is a government-financed scheme, represented by an entity of the Ministry of Forestry. Although there is a clear difference in the buyers' natures between the Cikole government-

financed scheme and the Suntenjaya private-user-financed scheme, they reflect a common ambiguity concerning their passive roles in demanding the ES delivery they are paying for. The active role of the buyer is imperative throughout the PES's entire existence. Otherwise, if the role of a donor is assumed, that assumption will constrain the successful development of the PES scheme, misconstruing its basic principles.

3.4 Social Aspects of PES implementation

The PES schemes proposed in Citarum are expected to play an important additional role in the livelihoods of rural people. There is an overall acceptance that PES should not have a negative impact on ES providers, but rather make the most of its potential to provide livelihood benefits to poor people, whether in cash or non-cash forms. Such an approach promotes the interests of potential ES providers and bolsters complementary social goals. The impact of poverty alleviation is still inexact in the context of the Citarum due to the schemes still being in their early stages. Table 3.2 combines a set of the most common criteria, culled from the current literature, used to understand social context, based on the categories of cash gains and non-cash gains. These aid in understanding the situation in the Citarum and stakeholders' reasons for embracing the program. Table 3.3 also describes part of pro-poor aspects proposed by Leimona (2011). Deeper discussion of some of these aspects are found in chapters 4 and 5.

Table 3.2: PES Social-contextual Aspects Description

Criteria	Suntenjaya	Cikole
1. Cash gains	Each participant receives a total of over 1 million IDR (calculation based on averages of land size and approximate number of farmers) • 50 million IDR for 22 ha • 45 participants • Average size of land/farmer: 0.3-0.5 h • Seven-year contract, mostly paid within six months to one year	Each participant receives a total of approximately 500,000 IDR (calculation based on averages of land size and approximate number of farmers) • 40 million IDR for 33ha • 84 participants • Average size of land/farmer: 0.3-0.5 ha • Five-year contract, mostly paid within six months to one year
2. Non-cash gains	**Scientific research and knowledge sharing** • Service not yet quantified (water quality and quantity); in need of scientific support. • Exposure to many researchers (IDDRI-France, JICA, etc.) to address current problem and the potential for funding through donors.	
	Social Capital	
	Approximate 35-50 farmers organized in farmers' association, Kelompok Tani Syurga Air	84 farmers organized in farmers' association, Giri Putre
	• PES activities benefit from existing farmer's association and encourage farmers to keep sharing information and interacting with other members as a way to strengthen the program.	
	Land tenure consolidation	
	Land status: community land with individual separation and private areas. Village's surrounding areas are part of a national park. • Farmers must possess their land in order to participate in the program. • No special land benefits are given through the program.	
	Public sector programs and subsidies	
	• No additional benefits from the buyers (both public and private). • Ministry of Agriculture (Directorate of Farming Land Management and Water and Land Management) provided assistance for seedlings and saplings, requested by LP3ES. • Among other various current public programs in the Citarum basin, the principal is the "Integrated Citarum Water Resources Management Program" (ICWRMP), 2009-2023	

Source: Author's fieldwork

Table 3.3: PES Fairness Dimension or Pro-poor Aspects Description

Criteria	Suntenjaya
Process	LP3ES (NGO) responsible implementer offering information in the village. The idea of agroforestry was brought by the NGO and coffee plantation was agreed by LP3ES and farmers' leader (other farmers simply accepted the idea). No participation of specialists (from the scientific field).
Access	Open informative session to all villagers through the collaboration of the local office (passive in information reception and contribution).
Decision-making	It was up to farmers to decide their participation. Farmers' leader played an important role to attract participants (appealing to other factors different from cash gains).
Outcome	No time series data to allow the measurement of poverty alleviation. Some satisfied farmers continue the program, while others quit.

Source: Author's fieldwork

3.4.1 Cash Gains

Cash gains are one way to attract and increase farmers' participation in PES programs, particularly in countries such as Indonesia, where the majority of farmers are among the poorest citizens. The highest-priority problems, according to rural women and men, involve a lack of capital and insufficient income for basic necessities, in addition to deteriorated infrastructure; this information also matches the literauture (Mukherjee, 1999; World Bank, n.d.b). The average farmer's income is approximately one million rupiah (approximately 80 US dollars) per month from their harvest, which includes vegetables grown outdoors and within a greenhouse. Agriculture is the village's main economic activity, complemented by

other activities including running a small shop and managing livestock. Although payments to beneficiaries are small, and do not constitute major revenue that would cover farmers' usual expenses (a kilogram of a rice, for instance, sells for an average price of 9,000 rupiah by 2013), to compete with the opportunity cost of the ES, they do provide the initial capital needed for farmers to shift their practices to agroforestry (about 500,000- 1,000,000 rupiah per participant, provided within six months). The estimated cost to cultivate coffee is 10,000 rupiah per sapling. In this sense, participating farmers are given the opportunity to gain income from cash crops, such as coffee, as part of the agroforestry deal, which, in addition to the PES, could be considered as the initial payment that covers the cost for the program's initial implementation. Agroforestry, which is focused on cash crops, intends to offer income stability to farmers, trying to attract farmers' participation.

The benefits of agroforestry, particularly on the socio-economic level, have held more appeal in terms of farmers' interests than in terms of the payment for ES, per se. There is an overall acceptance that agroforestry benefits the rural poor, a fact exemplified in the following range of gains: economic advantages (e.g., diversification of economic activities and agricultural revenues), environmental advantages (e.g., increased plant and animal biodiversity, improvement in soil fertility, mitigated impact of climate change on agriculture, and reduction of deforestation), social advantages (e.g., food security, landscape enhancement, and, in some instances, job creation), and cultural advantages (e.g., use of local and indigenous knowledge; De Baets, Gariepy, & Vezina, 2007). Agroforestry represents positive implications for both the environment and the farmers' income. It can also contribute to alleviating poverty in the rural population, a group that figures significantly in the Citarum basin, and this could simultaneously contribute to avoiding the escalation of environmental degradation. In general, agroforestry generates positive outcomes. Yet, this reality, in its

actual form, seems to misrepresent the best method of efficiently reducing erosion, and as yet unmeasured socioeconomic benefits. Yet, important to highlight is the fact that despite agroforestry may not represent the most efficient method for the specific task of erosion reduction; it is widely accepted as a beneficial strategy for ecological stability.

3.4.2 Non-cash Gains

Non-cash gains are harder to record due to the early stage of the project and the abstractness of issues, such as institutionalization, advancement of resilience and social changes due to induced behaviors. Even so, there are positive signs for potential development of PES schemes through the current exposure of many researchers (IDDRI-France, JICA, and others) to address problems in the basin, bases for potential funding and scientific support. The leading work of the LP3ES and other local organizations such as Citarum Care Foundation may contribute to strengthening social capital through the necessity of farmers interacting and sharing information about the PES program they have engaged in.

According to implementers, a PES program also expects to induce seller's awareness and commitment concerning environmental management. Within this aspect, conditionality and the time frame of the program are important for achieving both some environmental efficiency and the sellers' active role. In terms of conditionality, it is seen that in both sites, ES sellers already received payment for their ES, although the contract in Suntejaya and Cikole are still valid. Such a procedure jeopardizes the control the buyer exercises towards an efficient ES till the end of the contract since sellers' motivation might be negatively affected due to termination of incentives in an ongoing process of ES delivery. Shortening the time frame is not always recommendable due to prolonged processes of environmental regeneration (for effective results), affecting possible behavior change. May (2012) argues

that short contracts are more costly as a result of constant renovation, falling into greater costs of operations than possible benefits. In this sense, realizing aggregated benefits such as seller' awareness and commitment is highly associated and determined by the efficiency of the project, where high conditionality and monitoring need to be present.

PES programs can be highly influenced by public sector programs and subsidies. PES schemes that are government-financed can yield a number of positive advantages, particularly toward institutionalization and expansion in scale, which provides cost efficiency (Wunder, Engel & Pagiola, 2008; Arriagada & Perrings, 2009) and the possibility for provision of additional benefits to PES sellers such as tool or seeds. On the other hand, general public programs in PES sites can also be counterproductive for such schemes. This is true when ministries lack inter-cooperation and their good intention in one sector, for instance agricultural subsidies, harm another sector, as with PES programs within the environmental management field. Clarification of land status to avoid legitimation of illegal land usage and further encroachment or land conversion is also fundamental since land conversions constitute a problem in both Suntenjaya and Cikole. Institutional arrangements in the country are highly sectorial with limited coordination (ADB, 2007), a situation prone to contradiction among different policies and strategies that could affect PES schemes. Like in many developing countries, the Costa Rican case proves that "political will and mandate were crucial for the creation of the program" and its successful outcome (World Bank, n.d.a, p. 538). High expectations exist for development and harmony like the PES and the current *Integrated Citarum Water Resources Management Program* (ICWRMP), (2009-2023). The latter seeks to integrate different ministries towards the attainment of an integral outcome that would improve water management and living standards and poverty and environmental protection in the targeted area, objectives that should consonantly benefit PES. These cross-cutting issues

highlight the necessity in Indonesia for "political acceptance of the program at all levels of the government" (De Koning et al., 2011, p. 533) as well as clear rules and capacity to evolve based on continuous learning and feedback. More research regarding these specific aspects, that are not intended to be covered in this study, is encouraged.

3.4.3 Other Pro-poor Aspects

Although implementers were aware of the necessity to add a fairness dimension to the PES program in a rural and poor scenario like Suntenjaya (no information available for Cikole village), there are still no guidelines about how to apply and measure fairness for a pro-poor PES. As for the process, the program was implemented through an NGO, the LP3ES, in collaboration with a local organization, Citarum Care Foundation. Implementers were responsible to target and negotiate with ES sellers and ES buyers. Through the help of local officers, the implementer offered a series of open informative sessions about the PES program in the village to attract participants. After possible candidates were gathered, the head of the farmer's association volunteered to be the leader for the PES program and all together engaged in a few general training sessions about introducing stipulated crops like coffee and trees in an intercropping system. The idea of agroforestry and suggestion of stipulated crops was proposed by the implementer and farmers accepted it without hesitation, making for an absence in the promotion of farmers' local knowledge. The lack of brainstorming and incorporation of farmers' opinions is what years later the head of the farmer's association and others realized as an important missing point. For instance, afterwards the head of the farmers' association considered that other crops, like oranges could have work better. Regarding this aspect, it is important to remark that the incorporation of scientists or experts in the field of agriculture and environment would have also been helpful in order to determine precise

outcomes (since such expertise was absent among implementers and collaborators). On the other hand, the head of the farmers' association and few others had experience growing coffee before, while others did not, but they were attracted to a cash crop that could help them generate additional cash.

3.5 Concluding Remarks

The analyzed PES program, as some schemes in the initial stage, presents gaps between the theory and practice. Overall, this program reflects the importance of adapting and responding to ES providers' interests and contextual necessities, like introducing cash crops that could financially help farmers while helping the environment, and the introduction of an agroforestry system easily manageable by farmers, but caution needs to be employed so that contextual variances do not compromise part of the program's objective of environmental service delivery and program's workability. Practical divergences found list the followings.

In terms of efficiency, measures addressed to reduce erosion seem to be weakly defined especially due to difficulties at stating causality linkages between farmers' duties, in this case conversion and maintenance of agroforestry and ES delivery, concerned to erosion reduction. Although, this lessens the efficiency of the program, it could be improved through technical training and intervention, for example. Since pro-poor PES also involves the promotion of fair aspects of participants, farmers adopting agroforestry as agreed in the contract must be acknowledged for their contribution to the ecosystem and therefore be financially rewarded. The fact that the agreed ES is not completely achieved or efficiently delivered, does not mean that the ES is not enhanced, therefore retribution must be done. This trend is what various scholars cited before assert; the acceptance and recognition that pro-

poor PES program in real ground encounters difficulties at efficiently addressing the ES, but that overall they add benefits to the ecosystem that otherwise would not happen.

Program in the Citarum basin also demonstrates the misunderstandings that ES beneficiaries have about the PES concept. Beneficiaries tend to act as donors making social and environmental contributions. The current adoption of agroforestry as a practice aimed at reducing erosion has not yet offered quantifiable results from the Citarum schemes. The lack of measurable results could be closely related to the weak conditionality of the program. Even though this is important to be considered for future correction, as an initial and experimental stage it could be acceptable as a way to promote the understanding of these new schemes.

In terms of fairness or pro-poor factors, there are fundamental considerations to go along with the program, as stakeholders should be active in expressing their opinions, the necessities and realities of the context, and to work together with specialist to promote the development and successful realization of the program. A participatory approach should be encouraged, for example when deciding the crops to be adopted by the farmers, participants should consider the advantages and disadvantages of a new intercropping system could possibly bring. This should be done with the collaboration of specialists, so that knowledge can be integrated for optimal results. This case also encourages more research from the implementer's side regarding access and outcomes of the program towards sustainability and continuity.

Through this case it is also to be regarded that balance of efficiency and fairness is difficult to achieve in this first stage, particularly in a challenging context of poverty. Despite the gaps between practice and theory this case study presents, the program intends to combine both cash gains and non-cash gains for ES providers to eventually attract participants. Besides the importance to understand the process of implementation and characteristics of the

currently implemented program, it is also pivotal to comprehend other elements of the pro-poor scheme characterization, like access and outcome or workability, and factors that influence participation in this program, and characteristics of those willing to participate in a voluntary program. Chapter 4 aims to deepen analysis about this next step regarding socio-economic factors that influence access and farmers participation.

CHAPTER 4

CHARACTERISTICS AND DETERMINANTS FOR LOCAL PARTICIPATION IN PAYMENT FOR AN AGRI-ENVIRONMENTAL SERVICE PROGRAM

4.1 Introduction

In Indonesia, the agriculture system is very diverse due to different geographic characteristics, wherein upland areas' major agricultural systems include intensive farming, among others. Depending on how agriculture systems are managed, they can produce positive or negative externalities to the environment. In the case of intensive upland vegetable 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 fertilizer 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 (Agus & Manikmas, 2003).

Java is characterized by intensive farming systems; an example of negative externalities due to such systems is found in the Citarum Basin, an area known for its critical environmental degradation. As previously described in chapter 3, this basin underwent a vast upland farming expansion of approximately 31,000 ha in nine years (1992-2001), mostly at the expense of primary forest (ADB, 2007, p. 14; Munawir, 2007). The 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 other systems like rubber plantations, agroforestry, paddy fields, and shrubs (Agus & Manikmas, 2003). Data on erosion due to

steep slope vegetable farming is abundant. In fact, erosion and sedimentation control, along with flood mitigation, have been central targets of the national re-greening and reforestation programs. However, outcomes of these programs have fallen 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 PES.

PES has attracted substantial interest from 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, p.14), referring to synchronized measures to cooperate and act together in what is called collective action; as the greater the engagement, the greater the impacts. However, the voluntary nature of PES schemes refers that for the desired socially-efficient outcomes, it is necessary the adequate participation of landowners, and the fulfillment of their management requirements of the program (Mullan & Kontoleon, 2012). This implies that it is necessary to understand factors that determine landholders' participation, while understanding who participates and why can facilitate program design development.

Increasingly literature reflects the significance of PES aiming towards a more promising and workable program in regions like Asia (Leimona, 2011; George et al., 2009; Pirard, & Billé, 2010; Porras, Grieg-Gran & Neves, 2008). The voluntary nature of PES, along with its significant potential to address environmental recovery, has been enough reasons for the initiation of various studies on the issue of participation. Replication of these programs around the world have raised concern about more equitable measures for the program to be adopted in regions like Asia, strengthening the necessity for research to go beyond assumed economic interests as the main reasons for adoption towards a more

comprehensive understanding of PES participation.

Although much effort is being made, currently case studies in the Asian region to learn from are still insufficient and PES programs are still small and limited in many countries like Indonesia. More understanding, particularly about 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. Therefore, this chapter as part of the overall study seeks to clarify the influence of socioeconomic factors on farmers' participation in PES and their principal characteristics by answering what variables influence participation in PES, and according to those variables what are the principal characteristics of both PES participants and non-participants in the village.

4.2 Applied Methodology

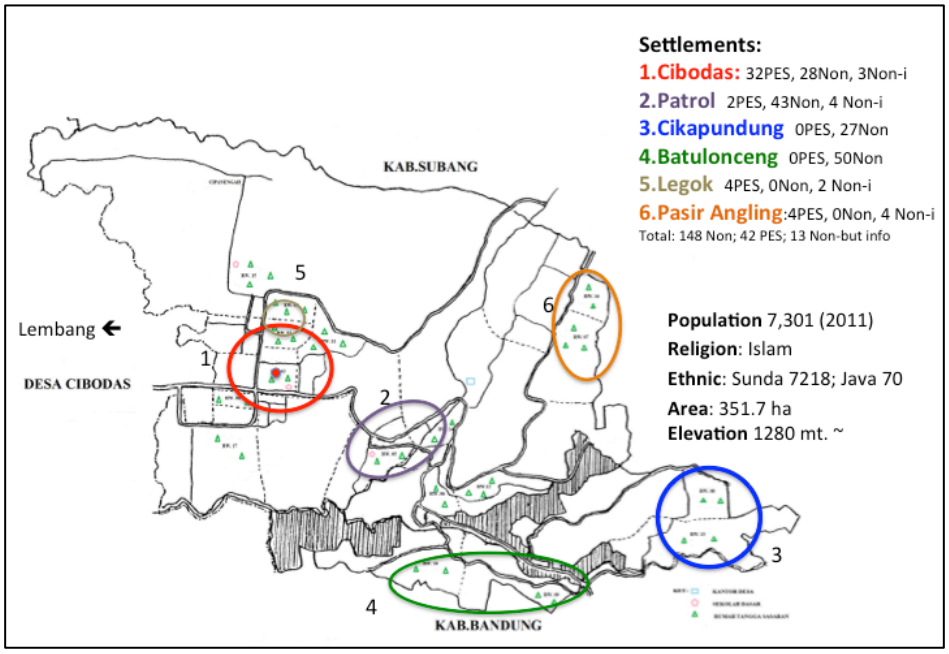
Data Collection

In order to empirically understand determinants for PES participation and farmers' main characteristics, this research analysis is based on primary data obtained through different methods that comprise the following; (i) a household questionnaire survey that comprises households agricultural activities, process and participation in PES and livelihood aspects based on the capital framework, conducted on March, 2014 with first-hand experience of having worked on the ground. The survey included 30% of the farmers' population, representing a total of 148 farmers, in addition to 42 PES farmer participants (of a total PES population of 45 members who originally engaged in the program), and 13 farmers who obtained information about PES, but did not participate in the program, for a total sample of 203 farmers. These categories of respondents are managed differently according to the analytical methods employed, explained along the study. (ii) Semi-structured interviews

conducted with key informants, such as the leader of the farmer association, the NGO coordinator in charge of the PES scheme implementation, and farmers from Suntenjaya village, including 10 PES participants and 10 non-participants. (iii) Two group discussion were managed, one involving PES participants and the other one with non-participants of the program, engaging a total of five farmers in each group.

The geographical layout of the stratified sampling is represented in figure 4.1. With the collaboration of local authorities, the announcement and spread of information about the survey, along with the correspondent provision of the list of farmers of the village was possible to be completed. Six main settlements or hamlets (what is called in Indonesia, particularly in Central and East Java, *dusun,* made up of smaller sub-divisions denominated RW and/or RT) were visited: Cibodas (63 respondents), Lekog (49 respondents), Patrol (27 respondents), Cikapundung (50 respondents), Batu Loceng (6 respondents), and Pasir-Angling (8 respondents).

Figure 4.1: Sampling in Suntenjaya Village



Source: Map adopted from Profil Desa Suntenjaya (2011), p.1 *Note.* Sampling conducted in March, 2014 by the author.

Legend: *PES*: PES members, that sums a total of 42 respondents; *Non*: Non-PES members, that sums a total of 148 respondents; *Non-i:* Farmers who obtained information about PES and did not participate, that sums a total of 13 respondents.

4.3. Factors Influencing Participation and Farmers' Characteristics

In order to be consistent with early studies on participation in PES (Arriagada et al., 2009; Ma et al., 2012; Zanella, Schleyer & Speelman, 2014) and complement the descriptive analysis, this section of the study applies a quantitative examination.

A multiple regression analysis serves to enhance understanding about statistically significant variables influencing participation. Research on participation has used different regression models that include the logistic model, for example the study of Zanella et al. (2014) combines both descriptive analysis and logit regression, and probit models like the ones found in studies from Arriagada et al. (2009) and Ma et al. (2012). Before running the probit model, a correlation matrix was completed in order to confirm that no significant or

strong correlation among variables occurred. This examination is provided along with the probit model in the findings and discussion section. Subsequently, the probit model estimating the probabilities for a binary response, in this case, farmers' participation in PES (represented by the dependent variable Y=1) or no participation (Y=0), is run. The model employs a total of 55 observations that includes 42 PES participants and 13 non-participants who directly obtained information about the program from the informative sessions, but decided not to participate. The dependent variable Y (participation) is a function of independent variables that include: numerical variables like land size, income, perceived benefit from community, education and age; and binary variables (1= yes/ 0= no), such as having cattle, training, social networks, and having an irrigation pump. There is a total of 9 independent variables for the 55 observations, variables that were selected according to previously addressed literature and to the viability to obtain data. The probit model in this study, in its empirical basis, therefore takes the following form.

$$Y = \beta_o + \beta_1 X_1 + \dots \beta_n X_n + e \qquad (4.1)$$

Where Y is as follow:

$$Y = \begin{cases} 1\ participation \\ 0\ non\ participation \end{cases}$$

A general statistical description of data used in this chapter, denoting number of observations, mean, standard deviation, minimum and maximum of each variable is found below in table 4.1.

Table 4.1: Statistical Description of Data Used for Chapter 4

Variable	Observations	Mean	Standard Dev.	Minimum	Maximum
Irrigation (yes/no)	55	.2545455	.4396203	0	1
Land size (hectares)	54	3414.148	4094.156	200	21000
Income (Rupiah/month)	52	2346981	1876084	500000	7300000
Cattle (yes/no)	54	.2962963	4609109	0	1
Social networks (yes/no)	55	.7454545	.4396203	0	1
Benefits perceived (yes/no/little)	55	7090909	.5667558	0	2
Education (elementary and above)	55	.9090909	.2901294	0	1
Training (yes/no)	55	.5272727	.5038572	0	1
Age (22-86 years old)	55	54.87273	12.93439	22	86

Source: Author's primary data, 2014

4.3.1 Statistically Significant Variables Influencing Participation in PES

At the project level, results obtained from the probit model in table 4.2 show that social networks (positive sign) constitute the most statistically significant variable influencing participation. Although with a feebler effect, land size (positive sign) is statistically significant when run with fewer variables.

The more involvement in social networks, the more likely farmers are to participate in the PES program. In this village different groups or associations are observed, like the cultural ones that include different *Sunda* music groups, puppet performance group, and martial arts, in Indonesian *pancak silat*. There are others like the milk cooperative and the farmer's association. This study particularly focuses on farmers engaging in the farmer's association, a formal organization where farmers benefit from information sharing about

market price, training sessions provided by fertilizer and pesticides companies and at times by researchers in the area of agriculture, and the interaction and exchange of information among members, therefore is the organization that matters the most for PES.

This study suggests this indicator as one of the most important influential factors for participation. While this is consistent with literature of participation in other environmental programs, it also reflects farmers' positive perception towards social benefit, as Dolisca, McDaniel, and Teeter (2007) express about the existence of different perceptions of economic, social and community aspects resulted from different group interactions. In the study of previously mentioned researchers, participants in environmental programs were found to be more informed individuals due to their association in groups like forest management; on the other hand, farmers who were not members of a forest management group were not well informed about local forest programs, and therefore they tended to overvalue the costs and underestimate potential benefits (Dolisca et al., 2007). Similarities are also present in the Suntenjaya case study.

Results also indicate the significance of land size, although in a lower proportion. In this case, the larger the land farmers have, the more likely they are to participate. As literature has addressed, land is an indispensable requirement for participation, and the larger it is the more room for the farmer to adapt to new crops while handling their existing practices.

Table 4.2: Probit Model for Participation in PES

Dependent variable: participation

VARIABLES	(1)	(2)	(3)
Irrigation	-.37664612	.409469	.4870855
	(0.434)	(0.587)	(0.539)
Land size	.0002126	.0001929	.0002181
	(0.092)*	(0.384)	(0.373)
Income	-6.35e-08	-2.09e-08	-3.45e-08
	(0.571)	(0.901)	(0.845)
Cattle	-.3984967	-7648861	-.7521944
	(0.375)	(0.241)	(0.253)
Social networks		2.630529	2.75811
		(0.000)***	0.000***
Benefits perceived		.3700098	.3118762
		(0.492)	(0.574)
Education		1.434067	1.594706
		(0.153)	(0.128)
Training			.2527146
			(0.676)
Age			-.0164489
			(0.574)
Constant	.5175024	-2.667716	-2.123473
	(0.223)	(0.059)*	(0.261)
Observations	49	49	49

Notes. Signif. codes: <0.01 *** <0.05 ** <0.1 * Z value in parenthesis
Source: Authors' computation

Table 4.3 shows the correlation among variables used in the probit model (table 4.2), as part of the fundamental steps to corroborate that bivariate correlation is not higher than the set standard (0.7)[2]. As shown below, results correspond to the accepted standards.

[2] Standards by Tabachnick and Fidell (1996).

Table 4.3: Correlation analysis for Variables in Table 4.2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Irr	Lan	Inc	catt	net	ben	edu	tra	Irr
Irri	1.0000								
Lan	0.1277	1.0000							
Inc	0.1248	0.1767	1.0000						
catt	0.1023	0.0621	0.0634	1.0000					
net	-0.1624	0.2336	0.1182	-0.0020	1.0000				
ben	-0.0231	-0.0325	-0.1265	0.0221	0.2658	1.0000			
edu	-0.2556	-0.2027	0.1006	-0.0687	-0.2026	-0.1685	1.0000		
tra	0.0095	-0.0505	0.0152	0.0923	-0.0095	-0.0409	-0.0469	1.0000	
age	-0.0844	0.0485	0.0204	-0.0957	0.0807	-0.1408	0.2499	-0.1364	1.0000

Note: Bivariate correlation no higher than 0.7 (Tabachnick & Fidell, 1996)
Source: Authors' computation

4.3.2 Variables Influencing Participation in PES and Farmers' Characterization in Suntenjaya Village According to the Capital Framework

First studies on participation were mostly based on regression analysis and conventional economic perspectives. Given the complexity to match theory and practice and understand variables for participation, particularly in pro-poor schemes, recent studies stress the necessity to combine both qualitative and quantitative techniques for the subject of participation (Zanella et al., 2014). In order to respond to present demand, beyond the fact of insufficient case studies from a qualitative perspective in the Asian region, and to complement the understanding regarding farmers' participation in PES and their principal characteristics, this study applies both of these approaches.

The following discussion section presents a descriptive analysis based on the categorization of farmers' characteristics according to the capital framework. This analysis includes farmers who participate in the program and those who do not, as well as factors

influencing such participation. Variables used in this section comprise the ones used in the previously analyzed probit model in addition to other not quantifiable ones that aim to complement and strengthen the interpretation. In order to capture general characteristics of non-PES farmers in the village, this section employs data collected from 190 farmers, representing over 30% of the farmers' population and contrast 148 non-PES farmers and 42 PES farmers.

4.3.2.1 Physical Capital

Most of PES participants are from Cibodas, a sub-division of Suntenjaya village, located approximately 12 km. away from the main and closest town, Lembang. Cibodas, Legok, Patrol and Pasir Angling settlements are relatively closer to each other, and they are also older settlements compared to Cikapundung and Batu Loceng, which are at a farther distance from the main town and closer to the forest area (refer to previous map in figure 4.1). While roads, bridges and related infrastructure are similar in the village, access to further settlements tends to be harder due to poor road conditions and higher elevation (1373 mt.). Location of settlements and structural conditions affect residents; for instance, proximity to the main town facilitates market access opportunities, employment, and information sharing. This could be considered advantageous for farmers to obtain more information regarding markets, or other advantages such as participation in programs like PES. Land in Suntenjaya was state owned, whereas farmers in Cibodas, Legok and Patrol currently enjoy a better security of land use due to the customary length of use, making their land private. Extending agricultural area of farmers in the center of the mentioned settlements tends to be difficult since settlements are established and land areas delimitated, contrary to the periphery of the village, where villagers may encroach and extend their agricultural area toward the

surrounding forest. The fact that expanding land is difficult for farmers located in the center of the village, this motivates them to use their agricultural land in more sustainable ways, according to locals' opinions. A sense of land ownership also tends to stimulate farmers for better practices and more sustainable ways of using the land (Thuy et al.; 2008, Forest Trends et al., 2008; Knowler, 2004). On the other hand, further settlements have been established in encroached-upon forestland, which could lead farmers to sense apprehension when making decisions about land use, particularly in semi official activities or programs like PES.

The context in Suntenjaya suggests that settlement closest to the main town may facilitate participation in PES due to security in land use and information sharing, placing farmers in a more advantageous position than farmers in farther settlements. As the literature highlights, infrastructure plays a fundamental role in the development of rural areas and the rural dwellers, as it facilitates agricultural commercialization, strengthens the links between agricultural and non-agricultural activities, as well as urban and rural connections, and inserts the poor into the economy (ADB, 2006). Interviews reflect farmers' awareness of their locations and the advantages and disadvantages. A total of 21 farmers from Cibodas, Patrol and Lekog all agree on their closer and easier access to the main town, Lembang. Because they are in the center of the village, they also recognize that access to forest is not as convenient for them as for farmers located in Cikapundung, and Batu Loceng. 17 farmers from a total of 20 located in Cikapundung agree on the difficult access to main town and on the convenient location near to forest for them. Farmers (15 out of 20 interviews) from Batu Loceng also agree on the difficulties to go to main town due to diverse reason as distance, poor road conditions, and poor public transportation system. Others (17 out of 20 interviews) also indicated the convenient access to forest compared to farmers in the center of the village. Regarding this point, a farmer from Cibodas states the following.

> Our settlement is closer to Lembang and with easier access compared to our neighbors in Cikapundung and Batu Loceng. Road conditions towards the latter are bad and dangerous. It even gets more dangerous when raining. Our focus is more on farming activities because getting grass for livestock can be difficult if you are not near the forest. The local office can support us more compared to farmers living in farther areas; we can also get support for our farming activities because of the proximity to the office and our settlements (Male farmer, 52 years old).

Although previously analyzed factors are important for this case study, the prior testimony suggests a contextual base variable. For instance, the Chinese case (Mullan & Kontoleon, 2012) mentioned in the literature review section, evidenced opposite results, showing households in remote areas were more willing to participate in the programs. This evokes to the necessity to carefully review variables embedded in a context. It is equally fair to indicate that due to the limited capacity of implementers and other technical constraints to disseminate the information among all villagers (as described in chapter 3), some farmers at farther distances from the local office and areas where informative session were conducted simply did not obtained information about the program.

In general, both groups seem to own the same basic tools for agriculture, like hoes, sickles and cleavers, fertilizer pumps and sprayers, but when surveyed about equipment like irrigation pumps, 24% of PES participants have pumps (equipment acquired before the program) compared to 5% of non-participants. Availability of basic equipment facilitates work and efficiency, which in return could provide more free time and security for farmers to engage in new practices. The reviewed literature suggested that more access to technology or

availability of tools and equipment likely increase the percentage of participation in programs that aim to change the land pattern, like the ones converting mono-cropping to agroforestry, since farmers with access to basic equipment tend to be more efficient than those who lack it. In this sense, present results are consistent with previous findings, delineating differences between the two groups. Table 4.4 refers to various indicators regarding physical capital that characterize both PES participants and non-PES participants.

Table 4.4: Physical Capital

Capitals	**Variables**		**PES participants**		**Non-PES**	
			%	N	%	N
Physical	Distance to the main town (Lembang)	Cibodas (within 12km)	80%	32	19%	28
		Legok (within 13km)	10%	4	0	0
		Patrol (within 15km)	5%	2	29%	43
		Cikapundung (~25km)	0	0	18%	27
		Batu Loceng (~17km)	0	0	34%	50
		Pasir Angling (16km)	10%	4	0	0
	Roads' condition	Narrow, curvy and within high steep, trodden paths				
	Production equipment and technology used by farmers	Hand tractor	0		0	0
		Irrigation pump	24%	10	5%	7
		Others tools like hoe, sickle and cleaver, fertilizers pumps and sprayers				

Source: Author's fieldwork

4.3.2.2 Natural Capital

Indicators grouped in the natural capital category also include land size, which can be placed in this mentioned category when regarding its biophysical characteristics, or also considered as a financial capital when regarded as an asset source of income. In this chapter, land size is considered as a unit of provision of natural service that could be improved with practices like agroforestry, as suggested by the PES program. Regarding indicators for the

natural capital, like crop types, both groups seem to be quite homogenous. Nonetheless, the PES leader and head of the farmer association in the village has reputable experience for growing coffee, a crop stipulated in the PES program. His advantageous position allows him to provide training and assistance to farmers willing to adopt coffee cultivation.

PES participants tend to have larger areas and at least a minimum of 200 mt^2 (0.02 ha) to engage in the program (see table 4.5). On the other hand, farmers with very limited (subsistence) land may be inevitably excluded from participation, unless the household is not financially dependent of its land and could plant the requested crops and trees for PES. In this case study results indicate that land size of those engaged in the program ranges from 1,700 mt^2 (0.17 ha) (1^{st} quartile) to 5,200 mt^2 (0.52 ha) (3^{rd} quartile). Land size is a common determinant for participation in PES, where participants usually tend to have larger areas, which in turns improves effectiveness in terms of environmental impact. In the case of Suntenjaya, approximately 30% of the land is used by lower-income farmers, while 70% is used by higher-income farmers who tend to have larger agricultural lands. If the tendency points towards the participation of farmers with larger areas and higher income, this would reflect the potential for a positive environmental impact. However, it could partially be argued that pro-poor measures are not being effectively taken into account since the poorest groups are not tackled, a challenge many practitioners and policy makers face, and those holding smaller land areas may have a lower tendency to participate. Yet for the program to be equitable it is also fundamental to regard fairness within elements proposed by Leimona (2011), like access, process, and decision-making. It is also important to recall that even though a pro-poor PES program aims toward benefiting and including the poor, its main and original objectives are based on environmental conservation.

In addition to that, different parts of the questionnaire survey proved that both groups,

PES farmers and non-PES farmers, are aware of the environmental problems in their village. Although a considerable number of farmers seem to care for their environment, their financial limitation might refrain them from actual participation and action-taking (the difference between willingness and ability to take action). Part of such inability could be observed when it was shown that most of the PES farmers used their program's payment to purchase more fertilizers and pesticides, even though they were aware of potential pollution. Non-PES farmers were also willing to spend more money on fertilizers and pesticides if they could.

Table 4.5: Natural Capital

Capitals	**Variables**		**PES participants**	**Non-PES**
Natural	Land size in mt2 (ha)	Min	200 (0.02ha)	80 (0.008ha)
		Max	21,000 (2.1ha)	14,000 (1.4ha)
		Average	4,600 (0.46ha)	3,300 (0.33haha)
		Median	2,400 (0.24ha)	2,000 (0.20ha)
		1stQuartile	1,700 (0.17ha)	900 (0.09ha)
		3rdQuartile	5,200 (0.52ha)	4,900 (0.49ha)
	Farm tittle	Private owned		
	Crop type	Broccoli, potato, cabbage, tomato, cauliflower, banana, coffee		
	Soil erosion	Extensive soil erosion (rate 50 ha), problems of landslides due to erosion (Village level statistics - Profil Desa Suntenjaya, 2011)		

Source: Author's fieldwork

4.3.2.3 Financial Capital

Income is regarded as one of the most important variables in most of the studies of participation in environmental programs, including PES. Based on a descriptive analysis PES participants have higher income than non-participants. PES-participant' average household income is 2,600,000 Rp./month, which may represent an approximation of the average income or level to participate in programs like PES. Although PES programs in Asia,

considered pro-poor programs, are supposed to encourage the participation of the poor, the poorest of the poor may not be eligible due to their landless condition, and the high risk in their livelihood. A number of non-PES participants have lower income than 600,000 Rp. (minimum for PES members), reaching a minimum of 125,000 Rp./month, limiting their participation. These poor households face considerable instability, oftentimes borrow money from other family members, get help when they are in need of medicines, exchange crops, and sometimes as one of the farmers indicate "constraints do not allowed them to do nothing, as its very difficult to find opportunities to earn cash" (male, 39 years old).

Livestock also represents part of the households' financial condition, an element for income diversification that mostly includes dairy and beef cattle, sheep and goats, chickens, and rabbits. In general, both groups seem somewhat homogenous. The time households spend in raising their livestock depends on a series of factors like the main activities they engage in to gain their income, the size of land for cultivation, and the time they dedicate to farming, and whether they count on family members' collaboration in these activities. Therefore, possession itself does not determine the time that the head of the household dedicates to raising livestock. Livestock is not a variable commonly referred to when addressing participation, but it provides a clearer picture of households' contexts, diversification and financial status. Other indicators like debts and savings were tackled in the fieldwork-investigation, but survey results could not get a clear picture regarding these issues, which might be due to the sensitivity or intrusiveness of the question.

Table 4.6: Financial Capital

Capitals	Variables		PES participants		Non-PES	
Financial	Monthly income	Min	600,000Rp.		125,000Rp.	
		Max	7,300,000Rp.		8,000,000Rp.	
		Average	2,600,000Rp.		1,300,000Rp.	
			%	N	%	N
	Livestock	Dairy cattle	8%	4	11%	16
		Beef cattle	16%	6	21%	30
		Sheep & goat	20%	8	11%	16
		Chicken	36%	15	25%	36
		Rabbit	8%	4	5%	7

Source: Author's fieldwork

4.3.2.4 Social Capital

92% of PES participants belong to associations or groups, compared to 18% of non-PES participants. This variable reflects the highest difference between the two groups in this first descriptive analysis. Results show consistency with the literature on the subject of social networks as a significant indicator of social capital that facilitates the advance of groups' common interest and cooperation and that strongly relates to collective action as an outcome.

PES participants value and perceive positive benefits from community interaction, like learning, sharing ideas and information about issues related to agriculture, to loans, to coffee, and other matters. They also consider cooperation an important element for the engagement in different activities, including the PES program. High perceptions most likely lead to joining social networks and facilitating collective action. For non-participants, their lower perception may be related to their little experience in joining groups or associations; they also gave a lower rate of importance to cooperation needed in programs like PES. Other factors influencing their perception and actions towards joining groups may include the distant location of their homes, and financial constraints, among others.

Although the element of trust was not quantified through the survey, it is fundamental to stress its role in joining the PES program, as farmers repeatedly expressed it during their interviews, group discussions and casual conversations. Trust, an element of social capital, highly related to reputation and reciprocity, turns out to be a very important condition for collective action, playing a significant role in reducing transaction costs. Vanni (2014) remarked that commonly participants involved in collective action decide to trust other participants based on reputation, this being the essence for successful collective action. Small landholders in this rural area may not count with much labor interaction, as each of them work their small piece of land by themselves or with family members, therefore associating with others farmers to share information is valuable for them. Interaction with other farmers after work not only enriches them in terms of working abilities, but they seem to bond more as a community. All PES farmers mentioned the well-known work and good reputation of the head of the farmer's association, trusting his capabilities to lead the program and also trusting him as a person. It is important to mention the farmer leader's active involvement in activities to conserve the environment, recognition received by the authorities of the village because of his work and participation in trainings provided in Jakarta and other locations. This characteristic of trust was present in PES farmers' discussions while not mentioned by non-PES farmers. Part of the obvious examples was when referring to coffee growing, although they have heard about the head of the farmer's association's good experience at managing coffee cultivation, non-PES farmers also expressed great concern regarding the risk it takes to shift, expand or start a new crop like coffee because of its price fluctuations.

Social networks represented through associations are specific groups joined by villagers with common interests, and free of charge in most of the case of this village. The milk cooperative seems to be the most advanced one, according the interviewees, due to the

good organization and the variety of activities that help villagers to be informed and participate in it. As stated by one farmer, "the high demand of milk may help the cooperative to be more organized, as we want to supply the demand accordingly" (male, 54 years old). The farmer's association is led by a leader and has farmers that come together to share information about crops, prices, middleman transaction, the usage of machinery if necessary, and so forth. They also benefit from some training, although not all farmers seem to attend because at times sessions are offered in the official Indonesian language rather than their dialect, *Sunda*, and at other times they also expressed their lack of understanding because of the use of technical words. The frequency of their gatherings depends on the issues to be discussed.

Commonly, bonding among villagers from the same community tends to be stronger than bonding among villagers from farther distances; proximity enables the rise and strengthening of trust and cooperation. Farmers in Cibodas, Lekog, Patrol and Pasir Angling are closer, not only in terms of geographic distance, but also in terms of community interaction. This provides the opportunity for farmers to better know some of them, like the head of the farmer's association. Some of the interactive community activities they engage in are helping to maintain some public facilities like roads when they get damaged by rain, to aid close acquaintances in ceremonies like weddings or funerals, and to interact in community celebrations like Independence Day or Islamic celebrations.

Some of these actual forms of association may differ from past ones, especially when compared to the Suharto era, when top-down promotion of villagers' participation in different programs was encouraged. Current associations in Suntejaya village are voluntary, based on villagers' interests, but the legacy of a strong centralized state may remain as an element for the structuring of community in many rural areas, as Beard and Dasgupta (2006) indicate. In

this case study, key informants stated that generally villagers' participation varies depending on whether programs are publicly promoted by governmental authorities or by private agencies. Participation in the latter may depend on households' own socioeconomic circumstances, while in large governmental projects, participation may be widespread regardless of household characteristics. Nonetheless, as Beard and Dasgupta (2006) and many other scholars signify, determinants for collective action are based on contextual features that may include multi-scalar social, political and historical factors, which need to be understood by planners and policy makers.

Table 4.7: Social Capital

Capitals	**Variables**	**PES participants**		**Non-PES**	
		%	N	%	N
Social	Associations/groups	92%	39	18%	28
	Perceived benefits from interacting with community	72% (yes)	28	58% (yes)	82
		16% (no)	6	37% (no)	53
		12% (little)	5	3% (little)	4

Source: Author's fieldwork

4.3.2.5 Human Capital

Although income level should be correlated to education level, the following results show how PES participants who tend to have higher income also tend to have slightly lower education level compared to non-participants. The majority's education level reaches elementary school, above 80% of the sample in both groups, which is a common characteristic in rural areas. Typically, studies indicate approximately 93% of the poor only reach elementary school in many rural areas where people use their physical skills as laborers in farming activities or as road and market cleaners, among others (ADB, 2006).

In terms of training, PES participants tend to have more training than non-participants, considering only training before starting the PES program. Types of training involve coffee growing and other farming related issues from extension workers from the local office. It may be assumed that extension workers would contribute to farmers' conservation knowledge, which may raise their environmental awareness. It was also emphasized in interviews that the head of the farmer's association and leader of PES has significant training in PES programs and environmental issues, as he visited PES schemes in different areas within Indonesia, like Lombok.

It is noted that some PES members are of advanced age. In Suntenjaya, aged farmers explicitly expressed that they joined PES because of their spare time, voicing as well their concern for the environment. While Le Trong, Rambo and Gillogly's (1993) findings are similar to the present study, in general, studies have pointed out age as an influential factor for participation in environmental conservation programs, but different studies have presented both positive and negative correlations (Knowler & Bradshaw, 2007), making it difficult to derive generalities from this point.

Table 4.8: Human Capital

Capitals	Variables		PES participants		Non-PES	
			%	N	%	N
Human	Level of education	Elementary	90%	38	82%	122
		Junior high school	7%	3	14%	20
		Senior high school	2%	1	3%	4
		Bachelor	0	0	1%	2
	Training related to agriculture		36%	15	20%	29
	Age (years old)	Minimum	22 y.o		27 y.o	
		Average	51.5 y.o		45.6 y.o	
		Maximum	86 y.o		76 y.o	

Source: Author's fieldwork

Empirical evidence on the adequate mix of monetary and non-monetary incentives for the provision of ecosystem services through forms of collective action is still lacking (Muradian et al., 2013). In sum, it can be seen that factors that majorly differentiate the two groups, PES and non-PES farmers, also influence participation. These are settlement location, which strongly connects with factors like social networks, better access to markets that likely increase financial opportunities, and the legitimization of their lands to be engaged in the program. The sample reflects that a PES household average's income is approximately 7,300,000Rp., and that there is a wide gap between those of higher income and the very poor found among non-participants. Financial viability may, therefore, influence participation. Land size also limits the participation of disadvantaged farmers in this program. These factors acting as a constraint for participation could challenge the main essence of what could be called pro-poor PES, as some scholars point out in the literature. Other complementary programs to help the poor could be applied alongside PES, since the ultimate goal of the latter is not poverty alleviation. However, it is important to consider the necessity of balancing

efficiency to deliver the ES and also the inclusion of the poor through pro-poor aspects, which in practical terms continues to be challenging.

In this case study, the PES leader mainly stresses the importance of environment conservation to attract participants to join the program, rather than highlighting the possible small financial incentives through environmental service provision. Overall, qualitative examination shows that social networks and physical proximity are important elements that promote information sharing. Relationships among members, including reputation, trust and reciprocity, are also important elements that facilitate engagement in the program. Finally, other elements like tools, land size, and income play a central role in terms of feasibility to join the program.

4.4 Concluding Remarks

Concerning the characteristics of PES participants and non-participants, important differences are found in the possession of limited land size, income, and tools to work the land, as factors playing important roles regarding the feasibility of participation. Inevitably the poorest of the poor may be left out of these programs without necessarily meaning that the pro-poor essence is jeopardized, as seen in the various elements of pro-poor programs and considering that this is not the ultimate goal of the program but rather to be balanced with the ES delivery.

Differences based on social aspects are fundamental and most prominent in characterizing the two groups, and therefore influencing their participation in programs that require collective action. Associations and social networks, in particular allow farmers to obtain relevant information to act together to address common environmental or social problems, as well as to participate in 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. Not only social network marks a big difference, but also other aspects of social capital like trust and reciprocity facilitate engagement in the PES. Moreover, statistically the regression model also confirms the significant influence of social networks in participation, as well as land size at a lower proportion.

The recognition of the influence of critical social variables is important for understanding new forms of PES schemes, like the pro-poor one, that tend to move away from the pure market approach. As practitioners and policy makers aim towards PES workability, it is important to understand that motives for PES engagement go beyond profit maximization as a reason for PES adoption. Although economic incentives cannot be disregarded, factors characterizing farmers enable the identification of the important role of social aspects in influencing participation. Therefore, considering elements that are necessary for engagement in PES could enhance the sustainability of such schemes, like the provision of initiatives to start or strengthen the community bond, continuous and wide-spread informative training about the program, and training for implementing new practices that could also engage younger and busier farmers.

This chapter addresses variables influencing participation in or adoption of the PES program as social capital, fundamental for the understanding of new pro-poor PES program in the Asian region. Nonetheless, it is also vital to consider variables that influence the viability for farmers to continue this seven-year program in order to promote their development and escalation. Such variables can vary significantly when regarding the adoption and continuity of the program. The latter point is considered in the next chapter.

CHAPTER 5

FARMERS' VIABILITY TO CONTINUE PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAMS: FARMERS' VULNERABILITY AND RISK MANAGEMENT

5.1 Introduction

Understanding factors that influence PES adoption constitutes an important element to further scale up and develop these programs. However, accessibility to PES is not the sole element guiding the development of the program, as uncertainty and risk commonly characterize poor rural settings where things do not go smoothly for farmers. For a program's viability for continuity and/or sustainability over time it is imperative to consider how vulnerability to poverty and its risks affect farmers' livelihoods and the way they develop and continue PES. It is not unusual to see farmers abandoning the program before the contract ends, as in one of the PES schemes in Cidanau, Indonesia (Hidayat & Kakizawa, 2010), and the current case study in Citarum, whether because of socioeconomic effects like market conditions and price fluctuations, or biophysical circumstances, jeopardizing the progress made toward ecosystem service and the future development of PES.

As income from agriculture is highly variable from one year to another or even from month to month, such instability may deepen and broaden poverty (Ravallion, 1988). For those poor just above poverty line vulnerability is a severe concern, because any decrease of their income or even a small mistake could impoverish them more. As a consequence the poor tend to be highly risk averse and reluctant to involve themselves in high-risk, high-return activities that eventually provide them good returns and boost them out of poverty (World Bank, 2000b). In some cases, when the most vulnerable fall into poverty, it aggravates the

vicious cycle of poverty intensification and environmental degradation. These are some of the dynamics that challenge the credibility of ecosystem services frameworks, replicability, and sustainability (Daily et al.,2009).

Literature on social environmental systems, particularly by Eakin et al. (2006), recognizes that despite the important improvement in connecting vulnerability research to policy and practice, still stronger ties are required. Understanding constraints like vulnerability to poverty that could affect farmers' performance would provide a better picture of how to develop PES, clarifying how likely the program is to be continued, and about other present alternatives for policy design. Although some cases report the withdrawal of some participants from PES schemes, the literature is still lacking in regard to the aspect of farmers' viability to continue these programs.

Concerning the continuity and development of PES in the pro-poor context, this study aims to discover what kinds of factors influence farmers' ability to continue the program and how farmers cope with vulnerability and other constraints of PES workability. The structure of this chapter is grounded on the earlier literature review that contains the central concept of vulnerability and part of the current shortcomings seen in different fields of studies, livelihood strategies, and the exemplification of rural contexts through empirical works. The understanding of poverty is transferred to the context of rural settings in Java to finally lead us to Suntenjaya village, the research site. The following methodology section explains details of data collection and presents quantitative and qualitative procedures that guide the findings and discussion portion, and lead to the main remarks and recommendations.

5.2 Methodology

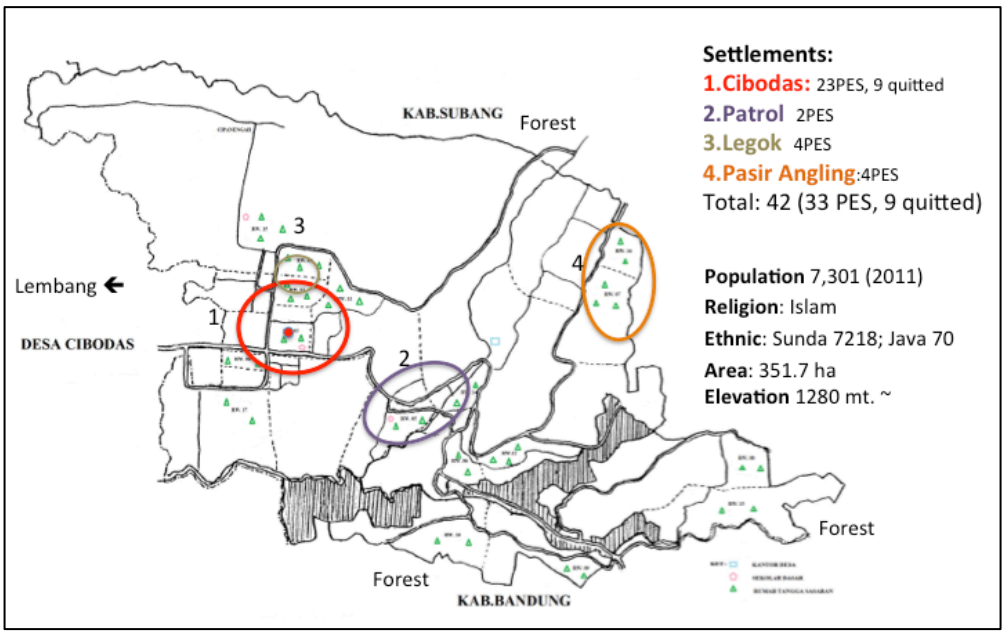
The intention of this chapter is not to measure vulnerability. There is a wide range of approaches to measure vulnerability but all methods agree on the difficulty of quantifying a phenomenon that cannot be directly observed (Tiani et al., 2015). Due to limitations on data, for instance lack of time series data, rigorous economic methods cannot be applied in this study. Nonetheless, as previously stated, this study's main concern is the elucidation of how vulnerability to poverty affects farmers' livelihoods, and at the same time affects their performance in the program, leading to the withdrawal of some of them and threatening the continuity of PES. Therefore, the use of general socio-economic variables closely related to the livelihood approach will be adopted in the present analysis.

Data Collection

For this chapter, a household questionnaire survey is conducted to deepen understanding about farmers' agricultural activities, risks and livelihood aspects, engagement and abandonment of PES. The survey was conducted in December 2014 with improved focus on the desired research objectives and first-hand experience of having worked on the ground. The survey included 42 PES participants (33 farmers who continue the program, and 9 farmers who quit the program during the contract), out of a total of 45 farmers originally engaged in the program. Among the nine farmers who abandoned the program, they all coincide that it was around year 2013 when they quit the program. However, there is no written record of the exact date of the abandonment and respondents do not remember precisely. Due to the lack of accuracy provided by the interviewees, this study categorizes respondents between two groups, those who continue the program and those who abandon it, indifferently of possible minor differences regarding the time they quit. Other sources of data

collection were also applied, as detailed in the *Introduction* chapter. The following map represents the layout of the survey and interviews conducted with the 42 respondents in different settlements marketed below, Cibodas (32 respondents), Patrol (2 respondents), Lekog (4 respondents) and Pasir Angling (4 respondents).

Figure 5.1: Geographical Layout of Surveys and Interviews in Suntenjaya Village



Source: Adopted from Profil Desa Suntenjaya (2011). *Note.* Fieldwork, December, 2014

Legend: PES members who continue, and those who quit.

A general statistical description of data used in this chapter, denoting number of observations, mean, standard deviation, minimum and maximum of each and various variables is found below in table 5.1.

Table 5.1: Statistical Description of Data Used for Chapter 5

Variable	Observations	Mean	Standard Dev.	Minimum	Maximum
Income (Rupiah/month)	39	2288513	1941250	550000	7300000
Land size (hectares)	41	3910.488	4529.255	200	21000
Livestock (yes/no)	42	.6666667	.4771187	0	1
Other jobs (yes/no)	31	.7096774	.4614144	0	1
Social networks (yes/no)	42	.9285714	.2606612	0	1
Education (elementary and above)	42	.9047619	.2971018	0	1
Sex (female/male)	42	.6666667	.4771187	0	1
Age (22-86 years old)	42	55.14286	13.59084	22	86
Distance (kilometers)	40	12.5	1.2195	12	16
Irrigation tool (yes/no)	27	.2222222	.4236593	0	1
Training (yes/no)	42	.547619	.5037605	0	1

Source: Author's primary data, 2014

5.3 Factors Influencing Farmers' Viability to Continue PES

5.3.1 Basic Features of interviewed (PES) Households and Their Farms

This section aims to elucidate basic features among all PES participants, comparing those who continue the program and those who abandoned it.

Education of respondents

30 out of 33 (90.9%) of those who continue the program reached the elementary school level and the other three members (9%) reached above elementary, which includes two

of them reaching junior high and one of them achieving high school. Among those who abandoned or quit the PES program, eight of a total of nine (88%) farmers reached elementary school, while one farmer (11%) reached junior high school. The majority of farmers' education level is elementary school, which is a common characteristic in rural areas.

Sex of respondents

It is important to clarify that men take the decision to enroll land in programs like PES or similar ones; however, implementation of the program can be managed by a woman depending on household cases. In light of this, it was found that 22 (66%) of those who continue the program are males, while the rest (11 members) are females, all of them wives helping their husband to manage the land. Among those who quit the program, the same proportion was found: six (66%) males and three (33%) females who used to manage the PES program on their land.

Marital status of respondents

Most farmers of both groups are married. Among farmers who continue the program, 26 (79%) are married, one (3%) is single, and six (18%) are widowed. The farmers who abandoned the program were all married.

Age of respondents

The vast majority of respondents from both groups (18 who continue and seven who quit) range between 41 and 60 years old. From the group who continue the program, there is a group of eight farmers from 71 years old and above engaged in the program, which is not present among those who abandoned the PES. As stated in previous chapter, older farmers

who have more spare time and do not practice regular farming have less risk to incur in the management of coffee.

Location of respondents

Farmers' agricultural land for PES is relatively close to each other, and the farthest location from their hamlet does not exceed an approximately 5km. Overall there is relative proximity among them. Among those who continue, 23 (70%) of them belong to the Cibodas area, while the rest are in nearby areas. Those who abandoned the program all live in Cibodas. Whether their farms are located in areas prone to floods or landslides was hard to determine by households due to different reasons, like changes in weather; thus, four (12%) of respondents did not answer this question. From the group who continue the program, four (14%) of them reported they were in areas prone to floods, while eight (28%) said they were in areas prone to landslides. PES implementers talked about the risk of exposure in areas prone to floods and landslides as part of the reason to promote participation in the program, which could mitigate such problems. On the other hand, among farmers who quit the program, one (20%) of them claimed to be at risk of floods and also landslides.

Tools of respondents

In general the basic tools used by both groups are hoes, sickles and cleavers, fertilizer pumps and sprayers. Irrigation pumps are the most expensive to acquire, and it was found that 26 (79%) of farmers who continue the program have those tools, while six (67%) of farmers who quit the program have those tools, making no considerable difference among them.

Social networks of respondents

While social networks played an important role in participation in the program, it seems that the role diminishes in terms of continuity or sustainability of the program. 31 (93%) farmers who continue the program belong to the farmer's association, while eight (88%) who quit also belong. Results indicate no important difference between the two groups.

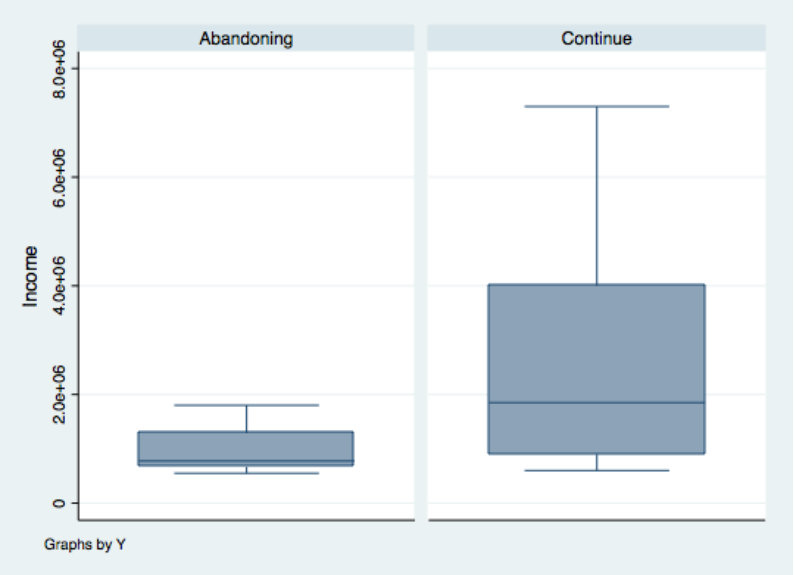
Overall the above social characteristics portray the two groups as somewhat homogenous, where there is no notable differentiation between those who continue the program and those who quit. Nevertheless, economic variables seem to mark the difference in this analysis. Some economic variables that could be quantified in the study were the size of land[3], the average monthly income, whether they have livestock and other jobs besides farming or not. Although savings and remittance also constitute important financial indicators (Rigg, 2006), due to the sensitivity of the questions, they could not be quantified with enough respondents.

As for livestock, seems that the two groups have the same proportion of raising livestock, 67%, while the rest have no livestock at all. However, the difference is in the type of the livestock they have. Generally farmers in Suntenjaya village own dairy and beef cattle, goats and sheep, chickens and rabbits. Those who continue the PES program tend to have more number of cattle than those who quit. Cattle usually can be used not only as a source of dairy products but also as a source of savings or way to access credits, this being an important financial asset. Regarding other sources of income, like having other jobs than farming, 15 (65%) from those who continue the program have other jobs besides farming, compared to seven farmers who quit the program (87%). However, almost 30% of respondents could not

[3] In this chapter, land size is considered as part of a financial asset, a source to generate income.

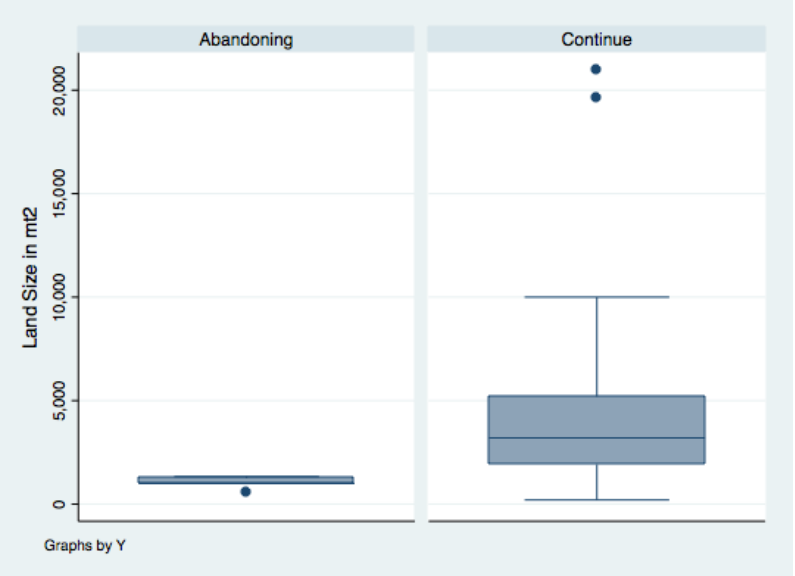
answer precisely, as their side jobs are not permanent ones. The difference in the average income between the two groups is more than double; PES farmers have an average income of approximately 2,627,161 Rp., while those who quit average 976,250 Rp. The average land size among those who continue is about 4,604 smt^2, while for those who quit it is about 1,051 mt^2. Other aspects, such as 1st quartile, 3rd quartile and median, that point to differences between the two groups can be visualized in the graphs 5.1 and 5.2 below.

Graph 5.1: Income Differences between PES Members who Continue and Those Quit the Program



Source: Author's computation, December, 2014

Graph 5.2: Land Size Differences between PES Members who Continue and Those Quit the Program



Source: Author's computation, December, 2014

5.3.2 Factor Influencing the Continuity of the Program According to Quantitative Analyses

5.3.2.1 Regression Analysis: Probit Model

The model run in the chapter is a probit model that estimates probabilities for farmers continuing in PES (represented by the dependent variable Y=1) or abandoning the program (Y=0). The dependent variable Y (continuity) is a function of independent variables that include numerical variables like land size and income, and binary variables (1= yes or 0= no) like having other jobs, and livestock. Due to the degree of freedom social network and other variables are not included in the model. The sample considers a total of 42 observations, as explained in the previous session (5.2.1 data collection). For the applied probit model formula refer to chapter 4, equation 4.1.

Correlation analysis and significant testing (t-test) are also used in this chapter, along

with the probit model. Significance testing (t-test) is also employed in this chapter as corroboration for a small sample.

According to the probit model, reproduced in table 5.2, the most statistically significant variables influencing continuity are other jobs, livestock, income, and land size.

The more different jobs farmers have, the more likely they are to continue PES. The more livestock they have, the more likely they are to continue the program. According to the contextual background and understanding gained in the field, it seems that these two variables are related to the diversification of farmers' livelihoods. The more diversified they are and less dependent on one asset, the better they might manage their livelihood and other activities like PES. Getting an extra income from other jobs or livestock and or having livestock as savings could ease farmers' sole dependence on PES crops, mainly coffee. These findings consistently match part of the risk management and diversification literature, as Dadzie and De-Graft Acquah (2012) note that farmers attitudes toward risk is an important and continuous result of their behavior and coping strategies to lessen the effects of risk they constantly face. Many scholars such as Niehof (2004) also agree that diversification, whether by increasing their assets or activities, is part of a significant strategy to mitigate rural households' vulnerability.

The more income households have, the more likely they are to continue in the PES program. This is closely related to the ability to manage poverty. In other words, if farmers have abilities, assets, and above all the income to manage the risk that PES could bring, such as loss of production and lower income, the longer they join the program. It is commonly seen how crop income shocks combined with households' lack of access to assets or credit relates to such uncertainty with poverty (Kochar, 1995). As Rigg (2006) reflects, income is part of a key determinant of well-being, and households' role "to the achievement of economic growth,

poverty reduction, and social development in rural areas" (p. 195). Wie (2010) recounts that despite the past four decades' economic growth and mitigation of absolute poverty, absolute poverty still remains a major national problem in Indonesia. Poverty certainly limits the development of activities like PES, as the ADB (2007) concretely describes for the Citarum area, where poverty has been a threat to many projects.

Finally, another important influencing indicator is the land size. The larger the size of land, the more likely farmers continue the program. In the particular case of Suntenjaya, farmers who quit the programs reported during the interviews that their limited land size did not allow them to maintain the diversification of their crops, and focusing on coffee production could be too risky for them. Coffee cultivation takes more space than other trees, while their shade (coffee plants) also affect the quality of vegetables grown in the coffee plant proximity. On the other hand, the larger the land area, the more flexibility farmers have to adjust to the new agroforestry system of incorporating coffee and trees. As opposed to this case, in Latin America factors for successful outcomes of PES lies partly in the fact that wealthy landholders that owned land ranged from 35 to 100 ha in size (Zbinden & Lee, 2005).

Table 5.2: Probit Model for Continuing and Abandoning the Program

Dependent variable: continuity

VARIABLES	(1)	(2)	(3)
Income	8.01e-07*	5.14 e-07	0.000141*
	(0.080)	(0.299)	(0.089)
Land size		0.0008614*	0.0033168*
		(0.068)	(0.054)
Livestock			17.3699*
			(0.089)
Other jobs			7.400827*
			(0.080)
Constant	-.3427349	-1.463314	-37.87789
	(0.552)	(0.109)	(0.077)*
Observations	39	34	29

Notes. Signif. codes: <0.01 *** <0.05 ** <0.1 * Z value in parenthesis

Source: Authors' computation

Table 5.3 indicates the correlation analysis among variables used in the probit model. According to what was established by Tabachnick and Fidell in 1996, a bivariate correlation higher than 0.7 between independent variables should not be incorporated in the regression analysis. As shown below, correlations obtained correspond to the accepted standards.

Table 5.3: Correlation Analysis for Variables in Table 5.2

	(1)	(2)	(3)	(4)
	Income	Land	Livestock	Job
Income	1.0000			
Land	0.2851	1.0000		
Livestock	-0.2006	-0.4007	1.0000	
Job	-0.0518	-0.6362	0.2974	1.0000

Note: Bivariate correlation no higher than 0.7 (Tabachnick & Fidell,1996)
Source: Authors' computation

5.3.2.2 Significance Testing: T-test

The t-test is conducted in order to evaluate whether the means of two groups are significantly different from each other, so that we can corroborate previous results from the probit model and draw on the relationship between different factors. T tests that ensure significant statistical differences are presented below.

Results in table 5.4 and exhibited in graphic 5.3 show that there is significant statistical difference in income level between households who continue the PES project and households which do not. Table 5.5 and its correspondent graphic 5.4 also present a significant statistical difference in land size between households which continue the project and households which abandon it. These results confirm the results presented in the probit model.

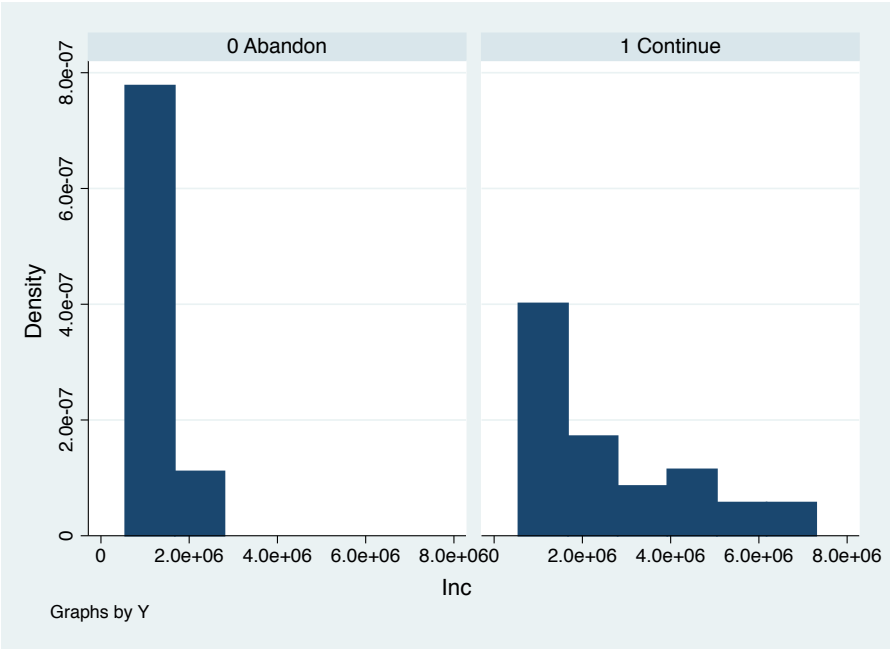
Table 5.4: Two-sample T Test with Equal Variances Income for the Groups Which Continue and Quit the Program

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	8	976250	160122	452893.5	597621.6	1354878
1	31	2627161	365786.7	2036614	1880125	3374197
combined	39	2288513	310848.7	1941250	1659232	2917793
diff		-1650911	731418.9		-3132907	-168915.9

Notes. diff = mean(0) - mean(1); t = -2.2571; Ho: diff = 0 degrees of freedom = 37; Ha: diff < 0; Ha: diff != 0 Ha: diff > 0; Pr(T < t) = 0.0150; Pr(|T| > |t|) = 0.0300; Pr(T > t) = 0.9850

Source: Author's computation

Graph 5.3: Two-sample T Test with Equal Variances Income for the Groups Which Continue and Quit the Program



Source: Author's computation

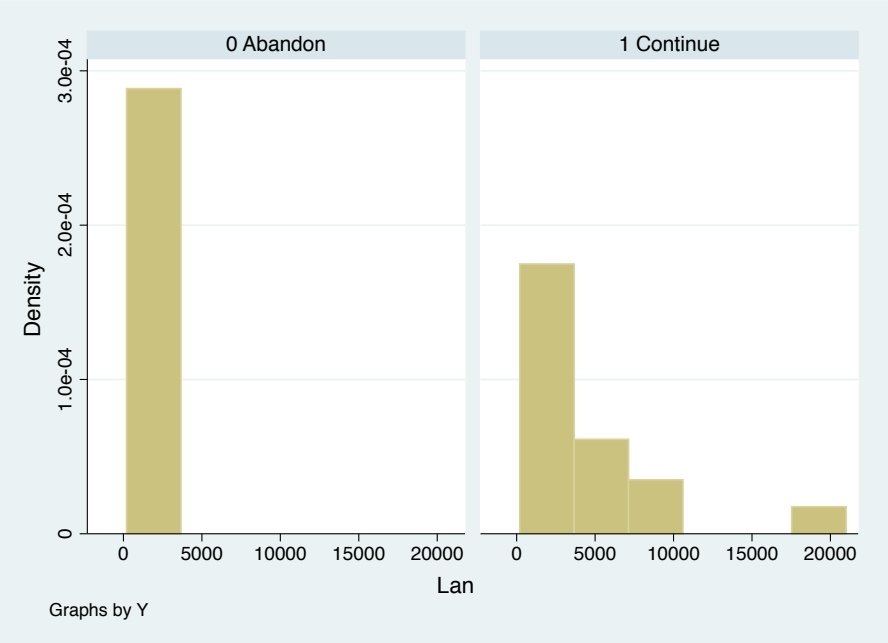
Table 5.5: Two-sample T Test with Equal Variances Land Size for the Groups Which Continue and Quit the Program

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	8	1051.25	86.26035	243.9811	847.2767	1255.223
1	33	4603.636	836.486	4805.246	2899.77	6307.503
combined	41	3910.488	707.3509	4529.255	2480.878	5340.097
diff		-3552.386	1715.816		-7022.952	-81.82077

Notes. diff = mean(0) - mean(1); t = -2.0704; Ho: diff = 0; degrees of freedom = 39; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.0225; Pr(|T| > |t|) = 0.0451; Pr(T > t) = 0.9775

Source: Author's computation

Graph 5.4: Two-sample T Test with Equal Variances Land Size for the Groups Which Continue and Quit the Program



Source: Author's computation

In addition to previous classifications, through the t-test other combinations were found to be significantly different, like owning cattle between the two groups. Other classifications are found between groups who have livestock or not and between those who have side jobs or not.

Table 5.6 and graph 5.5 present a significant statistical difference for having cattle between households which continue PES project and households which do not. Concerning the characteristic between having cattle or not, those who continue the program have a higher mean of owning cattle than those who quit. Cattle are valuable assets, a source of income mainly from dairy products, and collateral when requesting loans or credit. The management of cattle is done by men and women, including activities like grazing, where usually women and men go to the forest and surrounding areas to obtain the grass. According to data obtained during the fieldwork, it is found that women carry about 25 kg per day, while men do about 50kg per day. Through a village cooperative, some farmers sell their milk there, expressing their interest in the organization and the opportunities offered to sell their products in the nearest market in Lembang.

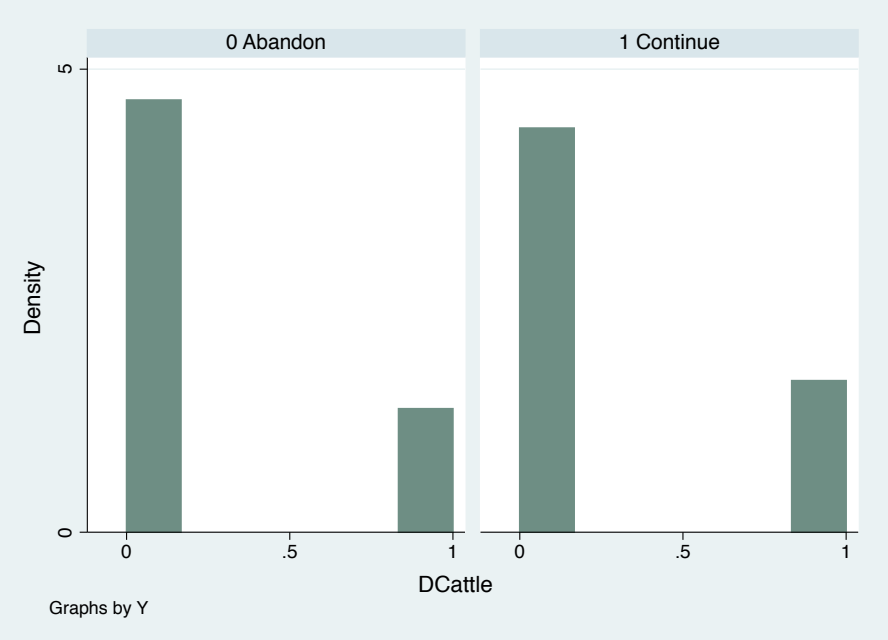
Table 5.6: Two-sample T Test with Equal Variances for Cattle for the Groups Which Continue and Quit the Program

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	9	.2222222	.1469862	.4409586	-.1167285	.561173
1	33	.2727273	.0787296	.452267	.1123604	.4330942
combined	42	.2619048	.0686651	.4450006	.1232328	.4005767
diff		-.0505051	.1692334		-.3925385	.2915284

Notes. diff = mean(0) - mean(1); t = -0.2984; Ho: diff = 0; degrees of freedom = 40; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.3835; Pr(|T| > |t|) = 0.7669; Pr(T > t) = 0.6165

Source: Author's computation

Graph 5.5: Two-sample T Test with Equal Variances for Cattle for the Groups Which Continue and Quit the Program



Source: Author's computation

Statistically, previous result state different relationships among resources, farmers, and their activities to improve their livelihood strategies. Observation and interaction with farmers also confirm that the precarious environment in the village, characterized by what they describe as a *place with few opportunities*, obliges them to find different ways to support their families. In such a context, diversification is considered a fundamental strategy to deal with vulnerability, a "process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living" (Niehof, 2004, p. 325).

As previously seen in the probit model and t-test analysis, financial variables are statistically significant when considering the continuity of the program. Social variables like social networks, education, and age are not reflected in the probit model due to the degree of freedom (of the linear regression). They also show no statistically significant difference in the t-test analysis; however, correspondent results can be verified in appendix A. Additional t-test of variables different than continuing or abandoning include land size for those having livestock or not and land size for those having side job or not are also presented in the appendix (B) for clarification of farmers' situation.

5.3.3 Understanding Farmers' Stories

Farmers who Quit and who Continued the Program

There are nine farmers who abandoned the PES program, and their most common reasons were their limited land size, their constraints with income, and plant viruses (see table 5.7). All who quit mentioned the word *risk* as part of proceeding with PES. In terms of limitations with land size and income it is important to regard the cultivation process of coffee as a main cash crop adopted for PES. The first year, when planting the seeds or seedlings in

an intercropping manner (beside other crops, like vegetables), changes in their new cultivation were almost unnoticeable. During the first year, the coffee plant takes time to grow without invading much the space of neighboring crops. In the second and third year, the coffee plant evolves in size, reaching approximately 1- 2 meters high; as a woody perennial, some types could reach about 5-8 meters, although that is not the case of the ones planted in Suntenjaya.

During the third year, vegetables grown next to coffee plant like broccoli or cauliflower, commonly planted by farmers in Suntenjaya, are affected by the shade of the coffee plant. Vegetables with less sunlight and space grow smaller and paler; farmers indicate that these affected vegetables have lower quality for which they get less money. Nonetheless, during the third year, farmers can produce their first harvest of coffee, which is on average four tons of cherries. Their second harvest usually triples, a stage that is attractive for farmers for increasing their income. Tables 5.7 and 5.8 exemplify the previous explanation.

Table 5.7: Reasons for and Reactions of Farmers Abandoning the Program

	Reason	**Reaction**
1	Plant virus, reduced income	Talked with members (plant virus) with PES leader
2	Plant virus, small land	Talked with members (plant virus) with PES leader
3	Plant virus, small land	Talked with members about plant virus
4	Plant virus, small land	Talked with other farmers about plant virus
5	Plant virus, reduced income	1st partially cut some coffee plants. Later, all
6	Plant virus, small land	1st partially cut some coffee plants. Later, all
7	Reduced income, small land	1st partially cut some coffee plants and trees. Later, all
8	Reduced income	Gradually cut some plants and trees
9	Reduced income	Gradually cut some plants and trees

Source: Author's fieldwork

Table 5.8: Relation of Coffee Growing with Land Size and Income

Years	Land size and effect over crops aside	Income generated from coffee
First	No effect	None
Second	Almost no effect	None
Third	Effect on adjoining crops	Income from 1st harvest
Forth	Larger effect on adjoining crops	Triple yield, higher income

Source: Author's fieldwork

Usually the coffee harvest is once a year, while vegetable harvests including broccoli, cauliflower, chili and others are three times a year. While cash gains from coffee could be higher than the ones from vegetables, farmers who quit the program prefer to obtain gains from vegetable as a more stable source of income. As one of the farmers stated, "I still think I can get more money from vegetables, because I can get it often. Once a year production is too long and too risky" (male farmer, 38 years old). Other farmers (five of five interviewed) agree with the previous statement. Furthermore, vegetables can be consumed by households, while coffee cannot due to the lack of machinery to process it. According to a group discussion involving five farmers, cash gains that involve PES crops like coffee could be higher than the ones generated from the vegetable harvest. For example, a farmer that only grows vegetables may generate an approximate of 6,000,000 Rp. from his/her harvest in a year, however a farmer must spend an approximate of 3,000,000 Rp. for seeds, pesticides and other goods required for the plantation. Hence, this farmer may generate a total of about 3,000,000 Rp. of cash gains per year. On the other hand, a farmer engaged in the PES program and diversifying their farming with coffee may generate about 3,000,000 Rp. from vegetable harvest and 4,000,000 from coffee harvest in a year (in total an estimate of 7,000,000 Rp. per year). A

PES member also spends about 2,000.000 Rp. for his/her plantation in a year. The expenses that the member needs to pay are lower that regular non-PES farmers because of the assistance obtained from the program (usually this assistance is only for the first year). In total a PES farmer may generate an approximate of 5,000,000 Rp. per year or less if farmer does not count with the assistance from the program especially after the first year. The following table computes some estimates of cash gains from both coffee and vegetables according to farmers' information.

Table 5.9: Farmers Thoughts about Gains With and Without PES Implementation

	Sources from income a year (Rp.)		**Cost of seeds and others (Rp.)**	**Total income a year (Rp.)**
	vegetables	**coffee**		
No PES	6,000,000		3,000,000	3,000,000
With PES	3,000,000	4,000,000	2,000,000	5,000,000

Source: Author's fieldwork (group discussions with farmers), December, 2014. *Note.* prices of coffee vary significantly from year to year and depend on how processed it is.

Regarding other designated species of the PES program, they also include trees like eucalyptus, and a mahogany-type tree called in Indonesian *sureni*, and the species known as umbrella tree, called *sobsi*. These trees are planted surrounding their agricultural fields, constituting tall but not yet thick trees. Usually they are used as a source for wood to be sold in the market, or often for the construction of their houses. Farmers do not know other forms of use for these trees, such as the extraction of oil from eucalyptus trees. Those who quit the program, cut the trees for sale as wood. In Suntenjaya, some villagers get different types of trees like bamboo and others from the forest to be sold in the closest market in Lembang.

In terms of plants that got viruses, this was a difficult experience to manage even

among those farmers with coffee growing experience, like the PES leader. Two farmers who consult with the farmers' leader were helped by the latter but with no successful results. They tried to apply more pesticides, but it was costly and did not work. They partially cut the plant and later proceeded to cut all. Many of the farmers who continued the program also faced the same problem of plant virus, including the farmers' leader, having to cut those plant that got diseases. A few years ago, the leader began to research about types of more resistant plants and even different options than coffee, such as oranges. His experience and recognition from some institutions of his work for the environment encouraged him to keep learning and trying PES and other social and environmental programs. He is an example of an empowered leader, but he recognizes the need for help from the different pertinent institutions.

Those who continued the program were not exempted from hardships. Also, many participants whose plants got viruses had to cut them, but they could manage to continue the program. Different factors influenced their decision, but overall many highlighted that the hardship was not felt so severely to push them to quit the program. A woman who helps her husband to implement the program stated, "since my husband works off the farm and mostly supports the needs of the family, I manage the field" (female farmer, 41 years old). Another woman reported that "I help to implement the program by myself while my husband works off the farm. When I cannot pick the coffee cherries, I directly ask the middleman to pick the harvest by himself. This is even though he pays me less money for doing such labor" (female farmer, 47 years old). A male farmer also reported that, "I continue because I believe we have to help mother nature urgently, and this motivates me to bear possible costs that the program may cause" (male farmer, 51 years old). These responses broadly represent farmers who continue PES, and despite their economic constraints, they may be in a better position than those quit the program.

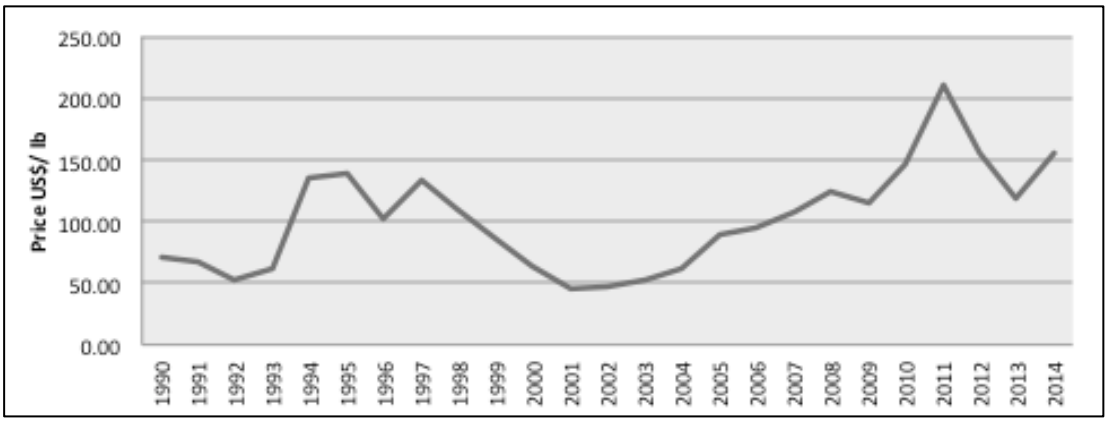
5.3.4 Other Influencing Factors: Coffee Price Fluctuations

This study shows that variables included in the group of financial capitals clearly influence the continuity of programs like PES in rural areas like Suntenjaya. Other factors related to financial indicators, especially farmers' income, relate to the price fluctuations of coffee (see graph 5.6). When the program was established in 2009, the price of coffee was relatively high and kept rising until 2011, but during the third year, when farmers were supposed to obtain their first harvest, coffee prices dropped. During 2013, corresponding to the second harvest, coffee prices were even lower. It was around 2013 when some farmers quit the program, explicitly because they could not take the risk of low prices. Following responses among those who quit the program reflect their hardship due to coffee price fluctuation along with other reasons comprising financial constraints. "If coffee price is low, it is difficult for me to grow it, so I have to stop planting. Years before the PES program started, around 2007, the coffee was at low price, we could get around 1000Rp. per one kilogram. The price goes up and down. In 2014, the price is getting higher again, thus some people may get interested in planting it" (male farmer 44 years old). Another farmer who quit the program also said, "I thought I could be part of this project at the beginning, but the reality has proved to be harder. Coffee may bring you more money, but it is risky. Besides, my plants got viruses and I had no option but to cut them and grow vegetables again. In this area, many farmers like me have small lands" (male farmer 45 years old). Finally another farmer who abandoned the PES program also expressesed his situation, saying "I understand the importance of preserving the environment, but it is difficult to do so when we have a family and when they are hungry. My land is small, so I concern about my financial condition. Also, I am very worried if the vegetables I grow get diseases or do not get big enough due to the shade of the coffee plants, if so, my income will drop and it will be very

hard to support my family. I cannot depend on just growing coffee" (male farmer, 54 years old).

The next graph reflects international coffee prices from 1990 to 2014. The PES project started in 2009 and it is supposed to end in 2016. Although Suntenjaya is not specifically known for growing coffee, there was some small cultivation in the village before. Much of the coffee plantation is also practiced inside the forest, where more research should be conducted regarding the counter-effects for the environment and its relation with environmental programs.

Graph 5.6: International Coffee Prices: Annual Average



Source: International Coffee Organization (computed from data available on the web, 2015)

Most of farmers in Suntenjaya only have the ability to grow coffee beans, and sell the cherries to the middleman, who takes them to a factory to process them and subsequently sell them in the market. In Suntenjaya, only the PES leader owns a rudimentary machine to peel part of the layers of the cherry, and he rents it out to other PES farmers. After peeling the first layer, farmers dry the beans under the sun (after drying the bean, 70% of the weight is lost). Through this process, farmers could add value to the coffee bean and obtain higher payment

from the middleman. However, not all farmers practice such processes since they have to pay for using the peeling machine. This means that when international coffee prices drop, farmers who cannot add value to coffee, like proper pealing, obtain less money.

As pointed out in different studies, historically low prices in the coffee market have financially and socially affected coffee farmers, particularly poor smallholders (Wollni & Zellerb, 2007; Eakin et al., 2006; Nyambo, Masaba, & Hakiza, 1996). In order to pass higher prices to farmers, Wollni and Zellerb (2007) explain the importance and positive impact for farmers to have access to specialty markets, to participate in the specialty coffee segment and in cooperatives in order to alleviate the crisis brought on by low prices and strengthen their capacities to cope with the shocks; or apply other strategies. In the case of farmers in Suntenjaya, the absence of formal organization among farmers in a cooperative evidently affects the performance and continuity of farmers in the coffee market. Farmers' lack of techniques and knowledge raise their vulnerability in the face of international coffee price fluctuation. It has been seen that PES farmers pick their cherries regardless of size and development, gathering all green, ripe and overripe cherries at once. This makes their labor easier, but affects the quality of coffee. As Wollni and Zellerb (2007) illustrate, green cherries affect the brewed coffee with a bitter taste, while overripe ones give a sour taste, lowering the quality of coffee. Wollni and Zellerb (2007) also explain that delay in delivery, which should be within 24 hours after harvest to the processing plant, also affects the quality of the coffee. Due to diverse limitations, such as farmers' dependency on the middleman to come and take the harvest, appropriate time delivery cannot be fulfilled. Pests also require special techniques to avoid affecting the coffee plant and their fruits, as pointed out by specialists and scholars like Nyambo et al. (1996), but such capacity training has not been provided to farmers in this area. All these limitations affect the quality of the coffee and therefore the potential gains for

coffee sellers.

Although social networks played an important role in promoting participation in the PES program, when regarding the program's continuity, their role diminished. In this case, the importance of financial capitals and access to them (as job opportunities) and other resources in order to diversify livelihood for survival is seen. Commonly, because farmers lack immediate assistance to deal with constraints and also lack of skills and resources to deal with pest and value adding to their products, their quick response was to stop the risky practice of coffee growing. Social networks could be used to create a cooperative, but without the continuous and active support of PES implementers and other institutions, it is rather difficult. As Dorward, Kydd, Morrison, and Urey (2004) explain, there is an urgent necessity to recognize that for agricultural growth it is important to invest and focus on non-farm incomes and activities in the livelihood of the rural poor since many difficulties lie beyond agriculture itself, but rather in other areas like infrastructure, telecommunications, governance, and so on.

In such a case, it is imperative to count on a more active presence of PES implementers to help farmers know how to act in cases where prices drop or when plants get viruses. As this is a lengthy project, it is also advisable to periodically review challenges farmers and the project itself face; reference of this overview is reflected in appendix C, which summarizes the main problems and recommendations provided by PES farmers during a group discussion conducted in December, 2014. Pro-poor PES like the one intended to be developed in Suntenjaya requires continuous presence for supervision and training that helps the poor to add value to farmers' products and gain access to the market through different strategies like cooperatives and marketing tools, and as a consequence helps the continuity of the program.

5.4 Concluding Remarks

For program sustainability it is imperative to know how poverty and its risk affects farmers' livelihoods and the way they develop and continue PES, an issue not much discussed in the literature. Concerning factors influencing the continuity of PES, important aspects are found in financial capitals that encompass income, land size, other side jobs, and livestock. The poorest, with less access to such assets and income generating activities, seem to be more vulnerable and more likely to abandon the program in the event of crisis. Income and land size mark the biggest difference between those who continue and those who quit the program, constituting an essential factor influencing the continuity and development of PES, even with pro-poor characteristics.

In terms of other social variables, their importance is not neglected. However, at this stage they seem not to be statistically influential. In the case of social networks, these played an important role in PES adoption, where leadership and trust were important elements to attract the participation of farmers. However, this role seems to have diminished with regard to the continuity of the program. This might be limited to the development of a new program like PES that needs more realization and understanding from villagers of the area. This does not mean that social networks do not play a fundamental role in other situations, like in festivities, or during natural disasters, and so on.

Another important element influencing the continuity of the program is the price fluctuation of the main crop to be adopted, in this case coffee. In order to manage the effects, it is imperative to count with the intermediary agency's support in implementing PES through supplementary training to add value to farmers' products and gain access to the market through different strategies, like cooperatives and marketing, so that farmers can have skills to manage the crisis and not quit the program right away.

Farmers often seek diversification of their assets and access as a way of survival. For poorer farmers, the PES program posed barriers that could not be overcome due to limitations, and such constraints forced farmers to abandon PES, as an activity that was not lucrative anymore, looking towards survival or improvement of their economic situation. In the case of Suntenjaya, particularly among PES farmers, some of their livelihood strategies are pursued through the possession of livestock, where cattle are more valuable than others, constituting a source of income and guarantee for loans and credit. Land size also plays a fundamental role, where its limitations compel farmers to seek other sources of income as side jobs. However, many endogenous (education level, lack of technology, assets) and exogenous (lack of access to market, lack of support from government and other institutions, price fluctuations) limitations challenge farmers' diversification. Although this case study focuses exclusively on Suntenjaya, similar characteristics found in other rural areas of the country could use part of this lesson when evaluating the continuity of PES programs.

CHAPTER 6

CONCLUSIONS

The rapid degradation of the ecosystem has brought to the table alternatives like market mechanisms to commodify the environment and bring solutions, or at least ameliorate it in specific circumstances. PES is a relatively new market-based alternative tool to respond to such degradation, highly valued and expected to be extended on a wider scope, particularly after the successful results experienced in various Latin American countries. Despite positive results in countries like Costa Rica, Ecuador, Brazil, and others, replication of these programs should be employed with caution, especially when encountering great contextual differences on different continents. This is where part of the dilemma deepens when trying to incorporate important contextual elements like the inclusion of the poor, widely present in the rural contexts of many Asian settings. The latter is a challenging region where most of the world population lives and where most of the rural dwellers are exposed to rapid environmental destruction.

The inclusion of the poor and the so-called pro-poor aspects in the programs are applauded by a group of scholars who claim that the perception about fairness and inclusion in the program is a key factor to determine feasibility and legitimization. Others even claim the importance of pro-poor elements as both moral and pragmatic aspects needed to be included. It is equally important to regard the arguments offered by some other scholars about the necessity to balance the goals of PES, as these programs were designed for improving the efficiency of environmental management and not merely for reducing poverty, which could counteract expected outcomes. Looking at the rural realities of countries like Indonesia, the obvious importance of the inclusion of the poor stands up; however, I argue that the mere

inclusion of the poor in such programs is not enough if socio-economic factors that affect the poor's livelihood are not well understood. Many of the newly implemented pro-poor PES schemes face the challenges of efficiently delivering the ES, yet different levels of ES achievement can be attained in pro-poor programs – enhancing the ecosystem that otherwise would have not been tackled, consequently contract's compensation must be fulfilled. Examining this initial and explorative stage is important towards understanding potential and actual participants' socio-economic condition for future development and continuity of the program. Factors influencing the participation of farmers were extensively reported in many Latin American case studies, but the literature is lacking in the context of Asia, and particularly in Indonesia, where programs are still at an initial and limited stage.

In order to understand socio-economic factors that influence the participation, workability and expansion of PES programs in Indonesia, the sustainable livelihood capital framework is employed, as it best suits the objective of evaluating factors that affect participation and continuity of participants in the program, and has been used in some studies about PES and its relation with additionality, livelihood sustainability and participation. Methods for data analysis include both quantitative and qualitative as ways to strengthen and complement results.

As a first step to develop a logical understanding of the program implemented in the Citarum basin, a contextual description of the basin and more specifically about Suntenjaya village where the program is implemented was given, contrasting the practical implementation with the concept and criteria offered by Wunder along with other scholars supporting part of the pro-poor or fairness elements. This case presents differences that exist between the current practical scheme and PES characterization. In sum this program underlines the importance of responding to ES providers' interests and necessities,

considering their poor situation, but caution needs to be employed so that variances do not compromise part of the program's objective of environmental service delivery and program's workability. Important gaps include, first, the vague environmental service. Strategies addressed to reduce erosion seem to be weakly defined due to difficulties at stating causality linkages between farmers' duties, and ES delivery. The fact that this diminishes the efficiency of the program, farmers' efforts still provide an enhancement to the overall environment. Since pro-poor PES also involves the promotion of fair aspects of participants, farmers fulfilling the contract must be acknowledged for their contribution to the ecosystem and therefore be financially rewarded. Second, this program demonstrates the misunderstandings that ES beneficiaries or buyers have about the PES concept. Beneficiaries tend to act as donors making social and environmental contributions and pay little attention to follow up of the conditionality aspect. In fact, the lack of measurable results could be closely related to the weak conditionality of the program. Even though this is important to be considered for future correction, as an initial and experimental stage it could be acceptable as a way to promote the understanding of these new schemes since setting clearly the role of all stakeholders may be difficult and lengthy.

In terms of fairness or pro-poor factors, at the process or planning level, evidence presented in chapter 3 suggests that stakeholders should be active to voice their necessities and realities, and work together with specialists to promote the development and successful realization of the program. Most literature encourages a participatory approach, and this study is not an exception, but it recognizes the difficulty of actively executing such an approach, partly due to the lack of experience in implementing PES, and failure to include more participatory activities in the budget. A concrete illustration of an active participation should include the opinion of farmers when deciding on the crops to be adopted, and participants

should consider advantages and disadvantages of a new intercropping system. This procedure should be accompanied by proper information and the collaboration of specialists, so that knowledge could be integrated for optimal results. This case also fosters more research from the implementer's side regarding access and outcomes of the program with regard to farmers' ability to continue the program.

Part of a pro-poor aspect, and also central objective of this study, focus on the participation of the rural poor in programs like PES. While many case studies in Latin America highlight financial factors as an important consideration that limits or promotes the interest in participation, principally regarding the cash gains participants can get from the program, scholars studying other environmental programs also refer to the importance of non-financial factors like social networks and collective action when joining different projects. In this sense, this study, through the sustainable livelihood approach, groups different variables within different capital to elucidate the influence of physical, natural, human, social and financial capital. Limitations are encountered when aiming to cover a wide range of variables, but evidence through quantitative and qualitative analysis points to the important role of social networks as a possible influential factor for participation. It is also difficult to isolate variables, so the study clearly recognizes the interaction and influence of many factors, but recognizes the influence of non-financial factors like the one previously mentioned in the case of Suntenjaya.

The recognition of the influence of social variables is important for understanding new forms of PES schemes, like the pro-poor one, that tends to move away from the pure market approach. As practitioners and policy makers aim for PES workability, it is important to understand that motives for PES engagement go beyond profit maximization as a reason for PES adoption. Although economic incentives cannot be disregarded at the time of PES

acceptance, factors characterizing farmers enable the identification of the important role of social aspects in influencing participation. Concerning characteristics of PES participants and non-participants, important differences are found in possession of limited land size, income, and tools to work the land as factors playing important roles in the feasibility of participation. Inevitably the poorest of the poor might be left out of these programs without necessarily meaning that the pro-poor essence is jeopardized, as seen in the various elements of pro-poor programs. Differences based on social aspects are fundamental and most prominent in characterizing the two groups, and therefore influencing their participation in programs that require collective action. Associations, and social networks in particular, 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.

These findings, shown in chapter 4, do not fit the findings presented in Latin American PES cases, where their focus was on the efficiency of the program. On the other hand, the evidence could be significant not only for the specific case of Suntenjaya, but be considered for other programs that look at pro-poor elements in the Asian region. According to these findings, in this specific case study, elements that could address necessities for engagement in PES to enhance sustainability include the provision of initiatives to start or strengthen community bonds, continuous and wide-spread informative training about the program, and training for implementing new practices that could also engage younger and busier farmers.

The importance of economic variables is not completely disregarded in this study. Although they are not majorly influential at the adoption stage of PES, they play a

fundamental role in terms of a farmer's ability to continue the program. It is not unusual to see farmers abandoning the program before the contract ends, such as in the current case study in Citarum and others like the Cidanau scheme in Banten province, Indonesia. Although scholars like Revallion highlighted that poverty and vulnerability may indeed influence farmers' engagement in programs like PES, and the vast literature on poverty of the rural poor also identifies farmers risk aversion due to the instability of their income and risk of falling into deeper poverty, studies on PES in the Asian region have not fully addressed the issue of farmers' ability to continue the program.

This study finds that financial capitals that encompass income, land size, other side jobs and livestock seem influential in a farmer's ability to continue the program. The poorest, with less access to the previously stated assets and income generating activities, seem to be more vulnerable and more likely to abandon the program in the event of a crisis. Income and land size mark the biggest difference between those who continue and those who quit the program, constituting essential factors influencing the continuity and development of PES, even with pro-poor characteristics. Another important element influencing the continuity of the program is the price fluctuation of the main crop to be adopted, in this case coffee. In order to manage the effects of the latter, it is imperative to count on the intermediary agency to support implementing PES through supplementary training to add value to farmers' products and gain access to the market through different strategies like cooperatives, and marketing tools.

The inclusion of pro-poor elements in PES implemented in the Citarum basin proves to be fundamental as all ES providers live under conditions where poverty is a threat. It is imperative that pro-poor PES implementation integrates the support of the scientist or experts in environmental management to assure solutions for or amelioration of the ecosystem as part

of an important goal of this program. Incorporation of participants' opinions is also indispensable, since it reflects the reality on the ground and positively includes farmers in the project. It is equally important to understand that pro-poor PES may not include the poorest of the poor, but still can be considered an inclusive program promoting fairness elements where poor farmers participate. This aspect should be seriously considered by implementers and authorities involved, so that realistic targets can be set and achieved. Alternative and complementary programs could help alleviate the poor and possibly encourage participation of a wider number of farmers in the program. This case encourages further research to practically enhance outcomes and provide valuable lessons as well. Numerical simulations to measure the outcomes and efficiency of the program, revision of the distribution and size of participants' areas, relation with efficiency and fairness aspects, and a comparative analysis with other programs in the country will support understanding of this subject.

As part of the opportunities and limitations learnt in this study, the following is emphasized. It is possible to implement PES at a lower cost than what economists would calculate from valuation methods, and this is seen to be true due to social aspects that bind the community together, like social networks, among others, that may facilitate participation in the program. Nonetheless, common constraints present in rural areas, such as poverty, demand continuous support throughout the whole program, in the form of training and capacitation, allowing farmers to understand the management of PES and to have access to other possibilities that could increase their livelihood diversification and provide access to markets that could help reduce financial vulnerability, and possibly improve farmers' ability to continue PES. If these considerations, along with governmental support encompassing the development and compliance of clear rules to manage environmental resources without excluding the people, are offered, programs in this area may advance from the experimental

and limited stage.

APPENDICES

Appendix A

T-test of Social Variables for Corroboration, Chapter 5

1. Income by social networks

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	3	2600000	1410674	2443358	-3469639	8669639
1	36	2262556	322374.4	1934246	1608101	2917010
combined	39	2288513	310848.7	1941250	1659232	2917793
diff		337444.4	1180903		-2055292	2730180

Notes. diff = mean(0) - mean(1); t = 0.2858; Ho: diff = 0; degrees of freedom = 37; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.6117; Pr(|T| > |t|) = 0.7767; Pr(T > t) = 0.3883

Source: Author's computation

2. Land by social networks

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	3	1970	641.2748	1110.72	-789.1826	4729.183
1	38	4063.684	757.0956	4667.051	2529.663	5597.706
combined	41	3910.488	707.3509	4529.255	2480.878	5340.097
diff		-2093.684	2730.325		-7616.289	3428.92

Notes. diff = mean(0) - mean(1); t = -0.7668; Ho: diff = 0; degrees of freedom = 39; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.2239; Pr(|T| > |t|) = 0.4478; Pr(T > t) = 0.7761

Source: Author's computation

3. Cattle by social networks

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	3	1	1	1.732051	-3.302653	5.302653
1	39	.7179487	.2407498	1.503482	.2305762	1.205321
combined	42	.7380952	.2312907	1.498935	.2709942	1.205196
diff		.2820513	.9081413		-1.553371	2.117473

Notes. diff = mean(0) - mean(1); t = 0.3106; Ho: diff = 0; degrees of freedom =40; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.6211; Pr(|T| > |t|) = 0.7577; Pr(T > t) = 0.3789

Source: Author's computation

4. Income by education

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	4	1960500	232006.3	464012.6	1222152	2698848
1	35	2326000	345530.5	2044186	1623798	3028202
combined	39	2288513	310848.7	1941250	1659232	2917793
diff		-365500	1036602		-2465856	1734856

Notes. diff = mean(0) - mean(1); t = -0.3526; Ho: diff = 0; degrees of freedom = 37; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.3632; Pr(|T| > |t|) = 0.7264; Pr(T > t) = 0.6368

Source: Author's computation

5. Land by education

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	4	7035	4226.12	8452.24	-6414.401	20484.4
1	37	3572.703	650.1173	3954.509	2254.204	4891.202
combined	41	3910.488	707.3509	4529.255	2480.878	5340.097
diff		3462.297	2349.749		-1290.519	8215.113

Notes. diff = mean(0) - mean(1); t = 1.4735; Ho: diff = 0; degrees of freedom = 39; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.9257; Pr(|T| > |t|) = 0.1486; Pr(T > t) = 0.074

Source: Author's computation

6. Cattle by education

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	4	0	0	0	0	0
1	38	.8157895	.2525975	1.557116	.3039783	1.327601
combined	42	.7380952	.2312907	1.498935	.2709942	1.205196
diff		-.8157895	.7872172		-2.406815	.7752358

Notes: diff = mean(0) - mean(1); t = -1.0363; Ho: diff = 0; degrees of freedom = 40; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.1531; Pr(|T| > |t|) = 0.3063; Pr(T > t) = 0.8469

Source: Author's computation

7. Age by Y

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	9	52	3.064129	9.192388	44.9341	59.0659
1	33	56	2.534609	14.56022	50.83717	61.16283
combined	42	55.14286	2.097111	13.59084	50.90765	59.37806
diff		4	5.135537		-14.37931	6.379307

Notes. diff = mean(0) - mean(1); t = -0.7789; Ho: diff = 0; degrees of freedom = 40; Ha: diff < 0; Ha: diff != 0 ; Ha: diff > 0;Pr(T < t) = 0.2203; Pr(|T| > |t|) = 0.4406; Pr(T > t) = 0.7797

Source: Author's computation

8. Age by social networks

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	3	48.66667	3.179797	5.507571	34.9851	62.34823
1	39	55.64103	2.231079	13.93309	51.12444	60.15761
combined	42	55.14286	2.097111	13.59084	50.90765	59.37806
diff		-6.974359	8.169949		-23.48644	9.537723

Notes. diff = mean(0) - mean(1); t = -0.8537; Ho: diff = 0; degrees of freedom = 40; Ha: diff < 0 Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.1992; Pr(|T| > |t|) = 0.3984; Pr(T > t) = 0.8008

Source: Author's computation

9. Age by livestock

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	14	57.71429	4.578292	17.1304	47.82349	67.60508
1	28	53.85714	2.188059	11.57812	49.36762	58.34667
combined	42	55.14286	2.097111	13.59084	50.90765	59.37806
diff		3.857143	4.462428		-5.161761	12.87605

Notes. diff = mean(0) - mean(1); t = 0.8644; Ho: diff = 0; degrees of freedom = 40; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.8037; Pr(|T| > |t|) = 0.3925; Pr(T > t) = 0.1963

Source: Author's computation

10. Age by side jobs

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	9	57.77778	6.851151	20.55345	41.97899	73.57656
1	22	52.36364	2.39728	11.24424	47.37822	57.34905
combined	31	53.93548	2.586539	14.40124	48.65307	59.2179
diff		5.414141	5.707884		-6.259793	17.08808

Notes. diff = mean(0) - mean(1); t = 0.9485; Ho: diff = 0; degrees of freedom = 29; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.8247; Pr(|T| > |t|) = 0.3507; Pr(T > t) = 0.1753

Source: Author's computation

11. Age by education

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	4	46	10.68488	21.36976	11.99594	80.00406
1	38	56.10526	2.036924	12.55644	51.97806	60.23246
combined	42	55.14286	2.097111	13.59084	50.90765	59.37806
diff		-10.10526	7.054188		24.36231	4.151782

Notes. diff = mean(0) - mean(1); t = -1.4325; Ho: diff = 0; degrees of freedom = 40; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.0799; Pr(|T| > |t|) = 0.1598; Pr(T > t) = 0.9201

Source: Author's computation

Appendix B

T-Test of Different Variables than Continuing or Abandoning, Chapter 5

Considering livestock possession and the land size of farmers, results shown in the following table and graph affirm the existence of a significant statistical difference in land size between households which have livestock and households which do not. Those which do not have livestock tend to have larger land size, mainly used for farming, while those households which have livestock tend to have a lower mean of land size. Many households expressed different ways of family collaboration in order to improve their livelihood strategies, where both men and women work on and off the farm. Possession of these two assets are very much desired by farmers who are conscious of the importance of diversifying their livelihood strategies, but certain limitations, like lack of skills and opportunities for work may constrain their diversification options.

Two-sample T Test with Equal Variances

Land Size for Those Having Livestock or Not

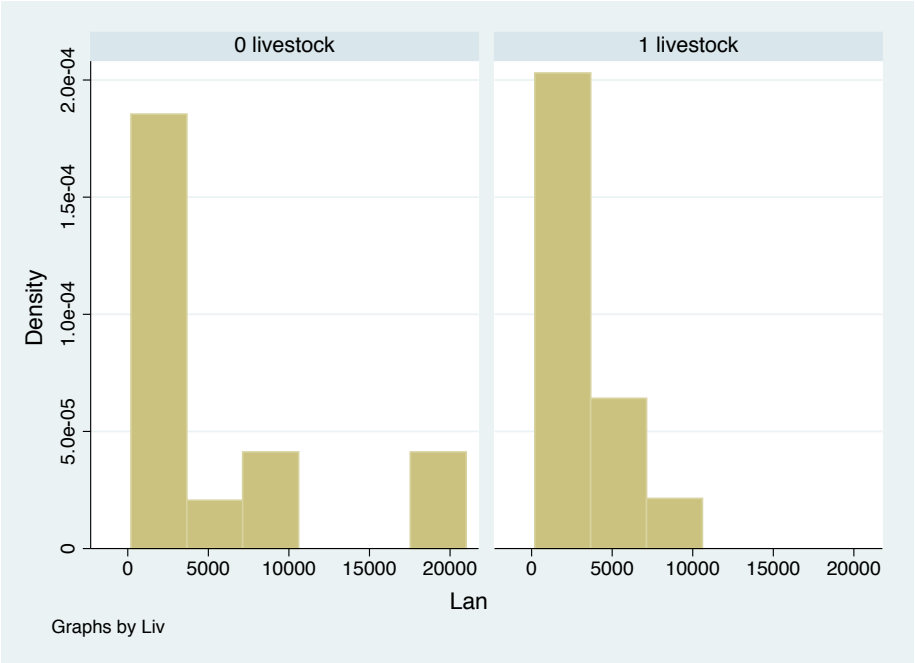
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	14	5883.571	1834.346	6863.493	1920.709	9846.434
1	27	2887.407	422.6573	2196.192	2018.623	3756.192
combined	41	3910.488	707.3509	4529.255	2480.878	5340.097
diff		2996.164	1432.464		98.73135	5893.597

Notes. diff = mean(0) - mean(1); t = 2.0916; Ho: diff = 0; degrees of freedom = 39; Ha: diff < 0; Ha: diff != 0 ; Ha: diff > 0; Pr(T < t) = 0.9785; Pr(|T| > |t|) = 0.0430; Pr(T > t) = 0.0215

Source: Author's computation

Two-sample T Test with Equal Variances

Land Size for Those Having Livestock or Not



Source: Author's computation

According to the results of following table and graph there is significant statistical difference in land size between households which have other jobs and households which do not. Those which have a side job have a lower mean of land size than those who do not have side jobs. Oftentimes limitations of land size oblige farmers to find other strategies for living such as side jobs. In Suntenjaya, these jobs may be getting wood to be sold in the market, and others that require certain skills or assets, like running a food shop, driving a small bus, delivering vegetables to the main town, and bringing products to re-sell like rice or gasoline. Regarding this point, one of the farmers said, "We have no education or a very low one, so even if we try to get a job in Lembang it is difficult, and usually we can only work for very low positions. We want our children and the youth to have more opportunities than us. Some

of the young people leave this village to go to Lembang or Bandung, but many others stay here farming" (male farmer, 51 years old).

Two-sample T Test with Equal Variances

Land Size for Those Having Side Jobs or Not

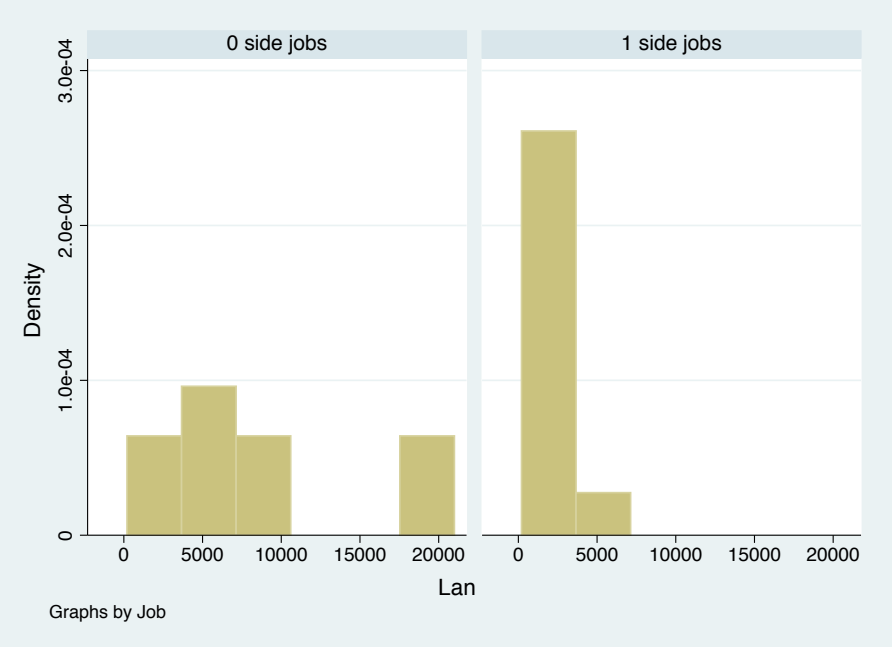
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	9	8803.333	2341.091	7023.272	3404.769	14201.9
1	21	1926.19	269.1968	1233.615	1364.656	2487.725
combined	30	3989.333	911.6147	4993.119	2124.872	5853.795
diff		6877.143	1552.277		3697.448	10056.84

Notes. diff = mean(0) - mean(1); t = 4.4304; Ho: diff = 0; degrees of freedom = 28; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.9999; Pr(|T| > |t|) = 0.0001; Pr(T > t) = 0.0001

Source: Author's computation

Two-sample T Test with Equal Variances

Land Size for Those Having Side Jobs or Not



Source: Author's computation

Appendix C

Main Problems and Recommendations Highlighted by PES Farmers, Chapter 5

Problems of current PES	Recommendations
• Infrequent communication • Farmers' financial necessities • Lost production • Unstable coffee price • Marketing coffee is difficult • At times coffee tree must be cut because it covers land for vegetables • Lack of awareness about the environment • Lack of earnings/capital • Lack of environmental conservation techniques • Rigid attitude of some farmers to quit the program • Lack of help • Villagers trash thrown to the rivers • Community lack tools to practice agriculture • Lack of manuals	• Government assistance to PES • Government assistance to cooperatives • The provision of a peeling and processing coffee beans machine and other necessary goods • Promotion of marketing knowledge • The cultivation of different species that could contribute to the environment and also to households' livelihood, like orange trees • Door to door informative talks • More funding and more participation from companies to promote PES • Help to old farmers or women • More information about PES spread widely • Provision and management of coffee beans and seedlings • Spread successful examples to convince people to join the program • Training from Regional Environmental Management Agency (BPLHD- *Badan Pengelolaan Lingkungan Hidup*), from West Java

Note. Thoughts provided by 5 PES farmers (male 40 years old; male 42 years old; male 52 years old; male 54 years old; male 76 years old)

Source: Author's fieldwork

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