

# CONCEPT AND IMPLEMENTATION OF PES PROGRAM IN THE CIDANAU WATERSHED: A LESSON LEARNED FOR FUTURE ENVIRONMENTAL POLICY

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## ABSTRAK

Tulisan ini bertujuan untuk menggambarkan konsep dan pelaksanaan Pembayaran Jasa Lingkungan (PJL) di Daerah Aliran Sungai (DAS) Cidanau. Sekaligus tulisan ini memuat keberhasilan pelaksanaan PJL yang dimulai dari adopsi konsep awal. Hasil studi menunjukkan bahwa PJL mulai mendapat perhatian dari berbagai institusi, dimana PT Krakatau Tirta Industri (KTI) merupakan perusahaan pertama yang mencoba melaksanakan konsep PJL ini. Langkah utama dalam kegiatan pelaksanaan PJL adalah mempromosikan pertanian konservasi, termasuk transfer teknologi konservasi dan penanaman pohon. Pertanian konservasi menunjukkan perkembangan cukup bagus yang ditandai dengan makin banyaknya jumlah pohon yang ditanam, meningkatnya aplikasi teknologi konservasi, dan adanya harapan optimis dalam peningkatan pendapatan. Selanjutnya, PJL tidak hanya menarik minat petani yang berpartisipasi tetapi juga bagi petani yang tidak ikut berpartisipasi dalam program ini. Berdasarkan fakta tersebut, Program PJL dapat secara potensial diadopsi petani dan sekaligus memberikan solusi dalam pemecahan masalah di DAS Cidanau.

**Kata kunci :** *Daerah Aliran Sungai (DAS), Cidanau, implementasi, konsep, Pembayaran Jasa Lingkungan (PJL)*

## ABSTRACT

Objective of the paper is to depict the concept of PES (Payment for Environmental Services) and its implementation in the Cidanau Watershed. This paper is a success story of PES implementation starting from the early adoption of the concept. The study shows that PES has impressed by many institutions, which was then initiated by PT KTI (Krakatau Tirta Industri) as a pilot project of the concept implementation. The main practice of PES implementation activities was promoting conservation farming, including transfer of conservation technology and trees growing. The conservation farming showed good development, which was characterized by more trees planted, more conservation technology applied, and more optimistic expectation for income increase. Moreover, PES Program will not only attract the farmers who participated in the program, but also other farmers who were not included in it. With such promising performance, PES Program can potentially be adopted by farmers and provide solution to various problems encountered in the Cidanau Watershed.

**Key words :** *Cidanau, concept, implementation, Payment for Environmental Services (PES), watershed*

## INTRODUCTION

Currently, more serious attention has been paid to see the problem of degradation in the upstream of river in the perspective of relation between the community living in the upstream and those in downstream. The growing harmful impact felt by the community in the downstream area and those receiving benefit acquired from watershed, led to the emergence of stronger demand for improvement and conservation of the upstream. On the other hand, the community in the upstream does not or indirectly feels that its activities in the upstream can affect the community in the downstream. No incentive and disincentive mechanism is applied to make the community in the upstream aware of the impact to those in the downstream. This is regarded to be the most important causes against the failure in conservation programs in the upstream, so far.

In some other countries, the mechanism effort has been tried to develop a relation between the community in the upstream and those living in the downstream through transactional system. This relation needs to be developed in order to raise environmental concern among the communities in the upstream and downstream. It is a fact that the impact of environmental treatment by upstream community will be directly felt by the community in the downstream. The community in the upstream may not realize that unfriendly treatment on environment around them will make the community in the other stream suffer. They, therefore, have no concern about maintaining the environment, since no direct benefit they can earn. Thus, there is a need to create a mechanism that encourages the community in the upstream to maintain environment around them. In this sense, the upstream community is the provider for environmental services that should be paid by the downstream community as the receiver. The notion of the exchanged commodity is not limited only to conservation services in the upstream of river or watershed, but it can also be in the kinds of a biodiversity, carbon sequestration and landscape. The payment by downstream community to the community in the upstream for conservation they carry out is called Payment for Environmental Services (PES). In fact, such concept has been developed in early 1990 (Wunder, 2005).

Empirically, PES concept has been implemented in several countries such as Costa Rica, Mexico, Brazil, El Salvador, and the United States of America. Among the countries, Costa Rica is the country which is known as the pioneer of PES concept implementation in forestry sector. In Indonesia, PES concept was initially established in 2002, through collaboration between LP3ES (*Lembaga Penelitian, Penerangan dan Pendidikan Ekonomi dan Sosial*/Institute of Research, Information and Education of Social and Economic Affairs and IIED (International Institute for Environment and Development) in the project of Development for Transaction Mechanism of PES in the Watershed of Cidanau and Brantas, and in West Lombok Regency. PES is expected to contribute to

conservation drive made by Indonesian government since all 282 watersheds across the country are in critical condition.

One of the main activities of PES is promoting environmentally friendly farming and conservation technique, including reduction of chemical application and tree growing on farmers' lands. Implementation of the concept is deemed important to the development of sustainable farming. Therefore, it is necessary to take lessons from the movement in order to replicate the same model in other areas as to promote better farming, in terms of low externality degree without sacrificing profit orientation.

The objective of the paper is to make description on the implementation of PES, in the Cidanau Watershed and linked with the prospect of promoting environmentally friendly farming. This article employs reports and information of the implementation of PES carried out by Institute of Research, Information and Education of Social and Economic Affairs (LP3ES) and other institutions and other literatures.

## **DESCRIPTION OF THE CIDANAU WATERSHED**

Administratively, Cidanau Watershed is located in two regencies, Serang and Pandeglang. In Serang Regency, it covers the Districts of Padarincang, Ciomas, Mancak, Pabuaran, and Cinangka, while in Pandeglang Regency it includes only Mandalawangi District. The Cidanau Watershed comprises 21 sub-watersheds, all of which flow their water into the Cidanau River. Some of the sub-watersheds flow their water into Rawa Danau. Formerly, Rawa Danau was a lake functioning as an effective catchment area, since most of rainwater in the area flows into the location. The water then flow into the Cidanau River before it reaches the Sunda Strait. Besides rainwater, Rawa Danau has many wells, which also fill the area.

The area of the Cidanau Watershed covers a size of 22,036 hectares and encompasses: 1) plateau in which Rawa Danau and rice field of 10,176 hectares reside, 2) sub-watershed from which the water flows to- and accumulates in- other plateau of 11,860 hectares. Based on a contour map of the location, the plateau is located at about 100 meters above sea level. In fact, long time ago, the plateau was a lake, but then drained after the natural dam was blasted by Dutch Government to lower the water level. After years then, people gradually started to live in the area and used the land for farming and housing, even legally administrative activities of village governments began running in the area.

The Cidanau Watershed encompasses lowland, hills, mounts and uplands. Lowland lies at the altitude of 0-100 m, which spreads along the northern coast namely Sirih, Taneng, Kosambi, Karangsuraga until Bulakan in the south, with the slope of 0-20 percent. The hills with the altitude of 101-400 m spread from the Merak mount through the south until the Rangkong mount with the slope of 21-40

percent. The mounts with the altitude of >400 m lies in the northern Gede mount, the Tukung mount and in the south are the Tangkuang and Kamuning mounts. Meanwhile, the uplands area of similar morphology lies at the altitude of 100 m, which is located in the northern Padarincang and in the south are the Batukuga and Jumungkal mounts.

The distribution area of the soil types in the Cidanau Watershed consists of Latosol (60 %), Alluvial (35 %), and Regosol/Andisol (5 %). The range of soil fertility is spread from low to fair and mostly is sensitive to erosion (actual erosion in 1985 was 146 ton/year), especially on lands with slopes of less than 15 percent and high run-offs. This condition can eventually cause sedimentation on the lowlands and/or Rawa Danau, which in turn resulted in silting up.

As mostly in Indonesian islands, the Cidanau Watershed has tropical climate with two seasons, namely dry and rainy seasons. In the dry season, rainfall is only 50-87 mm, which happens in June to October. In this season, relative humidity is 77.60-81.40 percent and shining intensity is 60.20-78.6 percent, and temperature is 26.14-27.00°C and wind speed is around 4.80-5.40 knot per hour. In the rainy season, rainfall is 133-346 mm, which happens in November to May. In the same season, the relative humidity is 79.6-84 percent and shining intensity is 31.60-68.2 percent, and temperature is 26.04-27.10°C with wind speed 5.00-5.90 knot per hour (*Badan Meteorologi dan Geofisika*, 1990 in *Badan Perencanaan Daerah Provinsi Banten*, 2002).

As stated above, most Cidanau Watershed lies in Serang Regency and partly in Pandeglang Regency. In Serang Regency, there are four districts and 23 villages included in Cidanau Watershed, but only one district and four villages in Pandeglang Regency belong to it. Totally, population in the Cidanau Watershed was 8,844 people or 1,806 households, most of which (83 % or 1,502 households) relied their income on farming. With the farmer population of 7,295 people and 455 hectares of farming area, there are 16 people for every hectare farmland (RuBRD, 2002 in *Badan Perencanaan Daerah Provinsi Banten*, 2002).

Based on the data of RuBRD (2002), the size of the Cidanau Watershed is 22,036.8 hectares. More than half (57.1%) of the area has been converted into varied purposes such as rice field (30.8%), mixed annual trees (15.8%), dry land (8.7%), and housing (1.8%). The rest of the area are bushes (27.2%), swamp (8.8%), and forest (7.0%) (RuBRD, 2002 in *Badan Perencanaan Daerah Provinsi Banten*, 2002). Land conversion of the rest into various purposes is predicted to proceed as the population in the area keeps increasing.

## THE CONCEPT OF PES

The idea of PES (Payment for Environmental Services) can be viewed as a concept which is still limitedly recognized in Indonesia. In general, PES is

considered as not a fairly new concept since it is developed in the early of 1990s. The idea is deliberately emerged in the middle of focal point of debate inspiring the occurrence of new paradigm in terms of sustainable environmental action, following the large extent of uncertainty towards the relationships between sustainable environment and poverty alleviation program. However, PES concept reflects the direct approach between environmental conservation and poverty alleviation.

Several definitions of PES have been formulated. Most of them discuss about compensation or payment for the producers or the sellers of environmental services which should be paid by the beneficiaries or the buyers. The producer or the sellers deserve to get the compensation or payment as they have made efforts to assure that the ecosystem is maintained for its sustainability. The PES concept covers some terminologies with various interpretations. For instance, environmental service among other things is interpreted as an output or implication of a dynamic landscape which is assessed as a service by the external stakeholders. In this interpretation, environmental services can be viewed as a basis on material flows (for instance water and carbon) or internal quality of environment (such as biodiversity and landscape beauty). Based on the definition, it is commonly recognized that there are four categories of environmental services, namely watershed protection services, biodiversity services, carbon sequestration and storage, and landscape beauty (Wunder, 2005).

The concept of PES is different from conservation approach, which relies on rules for protecting the sustainability of environment without economic incentive. PES concept has specific voluntary action of its constituent that is primarily supported using economic incentive. Despite the fact, the PES concept can be collectively implemented and is supported by the rules of implementation, such as in the case of international conventions performance about environment. However, PES concept is different from conservation approach which gathers the purposes of conservation with other development objectives. The essential difference of these approaches among others is on the transactional characteristics which are limited, flexible, and contingent. Nevertheless, it is possible to design PES in the form of certain integrated program.

As a new idea, PES concept is not freestanding from critics and distrustfulness from its opponents. While supporters of PES idea has a spirit to promote PES concept as an innovation in offering the new budget source for conservation efforts (particularly from private sector), the other skeptic persons perceive that it is a threat of separating over conservation agenda from the general development, deprivation of poor community by the strong group of provider services, and eradication of conservation value which is rooted in community custom by commercial transaction.

There is no formula established to determine how much PES should be paid to the farmers of upstream community as to change their farming system,

from traditional farming into an environmentally friendly farming. This is because so many variables should be included in the formula, as conditions of upstream area are different from one to another. Nevertheless, KTI has tried to determine PES by paying 1,2 million rupiah per hectare to farmer groups (or a land size of 50 hectares) for conservation activities, including tree planting.

## **FACTORS MOTIVATING PES IMPLEMENTATION**

Implementation of PES in the Cidanau Watershed was motivated by several factors, especially those related with problems encountered in the Cidanau Watershed and the need for sustainable water supply among downstream community. There are at least two factors motivating PES establishment in the Cidanau Watershed which will be discussed below.

### **Problems Encountered in the Cidanau Watershed**

Without ignoring natural causes, the main causes of the problems encountered in the Cidanau Watershed are the human factors, especially encroachment and conversion of forest into farmland. The encroachment has made most forest in the watershed become bare land. Such land condition led to many other problems, especially water crisis in the kinds of flood and water shortage, as most rain water run off freely without catchment. Likewise, this situation has made up further problem in the kind of critical land, since rainwater can also easily wash fertile material off the land.

Data show that critical land struck all sub-watersheds in the Cidanau Watershed, which reached 9,987.3 hectares out of 11,860 hectares. In this sense, land is considered critical if it has erosion value of over 35.22 ton/ha/year. About 71 percent of all the sub-watersheds were totally damaged and only small portion of the rest was still intact. It suggests that there was a phenomenon that the small-size sub-watersheds would be firstly devastated. Theoretically, this means that the remaining intact land among the larger sub-watersheds may only be waiting for their turn to damage. The condition of seriously damaged watersheds will be a challenge to conserve. However, the efforts of precise and immediate conservation of the watershed would be very important in near future.

### **Encroachment**

The condition of encroachment becomes more extensive and faster after the existence of enclaves within the area developed. There were nine enclaves existing in the area with the total size of 276 hectares, which were inhabited by 316 households or 641 people, most of whom were farmers. The occupation of

land by people within the upstream of the Cidanau Watershed can lead to further deforestation. This was because the community in the enclaves extends, because of which they need more and more land for various purposes, especially housing and farmland. Based on the data collected by Sub Section of Conservation and Natural Resource of Banten Province, there were about 602 people nabbed encroaching in the area, who have damaged the size of 400 hectares (Rekonvasi Bhumi, 1999).

Tree cut down along the hills of the river, bordering the area, had made rainwater slide down and bring materials away from the surface of the ground. This had raised the coefficient of run-off and level of actual erosion, which in turn escalated actual sedimentation of the area (Bappeda of Banten, 2002). Data taken from Head of Office Forest and Land Conservation of Serang Regency on hydrological condition of the Cidanau Watershed showed that the area has been in dangerous situation, as described in the following :  $Q_{max}/Q_{min}$  has been 31.78, level of actual erosion reaches 146 ton/ha/year, actual sedimentation is 479,488 ton/year and coefficient of run-off is 15.85 m<sup>3</sup>/minute (Bappeda of Banten, 2002).

From the quantity side, average debit of the Cidanau River decreased to be 8,000-10,000 liter per second in 1997, even in the same year the minimum debit had ever reached 1,700 liter per second. The water diminishing in the upstream of the Cidanau Watershed is alleged coming from the size decrease of Kobakan Lake (*Telaga Kobakan*) lying in the Rawa Danau area. There are some possibilities causing the phenomenon, among others was : the decrease of lake water level caused by lessening water debit entering the lake. Sedimentation rooted from volcanic process in the lake or sedimentation created by serious erosion could be the other factors creating water supply problem (Bappeda of Banten, 2002).

### **Application of Fertilizers and Pesticides in Farming**

The existence of farmland around the enclave is another threat to water supply in terms of water quality. It is recognized that use of fertilizers and pesticides is abundant which leaves much residue in the ground, some of which polluted river, which may enter drinking water and kill live organism. An analysis of content showed that water has been polluted with dangerous chemical substances and residues coming from fertilizers application in farmland of the upstream of the Cidanau Watershed. It has also been found that besides erosion, land clearing for farmland has intensified evaporation (Bappeda of Banten, 2002).

In line with problem solving of the upstream of the Cidanau Watershed, UNEP (United Nations Environment Program) had ever recommended to restore the water level of Rawa Danau to the original level as in the year of 1825 – before the Dutch Government blasted the natural dam to drain the lake – through constructing small dam around the original outlet. This solution was suggested in order to avoid people from using the area for farming. Logically, the missing of

rice field as the impact of such method, water-poisoning farming practice would be conquered. Nevertheless, the approach of solution has extensive socioeconomic consequences since the people in the area must be relocated and given alternative jobs. Therefore, the method has never been implemented because of very expensive cost (Rekonvasi Bhumi, 1999).

### **The Need for Sustainable Water Supply**

The need for water is predicted to significantly increase in Banten Province, especially among cities such as Cilegon Municipality and Serang. As water availability tends to go to the opposite direction against its demand, conservation towards critical area is essential in order to meet the raising demand for water. To date, the Cidanau River is the only raw water source to fulfill the water need of people, business sector, industry, and seaport of Cilegon.

There are three big beneficiaries that utilize the Cidanau River, namely PT Krakatau Tirta Industri (PT. KTI), Farming and PDAM (*Perusahaan Daerah Air Minum/Local State-owned Water Supply Company*) (Table 2). Among the three beneficiaries, PT KTI is the company that utilizes most. The company processes the river water and sells it as clean water to industries located in Krakatau Industrial Estate of Cilegon (KIEC), chemical industry area in Ciwandan and Merak, and PT Indonesia Power as one of the branch of *PLN (Perusahaan Listrik Negara/State-owned Electricity Company)*. Total consumers served by PT. KTI are 120 companies or about 80 percent of total companies in Cilegon Municipality. Water needed by large industries alone are about 1,100 liters per second.

Farming is another potential beneficiary for the Cidanau River. Land surrounding the Cidanau Watershed was dominantly utilized for technical and non-technical irrigated wetlands which consists of 5,193.35 hectares. Up to 2005, the farming needed around 200 liters per second. The water is predicted to rise in line with wetland development in the frame of increasing rice production program. Meanwhile, clean water utilized by *PDAM (Perusahaan Daerah Air Minum/Local State-owned Water Supply Company)* to serve 158,798 customers was only 30 liters per second, (*PDAM of Serang, 2001*). However, the number of customers is predicted to grow fast following population growth in the city. (Table 2).

On the other hand, in the last five years, the average debit of the Cidanau River was about 8,000-10,000 liters per second. Compared with water debit needed by users, such debit of the Cidanau River was nothing to worry. The problem will encounter when more forest in the upland is converted into farmland uncontrollable. Some worries have ever appeared when the water debit of the Cidanau River reach 1,700 liters per second during severe dry season in 1997. This extreme fluctuation of water debit may be warning that upland conservation is urgent for water debit stability.



Table 1. Water Utilization in the Cidanau Watershed

Water Beneficiaries	Water Requirement (liter/second)	Users
<b>PT KTI</b>	1,100	120 companies
Farming	200	5,193.35 hectares of technical and non-technical irrigated lands
<i>PDAM</i>	30	158,798 customers

Source : *PDAM* of Serang, 2001

## IMPLEMENTATION OF PES CONCEPT

The PES concept of upstream-downstream development in Indonesia is firstly introduced by GTZ-SMCP (Deutsche Gesellschaft für Technische Zusammenarbeit – Strategic Manpower Conversion Program) to Cidanau Watershed stakeholders in 2002, in a one-day seminar at Sucofindo office in Cilegon. The seminar, in fact, was a promotion to apply PES concept in the area in order to overcome the existing problems in the Cidanau Watershed. As the follow-up of the seminar, the funding agency giving an opportunity to the *Rekonvasi Bhumi* a local NGO (Non-Government Organization) in May-June 2003 to see and learn the successful PES in Costa Rica, Central America. This ended up with the decision of the funding agency to award PSDAL-LP3ES (*Pusat Studi Pengembangan Sumberdaya Air dan Lahan/Center for Land and Water Resources Development Studies-Lembaga Penelitian, Penerangan, Pendidikan Ekonomi dan Sosial/Institute for Social and Economic Research, Education, and Information (PSDAL-LP3ES)*) a national NGO to implement PES in the Cidanau Watershed.

Through a sequence of facilitation process, *PSDAL-LP3ES* and NGO *Rekonvasi Bhumi* succeeds to stimulate the formation of Communication Forum for the Cidanau Watershed/*FKDC* (Figure 1). The forum consisted of the Cidanau Watershed stakeholders such as farmers in the upstream as well as downstream of the watershed, universities, Forest Office, Agriculture Office, Gubernatorial Office, *PT KTI*, and other many other government organizations and companies. The forum was then drawn up by Banten's Gubernatorial Decree No.124.3/Kep.64.Huk/2002. The government support was deemed to be the main factor that made PES model implementation effort could work.

The kind of conservation effort is tree growing on farmers' land, while the payment amount will be determined by two sides, the upstream community farmers (the sellers) and downstream community (the buyers). This concept was then socialized to many institutions including Local Parliament, Gubernatorial Office, and some companies especially those using much water, and many more.

As the result, the concept received positive responses from most parties. Likewise, large companies were ready to pay more for water they use in order to pay farmers who apply conservation bid (van der Sand, 2004).

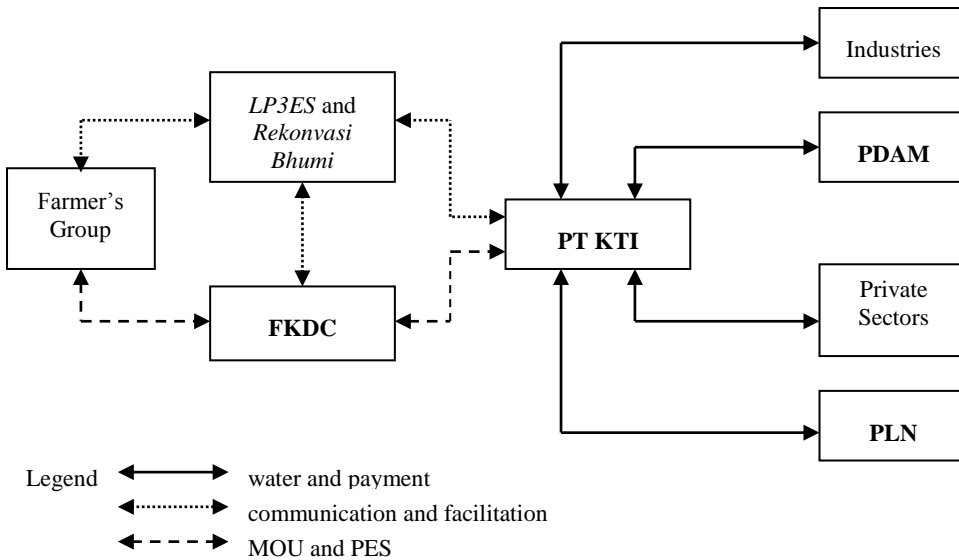


Figure 1. Scheme of Payment for Environmental Services in the Cidanau Watershed

In fact, PES has not been able to apply as many reasons including absence of appropriate law supporting the implementation of the concept. The existing law is deemed not to accommodate PES implementation since it is directed more to forest regulation, while PES is not. Besides that, many parties are skeptic that credible institution that implements PES could be formed. Some companies were doubt whether a credible institution could be established. In absence of credible institution, PES implementation is very hard to realize.

In the midst of the uncertainty of PES implementation, *PT KTI* appeared as the pioneer company that was ready to implement the program, which was also deemed as a test of PES implementation. For that reason, *PT KTI* appointed *FKDC* as the mediating institution which facilitated the interests of two sides, farmers and *PT KTI*. *FKDC* also forms an ad hoc team as the representation of *FKDC*'s stakeholders, which consists of 10 persons. They come from government representatives, buyers, and sellers. Besides managing the fund that comes from the payment of environmental services, the team also has the task to arrange payment for environmental services mechanism and establish an independent, transparent, credible, and accountably environmental services organizer institution. The institution would be supported by a professional official in financing, social, and forestry affairs.

Negotiation process between *FKDC* and *PT KTI* over the payment for environmental services had some important agreements written in MOU (Memorandum of Understanding) which was signed by Banten governor as the chief of local council of *FKDC* and Director of *PT KTI*. Another agreement resulted from the negotiation was a written PES agreement which is signed by the daily implementer of *FKDC* and Director of *PT KTI*. The latter contains some important statements as follows :

1. *PT KTI* is ready to pay for environmental services for the Cidanau Watershed project implementation as much as Rp 3,500,000 per hectare annually. Since the total area was 50 hectare, the whole payment should be delivered Rp 175,000,000. The money would be paid at the first and the second years.
2. MOU of PES agreement between *FKDC* and the *PT KTI* would prevail for five years or until 2009.
3. Payment amount for environmental services from *PT KTI* for the third and fifth years would be based on the negotiation result between *FKDC* and *PT KTI*.

Negotiation process between ad hoc team and seller (farmers' group) had produced some written agreements. Three agreement points are as follows :

1. PES that will be received by the seller is Rp 1,200,000 per hectare annually.
2. The PES will be accepted in three stages : (a) thirty percent will be obtained at the signing time of the PES agreement; (b) another 30 percent will be acquired by the seller in the sixth months since the date of signing; and (c) the rest of 40 percent will be received in the next 12 months since the data of signing.
3. Number of plants, fruit or wood plants, are no less than : (a) 500 trees at the end of the first until the second year; (b) 300-400 trees at the end of the third until the fourth year; and (c) 250-300 trees at the end of the fifth year.

Although there was no statement included in the MOU, the submission of trees and cash to the farmers was followed by intensive extension on conservation should be carried out by the farmers. Conservation knowledge was, in fact, a package of PES Program implementation since the knowledge was the most crucial factor in the program. Besides that, the farmers were given various knowledge of conservation farming that can lead them to make more profit from it.

Agro-forestry was chosen as the agricultural model in PES Program. The model was chosen in consideration that agro-forestry is a low-cost farming technology combining economic and conservation interest, and traditionally, farmers have also capable of implementing the technology. Based on the technology that has been developed by the farmers in the Cidanau Watershed, there are three kinds of agro-forestry models applied in PES Program, namely homeyard, upland, and mixed estate models, as follows (Suryadi, 2006) :

**Homeyard.** Plants grown on homeyard are categorized into three strata. First stratum (top) is long-term plant, which is characterized by large and tall trees such as mahogany, durian, and jackfruit. Second stratum (medium) is long-term plants but not large nor tall such as clove, *jengkol* (*Phitecollobium jiringa*), and so on. Third stratum (bottom) is the tree for monthly income such as banana, *talas* (*araceae sp*), and *kapulaga* (*amomum cardamomum*). The number of trees is 240-360 trees per hectare.

**Upland.** On average, the farmers' community has rainfed land (upland) of 0.2 hectare. In order to optimize yield economically, farmers usually cultivate it using mixed farming, consisting of dry land rice with corn or chili planted in the midst of the land. On the edge of land, farmers plant it with trees as the "fence plants" such as *melinjo* (*gnetum gnemon*), *dadap* (*erythrina spp*), durian, or coffee. Meanwhile, close to fence plants the farmers plant it with coconut trees using planting space of eight meters. The farmers in both locations commonly know best practicing good agro-forestry farming. It can be seen from the performance of the plants that can grow and produce crops optimally. This shows that farmers' orientation on planting is not only for economic purpose but also for conservation.

**Mixed Estate.** Such kind of agro-forestry is commonly applied by the farmers on *talun* land (a kind of upland that is located far away from the farmers' homes). From the structure and composition of plants, mixed estate is not far different from the concept of homeyard agro-forestry, on which almost 70 percent of the land is planted with multipurpose trees and another 10 percent with timber trees, while the rest is planted with food crops. Usually, the size of *talun* owned by farmers is mostly small ranging from 0.5 to 0.6 ha. Most of agro-forestry farming activities carried out by the farmers of PES Program is on *talun* land with consideration that such land was fallowed for long time.

All three kinds of agro-forestry model in both program locations of PES are more or less ecologically feasible. The condition of timber tree, multipurpose trees and varied food crops, which is arranged in three strata, enables to shade the land in effective manner. Land conservation technique is also applied by the farmers optimally, using terracing technique for the land of medium slope.

Meanwhile, the economic value coming from agro-forestry in two locations is very large. A calculation shows that despite small land (0.1-0.3 ha) economic value of agro-forestry activity in two-program location could give higher profit. Moreover, the farmers' income can be raised by integrating livestock such as cow into their farming, because the farmers can utilize plants as fodder. With average population of 160 trees for every 0.5 hectare of land, a farmer may acquire revenue of Rp 30,205,000 a year or Rp 23,205,000 net income after cost of Rp 7 millions. Therefore, the farmers' income of one hectare of land can reach some Rp 40 millions a year. This amount is much higher than that from wetland rice farming.

## RESULTS OF PES IMPLEMENTATION

Implementation of PES has produced some beneficial impacts to environmental and social condition, which is more environmentally friendly community. Some advantages are described in detail below:

### **Environmental Condition**

There are at least two conditions showing better condition of environment as the result of PES implementation, namely reduction of illegal logging practice and tree growing performance.

#### ***Reduction of Illegal Logging Practice***

A case in Cibojong Village gave evidence that illegal logging prevention could rise significantly after conservation technology was implemented. This condition, in fact, was a by-product from PES implementation since it was not the main target. It might appear as the increase of people's activities in PES Program, which their activity in illegal logging activity. The advantages that can be drawn from the illegal logging prevention were the increase of land fertility, certainty of acquiring water and agricultural yield to meet household needs in the location. Positive perception could grow among farmers if illegal logging prevention measure was followed by law enforcement on it.

#### ***Tree Growing Performance***

Evaluation study in the PES location in Cibojong and Citaman Villages show that the number of perennial trees in both villages in upstream of the Cidanau Watershed have developed. Meanwhile, the number of fruit crops increased from 5,100 trees in 2004 to 6,000 in 2006. Density of trees per hectare of land possessed by farmers' household in the watershed also shows an increase. Field observation reveals the density rises from 150 trees (2004) per hectare to 193 trees per hectare (2006). Perennial crops in Citaman Village were the highest (250 trees per hectare), while the lowest was found in Cibojong with 113 trees per hectare in 2004 and 126 trees in 2005. The relatively low increase of perennial trees density in Citaman Village was caused by the condition that the density had been high enough (256 trees) in 2004, which then rose to 260 trees per hectare.

In fact, farmers in two villages, Citaman and Cibojong, preferred fruit trees to timber trees, where the proportion in the latter village was larger. However, the proportion of fruit trees in the Cidanau Watershed decreased from 96 percent in 2004 to 86 percent in 2006, after two year since the project was

implemented. In spite of that, farmers' preference to fruit trees did not change as such kind of tree can easily elicit economic benefit as well as high economic value.

Perennial trees of cash crops were also preferred in the upstream of the Cidanau Watershed. For example, coffee trees in four villages in the watershed were relatively numerous. The tree planted most was *melinjo* (*gnetum gnemon*). It was noted that the number of coffee trees in Citaman Village was 28 percent in 2004 decreased to be 24 percent in 2006, while in Cibojong Village was 20 percent in 2004 rose to be 26 percent in 2006. This indicates that annual crops having vast stable market were preferred by farmers. On the contrary, the trees of limited and unstable market like durian and jackfruit were not favored.

Up to now the farmers keep maintaining the trees that are grown on their own lands belonging to PES Program. Mutual reminding efforts are inculcated among the farmers in order to maintain the trees keep standing on the land of PES Program.

### **Social and Economic Condition**

Although environmental condition is developed by farmers involved in the program, discussion of social condition of farmers is important to get special emphasis as it can show internalization of environmentally friendly attitude among farmers. Likewise, economic condition of farmers related to PES implementation is also important to make PES implementation sustainable.

### ***Conservation Technology Application***

Program impact of PES implementation towards development of conservation technology implementation by farmer participants shows promising description. The case in the Cidanau Watershed uncovers that before technological implementation in 2004, implementation of the technology on slope land was 78 percent. The percentage then rose to be 82 in 2006 after implementation of the technology. Similar trend also occurred in Citaman Village, in which implementation of the technology on slope land increased from 70 percent in 2004 to be 80 percent in 2006. This trend of conservation technology implementation happened to all the villages targeted by the program of PES.

Dissemination of technological mastery on terrace making was not spread evenly. As a description, in Citaman Village in which terracing technology making was frequently introduced by field worker can immediately be adopted by farmers. To date (2006), the farmers in the Watershed of Cidanau, especially in Citaman, 66.4 percent of the farmers have implemented terracing technology; whereas in 2004, no farmers in the location made it. Before the project entered in the Cidanau Watershed, no farmer knew the technology of terracing. The role of

field worker in terrace making in the watershed was very significant, including in improving those that have been made by farmers.

Before the project implementation (2004), farmers have been practicing conservation technology in the Cidanau Watershed were 53 percent; after two years of the project (2006), the proportion jumped to be 65 percent. Faster development of conservation technology happened in Citaman Village indicating that Citaman's farmers were more responsive to the technology. However, adoption of conservation technology in Cibojong Village was also prospective, as no many farmers in the village using the technology previously.

Generally, farmers have understood that technological implementation of terracing can give benefit to their land conservation. Besides that, the land using terracing technology found itself easy to cultivate. However, the farmers had no enough money to practice the technology because of high cost. The existence of the project of upstream watershed protection enabled small farmers to actively develop conservation technology, terracing in particular.

Likewise, positive perception towards conservation technology appeared to be significant in terracing technology. Moreover, within only short-term (two-year project implementation), the conservation technology especially those concerning regreening of land has been felt its benefit by the farmers in Citaman Village. This was because the technology could improve the condition of water shortage in the location. Previously, water supply had been problem for long to the residents in the village, so the existence of the technology was quite beneficial. The same also happened in Cibojong Village of upper part that was far from water source.

### ***Farmers' Income Performance***

After two years of project implementation, farmers' income in two villages of Citaman and Cidanau did not change significantly; otherwise, it experienced a decrease during the period. For example, in Citaman Village, the farmers found their income declined from Rp 777,000 per capita annually in 2004 to be Rp 639,000 per capita a year in 2006. The income decline was attributed to long drought during the year of 2005. In addition, various agricultural productions in Citaman and Cibojong Villages in the period of 2005-2006 faced major decline, which left the farmers in trouble. Citaman's farmers found themselves worse compared with those in Cibojong, as their previous income was lower and the condition made them quite suffer.

Despite income decrease during the PES implementation period, farmers' perception on economic benefit of conservation technology application shows an improvement. Observation gives description that at the beginning of the project; the farmers giving positive perception towards economic benefit were 50 percent. After two years of the project implementation, the farmers giving positive

perception jumped to be 75 percent. However, the description of some farmers' perception in Cibojong Village towards economic benefit was not as good as those in Citaman, as the latter showed worsening view over the economic side.

It can be said that from farmers' income generation, conservation technology could be felt. At least, there were three benefits that can be taken by Citaman's residents from terracing technology, namely increase of agricultural productivity, improvement of land quality and fertility, and more supply of water for farmers' households.

Before the result of tree growing can be felt by the farmers, they were managed to make additional business especially got rearing. Some of cash payment given by *PT KTI* was used to carry out the business. The payment received by the farmers is used to fulfill their daily needs, trees maintenance, and the rest of which are allocated as a starting capital for group's economic activities. The first phase of goat purchase is coming from the second phase of the payment received by the farmers. At the first phase the farmers bought five heads of goats, and the same number will be purchased when the third phase of payment is paid. Goat rearing is carried out by those appointed by the farmers' group. At the same time, the group is also attempt to make other economic activities, using the resources around the place in order to widen the group's economic activities (Tomasowa, 2005).

## **OBSTACLES ENCOUNTERED PES IMPLEMENTATION**

Despite the successful results, PES implementation faced various obstacles, which can potentially spoil its implementation in the future. The main obstacle of PES implementation come from regulation provided that regulates PES implementation. It is found that there are still some overlapped and unsynchronized regulations on conservation and environmental services. Regulation for water utilization, for instance, exists in the Law No. 34/2000 issued on Local Tax and Retribution, which specifies tax to each exploitation work of surface water and deep water. Meanwhile, based on Government Regulation No. 34/2002, water utilization is one of the utilization forms of environmental services which subject to the utilization of forest production (HPH) and provision of forest resources (PSDH). Apart from that, there is a regulation about environmental services cost which should be paid by each water beneficiary.

However, there is an exception for basic needs and agricultural requirements as issued on article-3 of the Law No. 7/2004 about water resources. Moreover, unsynchronized regulation can be viewed in terms of understanding the meaning of water utilization activity. Based on the Law No. 1/1999 issued on forestry and Government Regulation No. 34/2002, water utilization activity can be considered as one of activities of forest environmental services. Meanwhile, based



on the Law No. 7/200, water utilization activity is a part of water resource utilization as a product of water resource utilization in certain watershed area. Hence, it is need the intensive understanding coordination among sectors in order to avoid water conflict.

Implementation of PES concept in the government programs will require the suitability and new forms of planning, distribution, accountability of finance. The implementation of PES concept, for instance, requires the middle and long-terms commitment between 5-10 years, while the government budget plan is only applicable for one year. PES concept also requires budget distribution based on negotiation and contract with environmental services communities, while budget system is simply recognized in the models of auction and self-manage.

As a new idea, PES concept is still resistance among government bureaucrats, especially in forest department circumstances. Even though PES concept has been introduced, the department still carries on the conventional models of forest and land rehabilitation. Despite not all bureaucrats refuse the PES concept, only a few numbers of them willing to promote it further. This ends up with more complicated condition in line with debatable meaning of PES concept.

Generally, the attention and commitment of the government institutions are quite tacit towards the idea and concept of PES. The government's attention is more focused on critical and advanced issues such as economics problem. In line with environment, the idea of PES is not emerge in the attention agenda of government. Similarly, it is not also found in the sectors of forestry and water resource. With less attention, the commitment become powerless; while knowledge and understanding about the PES develops slowly.

## CONCLUDING REMARKS

The implementation of PES in the Cidanau Watershed was motivated by the threat of water problems in the watershed. There are some motivating factors to implement PES, namely problems encountered in the Cidanau Watershed such as encroachment which has devastated the function of catchment area and application of fertilizers and pesticides in farming which polluted water. Another factor very urgent to overcome is the need for continuous water supply, which has been found much fluctuated in recent years.

Although PES is deemed important to implement to solve water problems and many companies have found themselves agreed, implementation of the program is not simple. Implementation of PES was made possible as *PT KTI* as a water company was ready to finance the implementation as a test. In the implementation test of PES, *PT KTI* financed the community in the upstream of the Cidanau Watershed to grow trees and using conservation technique in their farming, besides funding other agriculture-related business.

PES implementation has produced some benefit impact to environment and the farmer condition involved in the project. There are at least four components showing better condition of environment as the result of PES implementation, namely reduction of illegal logging practice, better tree growing performance, better application of conservation farming, and expectation of income generation. The program also gave benefit to the farmers in the kind of internalization of environmentally friendly attitude among farmers and economic condition of farmers related to PES implementation, which is also important to make PES implementation sustainable.

However, there are some obstacles to implement PES in the future on sustainable manner, as regulation on the concept is still debatable. PES concept is still hard to accept as a new regulation, since the concept is regarded to have been accommodated by the existing regulation by some policy makers.

Such success story of PES implementation in the Cidanau Watershed needs to be taken as a lesson by government for future environmental policy. It is important to be noted that the success of PES implementation by *PT. KTI* stressed on educational aspect, in which rights and responsibilities of each side can be controlled transparently. Through this commitment, the farmers in upstream area will not procure compensation payment if they do not carry out beneficial efforts for those living in downstream. Upstream-downstream transaction mechanism is an entry point to develop local potential in order that upstream community can manage their own resources. Besides that, proper upstream-downstream transaction mechanism and assistance process can help local community build external communication and tie in wide partnership in order to foster community's well being.

With some improvement and modification, PES implementation can be tested nationwide. There is a need that campaign on PES implementation should be broadened among all stakeholders. It is also required that some big companies be encouraged to initiate the implementation; especially those commercializing as well as consuming water in large amount. Government, on the other hand, should play its main role as the initiator and regulator in order to improve and maintain PES program.

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