



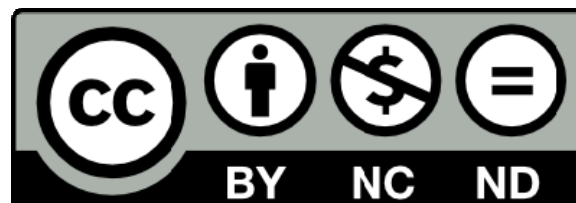
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Diswandi Diswandi (2017) A hybrid coasean and pigouvian approach to payment for ecosystem services program in West Lombok: Does it contribute to poverty alleviation? Ecosystem Services, 23 . pp. 138-145.

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A Hybrid Coasean and Pigouvian Approach to Payment for Ecosystem Services Program in West Lombok: does it contribute to poverty alleviation?

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A B S T R A C T

The Payment for Ecosystem Services (PES) concept is mainly based on Coasean economics theory that emphasizes the creation of a voluntary or market-based transaction for ecosystem services. Alternatively, many PES practiced in developing countries are based on Pigouvian economic theory allowing government intervention such as through regulation, tax or subsidy. A hybrid PES approach that compound Coasean and Pigouvian theory was developed in West Lombok Indonesia leading to a new policy paradigm that combines elements of both a voluntary market-based and mandatory policy-based system. This study aims to assess how the hybrid PES program contributes to poverty alleviation. By employing a participatory econometrics approach, this study found that the hybrid PES system does not contribute to poverty alleviation in short-term. It is possible that this PES program contributes to poverty alleviation in long-term.

Keywords: PES, ecosystem services, community forestry, poverty alleviation, participatory econometrics approach

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1. Introduction

Natural resources use frequently creates both positive and negative externalities that affect people differentially. Externalities are defined as external benefits or costs to some people that emerge as a result of others' activity (van den Bergh, 2010). Externalities can be positive if they come as benefits and can be negative if they come as costs for the affected parties. A simple example of a positive externality is that people can enjoy free clean and fresh air as a result of trees planted by other land-owners. On the other hand, unpleasant air as

a consequence of the existence of a nearby chicken farm could be an example of a negative externality. Positive externalities are not likely to be the subject of contestation since the affected parties benefit from their existence. By contrast, negative externalities are often an issue of interest since their existence is likely to raise problems for those that are affected, and may ultimately result in disregard or damage to the natural resource itself.

To promote natural resources sustainability by reducing negative externalities, a relatively new paradigm has been developed into a new policy instrument, namely Payment for Ecosystem Services (PES). Ecosystem services can be defined as the tangible and intangible ecological components, the benefits of which are enjoyed by people directly or indirectly (Costanza et al., 1997; MA, 2003; Boyd & Banzhaf, 2007; Fisher et al., 2009). Examples of ecosystem services include carbon sequestration, biodiversity conservation, watershed protection, and landscape beauty (Ferraro, 2001; Wunder, 2005). These are commonly categorized as public goods or quasi-public goods and typically are free to consume. However, the emerging scarcity of these resources causes them to become economic goods with the requirement to be managed and potential to be commercialized (Wunder, 2005).

In mainstream PES literature, PES is defined as a transaction based on mutual principles of buying and selling where a well-defined ecosystem service is bought by service beneficiaries from service providers with a condition that the providers continue to conserve the resource in order to secure the service provision (Wunder, 2005; Pagiola, 2007; Wunder, 2007; Sommerville et al., 2009). PES is often implemented as a program to support natural resources restoration and conservation. As Muradian et al. (2010, p. 1205) argue, “PES aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources”.

The terms ecosystem services and environmental services are often used interchangeably in academic and public policy literatures (Muradian et al., 2010) although there is inconsistency among scientists in the use of these terms (Derissen & Latacz-Lohmann, 2013). The term ecosystem services is used in this paper since it is the most commonly used in literatures because the definition of environmental services tends to be more ambiguous (Derissen & Latacz-Lohmann, 2013).

The concept of ecosystem services can be traced back to 1864 when Marsh wrote about the significant role of nature in human life (Marsh, 1864). More than a century later, concern about the unregulated use of ecosystem services continues to raise scholars' attention. For instance, in the late 1960s King *et al.* (as cited in Gómez-Baggethun et al.

(2010)) published on the functions of nature in serving human needs. Throughout the 1970s and 1980s, scholars focused on people's dependence on the environment and the concomitant economic impacts, thus raising greater public interest in environmental protection and biodiversity conservation (Westman, 1977; Pimentel et al., 1980; Ehrlich & Ehrlich, 1981; Costanza et al., 1997). A paper presented by Costanza et al. in 1997 was a landmark in the development of the concept and awareness of ecosystem services. The concept of ecosystem services started to be employed in the policy arena in the late 1990s and early 2000s (Gómez-Baggethun et al., 2010).

Pagiola (2008) points out that Costa Rica's country-wide program, called *Pago por Servicios Ambientales* (PSA), in 1997 was the first full-scale implementation of the formal PES mechanism in a developing country. The PSA was developed to address the problem of deforestation when Costa Rica had become widely known as having one of the highest deforestation rates at the time¹. As the best-known PES example (Pattanayak & Wunder, 2010), Costa Rica's PSA program succeeded in raising the interest of many countries in introducing PES programs as a tool for ecosystem protection including Brazil, Mexico, Colombia, Bolivia, Ecuador, China, and Indonesia. Further impetus came when the Kyoto Protocol established the Reducing Emission from Deforestation and Forest Degradation (REDD) program as a possible vehicle to articulate international PES schemes in the forestry sector.

Currently, there are four major types of ecosystem protection schemes operating globally using PES approaches (Wunder *et al.*, 2008; 2011; Greiner *et al.*, 2009; Engel and Palmer, 2008):

1. Carbon sequestration and storage (e.g. an electricity company pays farmers or landowners for planting and maintaining additional trees). The REDD program is another example of this PES type which aims to compensate the effort of land owners in reducing carbon emissions from deforestation and forest degradation (van Wilgen et al., 1998; Agrawal et al., 2011; Venter & Koh, 2012);
2. Biodiversity protection (e.g. conservation donors paying local people for restoring areas to create a biological corridor);
3. Watershed protection (e.g. downstream water consumers paying upstream forest users for adopting land management that controls deforestation, soil erosion, flooding risk, etc.);

¹ Costa Rica's deforestation rate between 1973 and 1989 had an average logging rate of 32,000 hectares/year (Brown & Bird, 2010).

4. Landscape amenity (e.g. a tourism operator pays a local community for maintaining landscape beauty or not hunting in a forest being used for ecotourism).

The PES schemes that have been introduced world-wide often employ voluntary market-based PES (Pagiola, 2008; Wunder & Albán, 2008; Zhang et al., 2008; Greiner et al., 2009; Prasetyo et al., 2009; Clements et al., 2010; Matthew et al., 2010; Pereira, 2010; Milne & Adams, 2012). Most of the buyers come from the private sector, and the sellers are farmers located in the areas where the ecosystem services are sourced. Both parties contract to make voluntary transactions of certain ecosystem services (mostly related to water quantity and quality).

Since high levels of poverty are often spatially correlated with remote conservation areas that provide environmental services (Pagiola et al., 2005), it is argued that PES can be used as a tool for poverty alleviation (Duncan, 2006; Pagiola, 2007; Wunder & Albán, 2008). However, the reality of the impact of PES programs on the livelihoods of poor households is an empirical question. Muradian et al. (2010) argue that the poverty alleviation goals of PES programs are hard to be achieved in some cases due to the misdistribution of PES benefits that should go to the poor. They stressed that benefits were often disproportionately distributed to the well-off landowners who hold formal land tenure. Similarly, Pagiola et al. (2005) contend that PES has primarily been an instrument for maintaining natural resource efficiency and not for poverty alleviation. They argue that “PES programs are not a magic bullet for poverty reduction, but there can be important synergies when program design is well thought out and local conditions are favorable” (Pagiola et al., 2005, p. 248). How effective of a PES program in improving the community members’ livelihoods, and hence alleviating poverty in rural areas that supply environmental services is an open question that this study intends to address.

The remainder of this paper is organized as follows. Section 2 describes the methodology used in the study. Section 3 discusses the concept of Coasean and Pigouvian approach on PES programs, PES program introduction in West Lombok including how the program integrated into a community forest practice, the payment system and the role of intermediary. The results of this study including qualitative survey result and econometrics analysis are presented in section 4. Finally, section 5 provides the conclusions of this study.

2. Methodology

This study was conducted in Sesaot Community Forest in West Lombok, Indonesia. This forest is important for water supply to the most area of Lombok Island. Households and industries in two districts --Mataram City and West Lombok-- use water from this forest for their daily needs. The Sesaot forest also supplies water for agricultural land in these districts as well as to two other districts, Central Lombok and East Lombok. The Sesaot forest is a pilot for a community forest management scheme in Lombok, where the PES program has also been introduced (see figure 1).

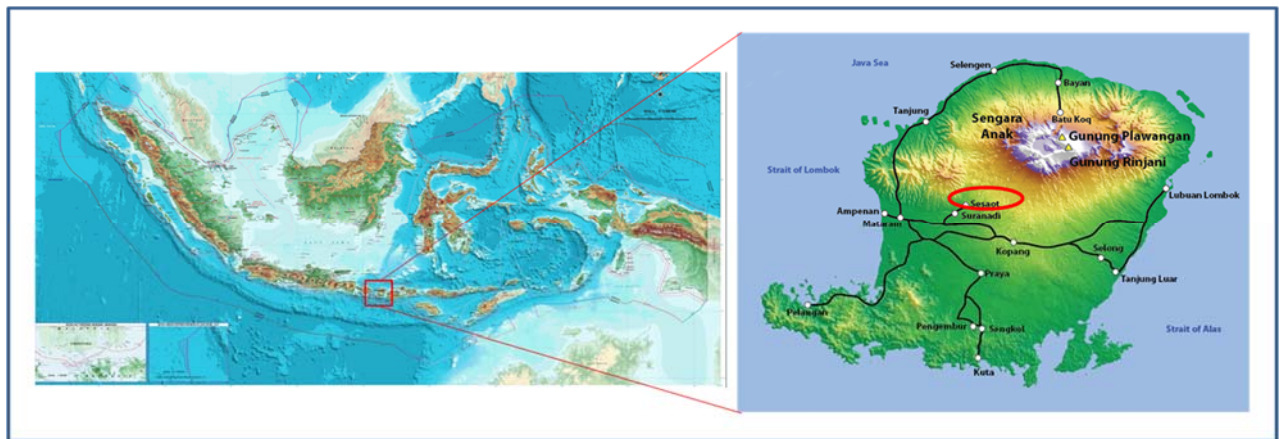


Figure 1. Map of Lombok Island (Lemhanas, 2013)

A mixed research method was used in this study. Mix method is able to minimize the weakness of solely quantitative and qualitative methods (Rao & Woolcock, 2003; Creswell & Plano-Clark, 2006). Integrated quantitative and qualitative method provides more comprehensive evaluation and evidence for a development program such as the PES (Rao & Woolcock, 2003; Creswell & Plano-Clark, 2006). Following Rao and Woolcock (2003), the mixed method approach used in this study was “participatory econometrics”. The participatory econometric approach accommodated certain steps in sequence: (1) in-depth interviews to obtain a grounded understanding of the PES issue; (2) survey instruments based on understandings developed from the interviews and field visits; (3) hypotheses derived from qualitative work that was then tested using survey data.

Thus, there are variety sources of data for this study: (1) documents: legal documents, reports, and contracts between the PES intermediary agency (IMP) and farmers' groups; (2) maps, (3) interviews; (4) surveys. These data were collected through conducting two rounds of fieldwork in West Lombok. The first fieldwork was carried out in May–June 2014, and a second fieldwork period in January – May 2015. The first fieldwork aimed to generate deep information related to PES development and practice; the second fieldwork aimed to clarify the results from the first stage as well as to generate data from the survey and further observation. This multiple data collection technique allowed the researcher to perform triangulation (Burns, 1997) to cross check, compare and contrast data among several different sources.

Personal semi-structured interviews were conducted in the first stage of fieldwork with 22 different informants including PES initiators, a water services officer, forest service agency officers, a regional development plan agency officer, a regional environmental sector officer, a local council, NGOs activists, academics, the PES program management (IMP) officers and local community leaders. In addition to the interviews, a focus group discussion was conducted with IMP officers to obtain broader information about their experience in managing the PES scheme. Field visits to the villages were also conducted to obtain grounded information about PES practice in the field.

The results from the first fieldwork stage were then used to develop a survey instrument (questionnaire). These surveys were conducted during the second period of fieldwork by visiting six villages where PES funds were distributed. The surveys aimed to elaborate forest farmer experience on PES practice in their community forest area including the impact of PES on the economy in the villages.

Respondents for the surveys were 200 forest farmer households that were selected using a purposive random sampling technique (Bryman, 2015). All respondents were classified into two difference groups. The first group consisted of 100 households that were randomly selected from those who were already enrolled in the PES program. The second group consisted of another 100 households that were selected from those who are not enrolled in the PES program. This technique was used to generate comparable data among respondents in relation to their experience with the PES program. Every survey question in the survey related to PES practice was closed and paired with an open-ended question in order to generate qualitative data to support the quantitative response. A focus group

discussion (FGD) with community forest leaders was also performed in the second fieldwork. In addition, the researcher obtained an opportunity to attend a community forest farmer group (CFFG) meeting and workshop on PES related issues, which was organized by a local NGO.

3. Discussion

3.1. Coasean and Pigouvian approach to Payment for Ecosystem Services

Coasean economics is the primary conceptual basis of the PES approach (Muradian et al., 2010; Sattler & Matzdorf, 2013). The Coasean theorem is based on the assumption that the problem of externalities can be solved through direct negotiation among related parties who cause and/or are affected by the externality, regardless of the allocation of property rights (Coase, 1960; Engel et al., 2008; Sattler & Matzdorf, 2013). In his influential article “The Problem of Social Cost”, Coase (1960) challenged Pigou’s approach in “The Economics of Welfare” to solving the problem of externalities.

Pigou (1932) argued that negative externality generates a social cost that should be dealt with by government. He proposed a system of tax, which is well known as “Pigovian tax”, for resolving the social cost problem. Pigou’s solution implies market failure and asserts that government authority is needed to correct the market so that an appropriate level of compensation for externalities would emerge (Yandle, 1997). Yandle (1997) argue that the Pigovian approach is likely to be more appropriate, and is to be applied in large-scale cases, where there are a lot of parties included in the system, and where it is too difficult to rely on contracts and market solutions.

On the other hand, instead of taxing or subsidizing the parties who cause externalities - to reduce or stop their harmful activity - Coasean economics suggests market and quasi-market transactions can achieve a socially optimal level of environmental externalities. Coase argued that those who produce externalities and those who suffer from them should be left in an unregulated situation without government intervention (such as Pigovian taxes or subsidies) and that a transaction process will eventually be developed automatically regardless of who holds the property rights (Turner, 1994). However, Sattler and Matzdorf (2013) argue that in practice, the Coasean solution faces some obstacles regarding efficient bargaining, in particular, high transaction costs, power imbalances, and poorly defined property rights. Thus the Coasean solution itself required a clear definition and allocation of property rights (guaranteed ownership of resources via the force of state law) and low

transaction costs, similarly requiring state intervention (Turner, 1994; Muradian et al., 2010).

Table 1 summaries PES practices in some countries that based on Coasean and Pigouvian approach.

Table 1. Summary of PES Schemes

Country, Case	Environmental Service	Actions Paid	Buyer	Seller	Approach	Reference
Costa Rica, Pago for Servicios Ambientales (PSA).	Water	Timber plantation and forest conservation	Hydroelectric power producers , bottlers, municipal water supplier, irrigation water users and hotels	Private land holders in watershed areas	Coasean	(Pagiola, 2008)
China, Sloping Land Conservation Program (SLCP)	Water	Conversion of cropland to forest or grassland	China Central Government	Rural farmer households	Pigouvian	(Zhang et al., 2008)
Madagascar, PES for biodiversity conservation in Menabe.	Biodiversity	Good forest governance	Durrel Community members	Rural Communities	Coasean	(Matthew et al., 2010)
Cambodia, Payment for Biodiversity Protection.	Biodiversity	Forest and biodiversity protection	Communities	Villagers within the boundary of protected area	Coasean	(Clement, 2010; Milne & Adams, 2012)
Indonesia, Payment for Water Services in Lombok.	Water	Watershed protection	Piped water consumers	Forest users	Coasean and Pigouvian	(Prasetyo et al., 2009)
Indonesia, Payment for hydrological system protection in Balikpapan.	Water	Forest protection	Local government and State Owned Oil refinery Company (Pertamina)	Managers of <i>Sungai Wain</i> Protection Forest (BP HLSW)	Pigouvian	(Prasetyo et al., 2009)
Mexico, Payment for Hydrological Environmental Services.	Water	Forest Conservation	State forest agency	Communal and individual land owners	Pigouvian	(Wunder et al., 2008)
Brazil, Bolsa Floresta Program.	Carbon sequestration	Carbon emission reduction through forest conservation	Government and private sector	Communities living in the Amazon	Pigouvian	(Pereira, 2010)
Australia,	Landscape,	Savannas	Government	People living	Pigouvian	(Greiner et

Country, Case	Environmental Service	Actions Paid	Buyer	Seller	Approach	Reference
payment for tropical savannas protection.	habitats and biodiversity	protection		in tropical savannas		al., 2009)

In summary, in a Coasean style PES, the beneficiaries of environmental services make a direct payment to the environmental services provider based on a mutually agreed voluntary negotiated procedure. By contrast, in a Pigovian style PES, the government undertakes an intervention such as by providing a subsidy to pay the environmental services provider in order to secure the environmental services provision (Sattler & Matzdorf, 2013). It is possible that a hybrid Coasean and Pigovian approach can lead to a new policy paradigm that combines elements of both a voluntary market-based and mandatory policy-based system. An example of the hybrid approach is the PSA program in Costa Rica considering the source of fund that combines Pigouvian and Coasean approach. The funding for this program comes from a private hydroelectric producer, tax, and the World Bank loans (Sánchez-Azofeifa & Pfaff, 2007). The PES system in West Lombok Indonesia is also a hybrid approach that is combining voluntary transaction in the supply side and government regulation in the demand side.

Pirard (2012) argues that PES in West Lombok is atypical compared to standard PES practices elsewhere with respect to the method of payment and the extent of compulsory public participation (Pirard, 2012, p. 28). Unlike other PES practices, the PES program in West Lombok has been officially mandated through a local government regulation, which is in line with Pigouvian approach. According to the regulation, anyone who utilizes the specified ecosystem services is obliged to pay a PES levy. This compulsory approach cannot meet the voluntary transaction criteria of PES that is proposed by Wunder (2005)² that has been a mainstream assumption of the PES literature. A new expanded concept of PES is required to encompass mandatory PES approaches that employ public policy in their implementation (Pirard, 2012). In this hybrid PES approach, Pigouvian approach is used in demand side to enforce mandatory participation from water consumers to pay for the PES

² Wunder (2005, p. 9) uses five criteria to describe PES principles: “A PES is: (1) a voluntary transaction where (2) a well-defined environmental service (3) is being ‘bought’ by a (minimum one) environmental services buyer (4) from a (minimum one) environmental services provider (5) if and only if the environmental services provider secures the environmental services provision (conditionality).”

levy. Meanwhile, on the supply side, Coasean approach is used to encourage voluntary participation from forest farmers to enrol into the PES program.

3.2. The PES Program introduction in West Lombok

The PES program was introduced as a response to the threat of water shortages in Lombok. The economic disparity between communities who managed forests in rural areas and those who consume water in urban areas evokes a conflict of interest related to forest governance. The poor villagers who live in areas surrounding Rinjani forest are encouraged to take part in the protection of the forest, which conflicts with their economic dependence on forest land. Meanwhile, the relatively prosperous communities in urban areas need water and are thus dependent on effective governance of the forest. The provincial government of West Nusa Tenggara could address the conflict of interest by implementing a conservation program which includes empowerment and livelihood benefits for villagers for a 'win-win' solution for both parties. This is, however, beyond the fiscal capacity of the local government. Limited government budgets for forest conservation motivated several NGOs and academics in Lombok to propose a scheme which encourages urban water consumers to participate in collective contributions for funding the conservation of water catchment areas through a PES program (RH, NGO officer, and PB, academic, interview, 6/6/2014, and 7/6/2014).

The ecosystem services concept was initially introduced in 2004 in urban areas. At the same time, institutional strengthening of rural communities through community organizing and capacity building was also conducted. Furthermore, widespread dissemination of information on ecosystem service initiatives was organized, locally and nationally. Following this, a trial of PES collection from tap water consumers (*PDAM* consumers) in East Mataram, a sub-district in the city of Mataram, was carried out and achieved positive responses from the participants (IMP, FGD, 4/6/2014).

Due to the complexities and scale of the water conservation issue, a mandatory PES scheme was proposed that is enforced through local government regulation. This is to ensure that all water consumers contribute to the PES program. The West Lombok Regional Government Regulation (*Peraturan Daerah, Perda*) number 4/2007 was enacted in 2007 as the fundamental basis of the official PES program. This policy regulates the scheme of payment for any individual and commercial use of water resources. The payment will be used for forest protection especially for the conservation of the water catchment area. This type of

PES practice is similar to PES practice in Vietnam (Suhardiman et al., 2013) that also driven by government regulation and intervention which is in-line with the Pigouvian approach.

Two years after the *Perda 4/2007* was enacted, it had still not been implemented, however. Although the program received positive responses when a trial was firstly introduced, resistance arose from some parties who argued that people should not have to pay for the provision of ecosystem services. To address this problem, advocacy was carried out through the *PDAM* consumers' association as the representative of all water consumers. Water consumers were educated about the importance of forests for maintaining a sustainable water supply. To avoid more resistance from the water consumers, water quantity and quality were enhanced by developing a new source for water extraction. This effort was conducted in order to demonstrate that a sustainable water supply is the result of good forest governance (SA, forestry agency officer, interview, 7/6/2014). To encourage a better awareness of people on the importance of PES development, campaigns on PES were mounted through various media, as well as through discussion forums. The *Perda 4/2007* was finally implemented in 2009, four years after the PES scheme was introduced.

3.3.A multi-stakeholder entity to manage PES

Since it is difficult to equalize the interests of heterogeneous sellers and buyers of ecosystem services in the case of PES program in West Lombok, a trusted independent body that takes a role as mediator and manager of the PES scheme is needed to oversee the program. One key success of PES programs in several countries, among other things, is the involvement of intermediaries (Vatn, 2010; Sattler et al., 2013). As argued by Huber-Stearns et al. (2013), such an intermediary body is necessary for effective PES application. Intermediary bodies play significant roles as agents of information exchange among related stakeholders, program designers, through representation and mediation among buyers, sellers and other participants, as well as providing administration and project coordination (Huber-Stearns et al., 2013). They also may act to control, monitor and verify the ecosystem services delivery (Sattler et al., 2013).

In Lombok an entity called *Institusi Multi Pihak (IMP)* was formed (WK, member of *IMP*, interview, 11/6/2014) to act as intermediary. The IMP is officially working in coordination with the West Lombok government that established the entity. The West Lombok Regent's decree (*Keputusan Bupati* number 1072/207/Dishut/2009) appointed the

IMP as an independent entity to manage the PES program. The *IMP* consists of representatives from relevant government departments, business, civil society, NGOs, academics and the *PDAM* consumers association, who are chosen by the Regent based on their experience and strategic positions.

Many challenges are faced by the *IMP* in managing the PES program. The most significant one is to obtain public trust in relation to fund management (WK, member of *IMP*, FGD, 4/6/2014). To achieve public trust on the demand side among consumers, efforts have been undertaken including a massive campaign through mass media and direct meetings with communities. To maintain accountability, an annual audited financial report is published in the local media. On the supply side, *IMP* also has to be able to advocate upstream communities that the PES payment is supposed to be used for forest and watershed conservation. In this regard, participatory monitoring and evaluation in upstream areas are done to ensure that PES terms and conditions have been followed.

3.4. Unfairness of the ecosystem service price

Setting up a system to collect the payments was a challenge for the introduction of the PES scheme in West Lombok. Fauzi and Anna (2013) argue that fiscal regulations for water charges in Indonesia are conflicting. Indonesian law no 28/2009 stated that government is able to charge for surface water and deep water. On the other hand, law no 7/2004 regulates that water used for basic needs and agricultural purposes is free of charge (Fauzi & Anna, 2013). There are two official schemes for collecting money from the public in Indonesia - through tax and levy - the levy scheme was chosen for PES payment in West Lombok and the tap water company (*PDAM*) company was appointed to act as the collector of the payment.

The rate of payment that is collected from water users was designed to be a flat fee across all households. Every household pays Rp 1,000 (equal to about US\$ 0.08) per month regardless of their water consumption. Thus, there is no distinction between the rich and the poor; all consumers pay the same amount regardless of their economic condition. This situation contrast from the criteria of fairness since people who consume high volumes of water are paying the same as those who consume less, and neither need nor disincentives to waste were central considerations in designing the scheme. The purpose of this flat rate is to simplify the scheme and to reduce the resistance from all water users (PB, academics, interview, 7/6/2014). In addition, the initial aim of the program was to build awareness among urban consumers about the necessity for forest protection. It is possible, however, to

increase the rate in the future once this program is well established (WK, a member of *IMP*, FGD, 4/6/2014).

Under this PES scheme, industries pay double the rate of households regardless of how much water they use. This situation also seems inequitable, since big industries such as hotels that use a lot of water are paying the same amount as small shops, and are paying little more than household consumers. The application of the PES would be more efficient if the amount charged was determined in accordance with the volume of water used, according to an academic (PB, academic, interview, 7/6/2014). Ninety-four percent of the total water supply from *PDAM* is consumed by households, while industries only consumed six percent (*PDAM Giri Menang*, 2014). Instead of using water from *PDAM*, the vast majority of industries in Lombok extract water directly from underground water sources. Despite the fact that underground water provision is also influenced by the existence of forests on the island, industries refuse to pay the PES levy due to an underground water extraction tax that has been charged by the local government.

3.5. Integrating PES and Community Forestry Program

Since the PES program was designed to conserve the forest as well as to reduce poverty, an alternative way to achieve this goal is by integrating PES into community forestry practice. Thus, the Community Forest Farmer Groups (CFFGs) who manage the forest in the water catchment area are identified as the ecosystem service providers. The application of the PES was then adapted to suit the community forestry practice. In practicing community forestry, CFFGs plant multipurpose trees species (MPTS), trees that are able to produce economic and ecological benefit in their lifetime, for example, durian, mangosteen and candlenut. The PES payment is then used for funding MPTS and timber tree planting at the community forestry location. Such in-kind payment that suits the needs of forest farmers tends to be accepted more easily and could stimulate more participation, as experienced in Western Mexico (Balderas Torres et al., 2013).

The Coasean approach works on the supply side, allowing voluntary transaction mechanism occurs between *IMP* and CFFGs. The PES program gained positive responses from CFFGs although the current PES funding is only sufficient to cover the costs of conservation activities. Based on interviews with farmers, they cannot afford to buy seeds to

be planted on community forest land, which is debatable since the price of seed is only 2.5% of their income (survey data, 2015). The PES program that over free seed is easily accepted by the CFFGs. Since the amount of available funds provided is limited, the CFFGs compete to enroll to the PES program and not all CFFGs can be involved. Some of them have to wait their turn until the PES fund is enough to fund their PES proposal.

4. Result

4.1. Farmers Opinions on the Contribution of PES on Poverty Alleviation

The PES program in West Lombok is integrated with community forestry in order to help farmers obtain free seeds, which is mainly MPTS that are supposed to provide economic benefit and thus contribute to poverty reduction. However, since the amount of funds provided is relatively small, it can only be used for additional capital for managing the community forest. Nonetheless, Fauzi and Anna (2013) argue that PES has been readily accepted by local people since it adopts a policy that is very different from the command and control system of natural resources management that previously applied under Indonesia's New Order regime.

It is difficult to argue that PES will be able to solve poverty problems in the short term. Since most of the planted trees are categorized as MPTS, it can be assumed that more benefits will be enjoyed in the long term once they are ready to be harvested (RN, personal communication, 10 June 2014). My survey results indicate that 64% of respondents think that PES improves a farmer family's quality of life. There is a possibility that their incomes will increase in the future once the seeds that have been bought from the PES fund, which are MPTS, have grown and produce fruits that may serve as a source of income (RN, community leader, interview, 10/6/2014). They do not get paid for planting the trees since their CFFG agreed to allocate the planting wage for buying more seeds so that more trees can be planted and more future economic benefits could be achieved. On the other hand, 18% of respondents disagree that PES improves their family's quality of life. The main reason is that the trees are not fully grown and have not yet produced yields. Furthermore, they explained that the number of seeds is limited and not adequate for their needs. Furthermore, not all forest farmers are involved in the PES program due to the limited budget as mentioned above. Others have just started to become involved in the PES program, and except for free seeds, have not yet obtained a direct economic benefit.

The survey indicates that around 17% of respondents are neutral, which means they neither agree nor disagree with the statement that PES improves their family's quality of life. The main reason as among those who disagree is because the seeds have not yet grown. The economic benefit may be achieved in the future if the seeds grow well. There is an expectation that the PES program may reduce poverty in the future. About 83% of respondents indicated that PES could potentially support poverty alleviation after all forest farmers get involved and all the seeds have grown and are producing fruits. In such a situation, money from PES can be used for other economic activities rather than for forest conservation once the forest has been fully planted. However, for the time being, the current direct economic benefit from PES is the value of the seeds that are distributed. If the farmers have to buy the seeds using their own money, they need to spend at least Rp 11,600 (US\$ 0.87) per seed on average. The money from PES would be more beneficial if it could also be used for planting wages.

Ironically, PES funds, which are supposed to be used for conservation related activities, are also used as a source of revenue for the local government. As stipulated in *Perda 4/2007*, a quarter of the PES fund is allocated for regional government revenue and three-quarters of the collected funds are allocated to activities related to ecosystem services provisions, such as forest conservation or local people's economic empowerment initiatives. On the other hand, a large number of CFFGs that are potential participants in the PES scheme are still on a waiting list since only around ten CFFGs can be involved in any one year. This is similar to PES practice in Vietnam, where the scheme is also used as a government revenue source (Suhardiman et al., 2013). However, the type of ecosystem services in Vietnam's PES program are not clearly defined (Suhardiman et al., 2013) in contrast with the PES program in West Lombok.

4.2. Econometrics Model for Poverty Alleviation

An econometrics model was developed to support the qualitative findings of this study. This model particularly aims to estimate the impact of the hybrid PES program on poverty alleviation. The welfare of the forest farmers that manage the community forestry is considered as a proxy for poverty condition. The welfare variable is a composite variable constructed from seven components which are the physical living standards of the forest farmer that defined by Indonesian statistics agency (Riyadi et al., 2015). Indonesia Statistics Agency (BPS) publishes yearly welfare indicators to report the economic condition of the

Indonesian households. The data was collected through surveys including national social economic survey and national workforce survey. The publication reports several measurable aspects of human welfares including health and nutrition, education, employment, consumption level and patterns, housing and environment, poverty, and other social aspects (Riyadi et al., 2015).

Following the Indonesian Welfare Indicator, this study considers seven aspects to measure the welfare condition of the forest farmers in Sesaot community forest. These aspects including house ownership, house condition, electricity supply, water supply, energy for cooking, transportation facility and telecommunication facility. All aspects' score were thus compounded into a single number as a welfare index variable, using weighted average method (Nardo et al., 2005).

Welfare of community forest farmer was hypothesized to be influenced by community forestry index, property rights of the forest farmer upon the community forest, farmer involvement on PES program, farmer obedience on *adat* rule to govern the community forest, and community forest land size. Thus, the econometric model for this situation is as follow:

$$welfare = \beta_0 + \beta_1 cfind + \beta_2 pr + \beta_3 pes + \beta_4 adat + \beta_5 lgcfland + \varepsilon \quad (1)$$

The dependent variable in this model is welfare growth. This variable measures the growth of the forest farmer's welfare in two periods of time, before community forestry program was introduced in 1998 and after the program has been well established in 2015. Five independent variables are considered to influence the welfare growth. These are community forestry index (*cfind*), property rights (*pr*), farmer involvement status in PES program (*pes*), farmer obedience on *adat* rule (*adat*) and community forest land size (*lgcfland*).

Expected influence of each independent variable on the dependent variable in this model is as follow.

1. Influence of community forest index on welfare

Community forestry index refers to an index of community forestry management practice that applied by the forest farmer. This index is constructed from nine factors

that form three groups of governance indicators of community forestry. The factors including land governance, institutional governance, and business governance. A high index indicates a better community forestry practice that will possibly lead to a better economic outcome, thus a higher welfare growth.

2. Influence of property rights on welfare

Property rights of the farmer, which is indicated by the legal status of the community forestry land, will assure the security of land access for the farmer. It is likely that the more secure the access, the more confidence the farmer in managing the land, and it will thus produce a better outcome for their income and economic livelihood. A more secure the property rights could impact on a better outcome and thus produce a higher welfare growth.

3. Influence of PES on welfare

Farmer involvement in PES program will generate an economic benefit since PES program provides cash that is used by the farmers' group to buy MPTS seeds to be planted in the community forest land. The value of the seeds could be an immediate economic benefit of the PES program. Furthermore, the fruit produced by the MPTS is the most economic benefit for the farmer in the future. Thus, involvement in PES program is estimated to increase the welfare growth.

4. Influence of *adat* on welfare

Adat rule is a local customary law that is agreed and used by the CFFGs in community forestry management. Failure to follow the *adat* rule will cause the forest farmer lost their rights to manage the community forest. Thus, they will suffer an economic loss since income from community forest will be lost as well. Following the *adat* rule will ensure the safety of the rights, thus ensuring their economic benefit from the community forest. It is hypothesized that the higher the *adat* obedience, the higher the welfare growth.

5. Influence of community forestry land size on welfare

Community forestry land size was estimated to influence welfare growth in regard to the ability of the households to obtain money by farming on the community forestry land. It was assumed that the larger the land size, the more money the household can obtain, thus the higher the welfare growth.

The estimation result of the OLS regression for this model is as follow.

$$welfare = \beta_0 + \beta_1 cfind + \beta_2 pr + \beta_3 pes + \beta_4 adat + \beta_5 lgcfland + \varepsilon \quad (1)$$

$$\widehat{welfare} = 23.516 + 2.112cfind + 15.098pr + 1.248pes + 2.753adat + 12.618lgcfland$$

(2.59)** (1.37) (6.22)*** (0.59) (1.55) (2.98)**

F = 12.21***
Adj R² = 0.2198

Numbers in the bracket is t statistics

* significant at α 10%

** significant at α 5%

*** significant at α 1%

The estimation for model 1 resulting only two independent variables, property right and community forestland size, that significantly influences the welfare with confident interval 99% and 95% respectively. Meanwhile, PES and *adat* does not significantly influence the welfare. This model produces F statistic 12.21 which indicates a significant influence of all independent variables simultaneously to welfare by 99% of confidence interval. This model can to explain the variation of welfare by 21.98% which is indicated by the adjusted R² value of the model.

The next regression removes the PES variable since it has the smallest probability to influence the welfare. It thus produces model 2.

$$welfare = \beta_0 + \beta_1cfind + \beta_2pr + \beta_3adat + \beta_4lgcfland + \varepsilon \quad (2)$$

The regression result for the model 2 is as follow.

$$\widehat{welfare} = 23.864 + 2.108cfind + 15.510pr + 2.813adat + 12.856lgcfland$$

(2.63)** (1.37) (6.70)*** (1.59) (2.63)**

F = 15.22***
Adj R² = 0.2223

Numbers in the bracket is t statistics

* significant at α 10%

** significant at α 5%

*** significant at α 1%

After PES variable has been removed that resulting model 2, the community forestry index and *adat* remain insignificant to influence the welfare. Meanwhile, the property right and community forest land size still significantly influence the welfare with confident interval 99% and 95% respectively. Removing PES variable has increased the F statistic and the adjusted R².

This econometrics analysis indicates that PES program has not influenced the farmers' welfare, and thus poverty alleviation. It is an interesting finding since this condition contradicts with the PES theory and the PES program's goal.

5. Conclusion

Payment for ecosystem services (PES) is one important policy framework aimed at controlling externalities in a management of common resources such as forests. Pigou's and Coase's theories became the fundamental alternative approaches for PES development and implementation. The Coasean approach is featuring market transactions between the party which cause the negative externality and the environmental service user who suffers from it. Coase suggests that both parties negotiate without any government intervention so that an optimal level of balance can be achieved between cost and reward. On the other hand, the Pigouvian approach accommodates the involvement of government in mitigating the externalities through regulatory mechanisms, and by exercising tax or subsidy authorities. In practice, many applications of PES follow the Pigouvian approach where the buyer of the ecosystem services is the government, or the government provides cash on behalf of their citizens for rewarding the resource protection. Others PES practice employ the Coasean approach where the ecosystem services buyers are private companies or communities who voluntary transact with the ecosystem services providers. There is also a possibility for a hybrid PES system that compounds Coasean and Pigouvian approach, where market transactions are involved, and government intervenes through policy frameworks to make the PES system work.

The PES program that has been applied in West Lombok is an example of hybrid PES system that has been integrated with the community forestry management program. The PES program provides funding for planting trees in the degraded community forest in order to maintain water supplies from the forest. The hybrid PES system is designed to achieve forest conservation and poverty reduction in the rural area where ecosystem services (water) is produced. On the supply side, Coasean theory works where forest farmers tend to accept the PES program since there is an expectation for future economic benefit from planting MPTS trees that were funded from the PES program. On the demand side, Pigouvian theory works where local government intervenes through a regional regulation to enforce urban water consumers to participate in providing the PES fund.

This study argues that the hybrid PES program in West Lombok does not contribute to poverty alleviation in short term. It might be beneficial for poverty alleviation in the long term once the economic benefit from the seeds that bought using PES fund grow and produce fruits that can serve as source of income for the forest farmers.

Acknowledgments

This study was funded by The Ministry of Research, Technology and Higher Education (RISTEKDIKTI) of Republic of Indonesia and Murdoch University. This is part of a PhD thesis in the Asia Research Centre, School of Business and Governance, Murdoch University Australia, supervised by Prof. Malcolm Tull, Dr. Carol Warren and Dr. Randal Taylor. The author is grateful to the supervisors, Asia Research Centre, Murdoch University, RISTEKDIKTI, Faculty of Economics and Business University of Mataram, PDAM Giri Menang, WWF NTB, KONSEPSI NTB, IMP, Forum Kawasan and respondents of this study.

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