

## Payment for Ecosystem Services under Conditions of Poverty

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**Abstract:** Protection and conservation of resources requires practicing of environmentally benign practices and involves costs to practitioners. People incurring these expenditures expect to be compensated or rewarded, as an incentive, for their involvement. However, majority of existing environmental protection and conservation schemes do not contain rewards for service providers. Inadequacy of market to bring various environmental services in to the market fold leads to markets failure. Market failure occurs because many environmental services provided fall into the category of externalities or public goods. Markets typically fail to compensate those who produce positive externalities due to the absence of property rights and other legal means or perhaps because the service provision is not recognized by the beneficiaries or may be even by the providers themselves. The aspect of reward for environmental services gave way for development of market-based instruments for ecosystems services though in a limited way. These schemes have been called by different names such as payment of ecosystems services (PES), compensation for ecosystems services (CES). Market based instruments provide an opportunity to compensate environmental service providers who adopt conservation measures, collecting compensation from service users or beneficiaries of such environmental services. This paper attempts to illustrate how PES schemes would be effective under conditions of poverty in Asia. This study is based on review of literature related to PES.

**Keywords:** Payment for ecosystem services, poverty, Property rights, Conservation, Tenure, Affordability.

### INTRODUCTION

Ecosystems provide different types of essential goods and services such as food, water and air to the society. Protection and conservation of natural resources assumes significance, considering the contributions of ecosystems for development. The Millennium Development Goals of UN identifies that ecosystem conservation by controlling degradation is necessary for achieving the Millennium Development Goals. This requires resource users to practice environmentally sustainable resource use practices. Policy making process, however, had not considered the environmental concerns for long time, which resulted in degradation and depletion of natural resources. Environmental problems augmented over the period posed threat to life on earth, e.g. endangered species, and created awareness among resources managers and policy makers to derive alternative approaches to achieve sustainable resource use and management of bio-diversity. Various measures in conservation and protection of ecosystems, such as state's intervention in the form of command and control, community or individual based conservation methods, etc., have been developed for sustainable use and management of stock and flow of ecosystems services.

Protection and conservation of resources requires practicing of environmentally benign practices and involves costs to practitioners. People incurring these expenditures expect to be compensated or rewarded, as an incentive, for their involvement. However, majority of existing environmental protection and conservation schemes do not contain rewards for service providers. Inadequacy of market to bring various environmental services in to the market fold leads to markets failure. Market failure occurs because many environmental services provided fall into the category of externalities or public goods. Markets typically fail to compensate those who produce positive externalities due to the absence of property rights and other legal means or perhaps because the service provision is not recognized by the beneficiaries or may be even by the providers themselves [1]. The aspect of reward for environmental services gave way for development of market-based instruments for ecosystems services though in a limited way. These schemes have been called by different names such as payment of ecosystems services (PES), compensation for ecosystems services (CES). There is a continued debate on using terminology. Market based instruments provide an opportunity to compensate environmental service providers who adopt conservation measures, collecting compensation from service users or

beneficiaries of such environmental services. PES is a new method of natural resource management based on market mechanism. It is to be noticed that although the theoretical development of payment for ecosystems services emerged decades ago [2], the implementation of these market-based instruments for managing natural

resources has started rather recently. These schemes are based upon the fact that natural or human-controlled ecosystems provide positive environmental externalities that normally are not taken into account in individual economic decisions.

**Box 1. The Growing Number of Markets for Environmental Services**

In a recent global review of emerging markets for forest environmental services, over 280 cases of actual and proposed payments for four sets of environmental services were uncovered. These include 75 deals for carbon sequestration deals, 72 for biodiversity conservation, 61 for watershed protection, 51 for landscape beauty and 28 for sales of “bundled services.” Far from being concentrated in the developed world, these cases were drawn from a range of countries in the Americas, the Caribbean, Europe, Africa, Asia and the Pacific. While the study suggests impressive expansion in markets, it also highlights the tremendous variety of market structures. Schemes differ according to the number and type of participants involved, the payment mechanisms employed, the degree of competition and their level of maturity. They also often have very different impacts for local and global welfare. These variations reflect local socio-economic and environmental factors, drivers and ultimately local variations in the process of market development.

**Source: taken from Powell et al. [3] (Original source: Landell-Mills, et al. [8], “Silver bullets or fools’ gold? Developing markets for forest environmental services and the poor”, Instruments for private sector forestry series, IIED, London.**

In recent years several ecosystems services are attracting the attention of industry and private individuals, besides to government efforts to protect and conserve resources. PES is a market based instrument, which tries to involve the beneficiaries and service providers of environmental services for protecting and conserving natural resources. Development of markets for environmental services, which have public good nature, is a difficult task. However, in recent times, environmental services are being treated as tradable services and are traded in many parts of the world, though in a limited way but with increasing trend (see Box 1).

Market failure is observed in the case of ecosystems services, but it is necessary to account for these services in planning process. While accounting for these services, one has to be aware of the value of ecosystems services. This problem might be resolved by assessing the economic value of environmental services. Valuation provides an insight into the losses (or gains) across different stakeholders, arising out of perturbances in ecosystems and subsequent services, while enabling the choice better informed by assessing the losses and gains which are very important for public policies [4]. Total Economic Value (TEV), which distinguishes between use values and non-use values provides a framework for valuation of ecosystems services (for a review of valuation methods and approaches see Kumar [4]).

Payment for ecosystem services has been developed as a tool to correct the problem of market failure in environmental services and also for providing

rewards or incentives to promote sustainable resource use practices. The importance of markets in ecosystems services comes at a time when traditional models of government financed protected areas and conservation are under strain due to increased public deficits and the inefficient management of resources by the government. Ecosystem service markets are emerging around the world, for e.g. in greenhouse gases, wetlands, water pollution and endangered species [3]. According to Infocources [5] compensation or reward mechanisms have taken three main forms:

- Financial compensation (payment for ecosystem services; PES): consists direct payments from the beneficiaries to environmental service providers or payments to farmers from government offices or public institutions.
- Payment in kind: infrastructure development, access to training, etc.
- Access to resources or markets: e.g. land-use rights, access to new markets through certification

The different compensating mechanisms developed around the globe have been categorized into four groups based on the features of buyers by Powell *et al.* [3]:

- *Public payment schemes* to private land and forest owners to maintain or enhance ecosystem services;
- *Open trading between buyers and sellers under a regulatory cap or floor* on the level of ecosystem services to be provided;
- *Self-organized private deals* in which individual beneficiaries of ecosystem services contract directly with providers of those services; and

- *Eco-labeling of products* that assures buyers that production processes involved have a neutral or positive effect on ecosystem services

While several mechanisms of compensating have been developed covering various types of environmental services, it is necessary to examine how effective are these schemes in their functioning under different conditions like poverty, environment, institutions and market. Compensation mechanism is being seen as a tool for natural resource management and also for poverty reduction. The effectiveness of CES in achieving these objectives depends upon several related factors – poverty, environment, institutions and market. Each of these factors significantly influences the functioning of CES. In this paper we attempt to illustrate how PES schemes would be effective under conditions of poverty in Asia. This study is based on review of literature related to PES. Literature available on PES programmes, other resource management programmes having features of PES and which could be

developed as PES schemes, if desired so by the resource managing agencies are considered in this paper.

#### Payment for Ecosystem Services Schemes in Asia

PES schemes have been catching up the attention of policy makers around the globe, particularly after the Kyoto Protocol Agreement. However, it should be noted that implementation of these schemes is a recent development, sparse in terms of coverage of area and environmental services. This section outlines features of some of PES or PES like schemes in Asia

Table 1 illustrates some of the resource conservation programmes having features of PES schemes. According to the table majority of the programmes with PES characteristics are implemented in the areas of watershed development, forest, biodiversity, medicinal plants and Clean Development Mechanism (CDM). CDM, which is considered as PES based approach, has been implemented rather sparsely.

**Table-1: PES Schemes in Asia**

	Name of the Scheme	Location (State/Country)	Type of Environmental Service	Major Features	Compensation Mechanism	Remarks
1	Sukhomajri Watershed Development- Tradable water rights system and user fees (Source: Landell-Mills, N Website: <a href="http://www.rinya.maff.go.jp/faw2002/32%20%20N.%20Landell-Mills%20(S.%20Vermeulen)%20(IIED).pdf">http://www.rinya.maff.go.jp/faw2002/32%20%20N.%20Landell-Mills%20(S.%20Vermeulen)%20(IIED).pdf</a> )	Haryana/India	Watershed	- Check dam construction - Controlling soil erosion, thus sedimentation in the Lukna Reservoir - to increase the dry season flows -	- another irrigation dam was built as an incentive to farmers for their participation in watershed conservation activities - first, a benefit-sharing system, which provided tradable water rights to all households (catchment and command area) - Recently tradable water rights scheme has been abandoned in favour of water user fees, because of the fluctuations in water availability – the amount collected is channelled through the Water Users Association to be spent on dam maintenance and watershed protection activities.	
2	Watershed Development (Source: John Kerr World Development)	Maharashtra/India	Watershed development	Restricted access to common lands under watershed projects – <b>Provision of employment</b> Training of women in activities such as the use of		Reduced access to fuel wood Decrease in the availability

				improved cookstoves, tailoring or raising of plants and trees that could be used in watershed programme		of products from common lands over the years Impact on women and herders.
5	Joint Forest Management – 1990 (Source: <a href="http://www.iascp2004.org.mx/download/paper_432.pdf">http://www.iascp2004.org.mx/download/paper_432.pdf</a> )	Tamil Nadu/India	Forest	- not a CES programme, but has the main elements of CES - activities such as steps for inducement of natural regeneration, seeding, soil conservation methods, fire protection, maintenance of boundaries, weeding, tending, thinning, etc - no rights over land - No grazing or agriculture is allowed on the site	- usufructuary rights to items as fodder, fuelwood, loppings and minor forest products - A share in the proceeds from the sale of trees when they mature - Poor and landless given preference - Returns from the sales of surplus forest products, keeping 25 % to Village Development Fund, shared equally among the members - 75 % of the Village Development Fund spent on those who last access to forest due to JFM implementation	
6	Participatory Utilization and Conservation of Medicinal and Aromatic Plants: A Case from Western Nepal Himalaya Source: Bhisma P. Subedi [9] Asia Network for Small Scale Bioresources (ANSAB) A paper presented in Conference on Medicinal Plants, Feb 16-19, 1998, Bangalore	Nepal	Conservation of Medicinal and Aromatic Plants in Western Nepal Himalaya	Conservation and development strategies for improving economic and environmental conditions for the benefit of local community members in a sustainable and equitable way. The major activities undertaken in this endeavor include enterprise development, marketing, local capacity building, proper allocation of property rights, institutionalization of resource management systems, and monitoring and evaluation.	Providing an incentive to local communities to identify and take action against both internal and external threats to biodiversity.	
7	Participatory forestry on degraded forest lands (Source: Kallesoe and Alvis 2004) - implemented between 1993-2000	Srilanka	Forest	- not a CES programme, but has main elements of CES  Reducing deforestation and improving household livelihoods by promoting co-management and agro-forestry facilitate	After the 15th year commercial thinning would be allowed In the initial phase of the project participating households were also provided with food	

				reforestation, by issuing lease agreements to farmers and by adopting a participatory approach to forest management - focus individuals	coupons in return for labor Provision of food, timber and income from the trees planted	
8	Upper Watershed Management Project (UWMP) (Source: Kallesoe and Alvis 2004) - Implemented between 1998 - 2005	Srilanka	Watershed	- not a CES programme, but has main elements of CES to address management issue - providing lessons learnt facilitating the development of a national watershed policy, - engaging local communities in forest management and applying a pro-poor approach to rehabilitation and conservation activities, specifically focusing on the upland poor - focus community	- Harvesting timber upon completion of the lease (25 years) - Technical assistance, seeds and plants were provided - Bee keeping and livestock raising were introduced as alternative livelihoods. - Micro credit scheme for the establishment of small timber farms, which acted as a financing mechanism to cover initial costs.	
9	Energy Services Delivery Project (ESDP) & Renewable Energy for Rural Economic Development Project (REREDP) (Source: Kallesoe and Alvis 2004)	Srilanka	Energy	- not a CES programme, but has major CES components - providing poor rural areas with electricity by introducing village-operated micro-hydropower schemes		
10	Conservation and Sustainable Use of Medicinal Plants Project (Source: Kallesoe and Alvis 2004) – implemented in 1998	Srilanka	Medicinal Plants	- conservation of globally and nationally significant medicinal plant species and their habitats through (a) in-situ conservation by establishing five medicinal plant conservation areas, (b) ex-situ cultivation by promoting nurseries, homestead gardens, plantation cultivation and supporting propagation and agronomic research and (c) by providing information and institutional support as well as promoting an appropriate legal and policy environment. - promoting sustainable harvesting and conservation among communities living adjacent	- growing medicinal plants for commercial purposes has been promoted and created alternative livelihood opportunities. - Market access has been facilitated through the institutional setup - capacity building and training	

				to forests and other medicinal plant habitats		
1 1	Innovations and Application of Participatory Economic Planning for Conservation of Biodiversity and Water Resources in the Knuckles Range of Forests (Source: Kallesoe and Alvis 2004) - 2002	Srilanka	Biodiversity and Water resources	- not a CES programme, but has major CES elements - to promote community participation in forest conservation by developing alternative sources of income, which relied on conservation efforts - sustainable agricultural practices were introduced and income generating conservation supporting initiatives (e.g. eco-tourism) were undertaken based on a principle of benefit sharing and local participation - Environmental services are being provided in the form of biodiversity conservation, carbon sequestration, watershed protection and landscape beauty	- Eco-tourism - Income generation through eco-tourism activities	
1 2	Climate Change Enabling Activity Project (CCEAP)– (phase II) (Source: Kallesoe and Alvis 2004) – initiated in 2001	Srilanka	Climate change – CDM	- not a CES programme, but has major CES elements - to assess the impacts of climate change on the different sectors of the national economy i.e. by conducting vulnerability studies - to develop an adaptation strategy; - to recommend mitigation measures needed to offset and limit potential impacts of climate change		

### Poverty and Effectiveness of PES Schemes

How do PES schemes function under conditions of poverty? Development of PES schemes and the degree of their effectiveness to a large extent depend upon their performance under the conditions of poverty. Poverty determines functioning of PES schemes through ability of participants either in selling or purchasing ecosystems services. Various dimensions of poverty like lack of property rights and tenure over resources, lack of knowledge about market, etc., adversely affect marketing of ecosystems services, while low affordability, etc., restricts purchasing power of individuals.

### Poverty Level in Asia

Poverty is a condition where people barely capable of meeting their basic needs such as food, shelter and cloth. Poverty is being measured by drawing a poverty line, which varies from country to country, which is usually expressed in terms of income to acquire the basic needs. The World Bank defines the poverty line at \$ 1 per day and states those with less \$ 1 per day are in poverty line. Poverty is widespread in most of the Asian countries as higher proportion of population, over 20 per cent, live below poverty line in more number of countries, indicated in Table 2. Across rural and urban areas, poverty is high among rural people, who directly depend upon on ecosystems services for their livelihood.



Table-2: Poverty Level in Selected Asian Countries

Sl. No.	Countries	Population in Poverty (%) by National Poverty Line <sup>a</sup>			
		Total	Urban	Rural	Reference Year
	<b>East Asia</b>				
1	China	4.6	2.0	4.6	(1998)
2	Mongolia	35.6	39.4	32.6	(1998)
	<b>Southeast Asia</b>				
3	Cambodia	35.9	18.2	40.1	(1999)
4	Indonesia	18.2	14.5	21.1	(2002)
5	Lao PDR	38.6	26.9	41.0	(1997)
6	Malaysia	7.5	3.4	12.4	(1999)
7	Myanmar	22.9	23.9	22.4	(1997)
8	Philippines	30.4	...	...	(2003)
9	Singapore	...	...	...	
10	Thailand	9.8	4.0	12.6	(2002)
11	Viet Nam	28.9	6.6	35.6	(2002)
	<b>South Asia</b>				
12	Bangladesh	49.8	36.6	53.0	(2000)
13	India	28.6	24.7	30.2	(2000)
14	Maldives	43.0	20.0	50.0	(1998)
15	Nepal	30.9	9.6	34.6	(2004)
16	Pakistan	32.6	25.9	34.8	(1999)
17	Sri Lanka	25.0	15.0	27.0	(1996)
Source: Asian Development Bank (ADB) - Key Indicators 2005 ( <a href="http://www.adb.org/statistics">www.adb.org/statistics</a> )					
Note A:	When available, official poverty lines are used. In some countries, no official poverty line is available, and data may have been computed by non-governmental agencies.				

### Relationship between Poverty and PES

Ecosystems provide goods and services, which are main livelihood source for poor people, particularly in rural areas. More than half of the poor live in rural areas and are disproportionately affected by environmental degradation. The United Nations Millennium Development Goals (MDGs) aim to halve the number of people living in poverty by 2015. But, the Millennium Ecosystem Assessment reported that degradation of environmental services is a significant barrier in achieving the MDGs. It is expected that the consumption of important environmental services, which is often unsustainable, will grow rapidly, compounded by climate change and excessive nutrient loading. Furthermore, it also states that the harmful effects of environmental service degradation are being borne disproportionately by the poor, and are often the principal drivers of poverty. The report points out that any progress achieved in addressing the MDGs of poverty and hunger eradication, improved health, and

environmental sustainability is unlikely to be sustained if most of the environmental services on which humanity relies continue to be degraded [6]. This clearly indicates the links between environmental services and poverty.

There is a close relationship between poverty and PES schemes. Conservation of resources helps poor people to obtain ecosystems services for long time, while protecting the environment. PES schemes might also influence level of poverty in different ways. While in some cases it can reduce poverty among people, in other instances it may impact negatively on poverty reduction. The negative impact may be occurred when PES schemes do not provide adequate reward, due to factors like property rights, tenure and also reward distributed disproportionately among poor people. Table 4 illustrates the potential impacts of PES schemes on poor people.

**Table-4: Potential impacts of PES programs on poverty<sup>a</sup>**

Providers	Potential impact	Extent of impact depends on	Comments
<b>Participants</b>			
Land owners with secure tenure	Income from PES (+)	<ul style="list-style-type: none"> <li>• Amount of payment (+)</li> <li>• Opportunity cost (-)</li> </ul>	
Land owners with insecure tenure	Income from PES (+)	<ul style="list-style-type: none"> <li>• Amount of payment (+)</li> <li>• Opportunity cost (-)</li> <li>• Ability to participate (+)</li> </ul>	Efforts by politically powerful groups to seize more land? (-)
Tenants	Income from PES (+)	<ul style="list-style-type: none"> <li>• Amount of payment (+)</li> <li>• Opportunity cost (-)</li> <li>• Division of benefits with landlord</li> </ul>	Change in landlord's willingness to rent? (-)
Downstream service	Pay for PES (-) Receive services (+)	<ul style="list-style-type: none"> <li>• Amount of payment (-)</li> <li>• Consequences of lack of PES program (+)</li> </ul>	
<b>Nonparticipants affected by PES</b>			
Farm workers	Change in labour demand (+/-)	<ul style="list-style-type: none"> <li>• Relative labor needs for PES-promoted practices compared to current practices (+/-)</li> <li>• Other employment opportunities (+/-)</li> </ul>	
People dependent on NTFP collection	Change in availability and access to nontimber products (+/-)	<ul style="list-style-type: none"> <li>• Nature of current and PES-promoted practices (+/-)</li> <li>• Local context</li> </ul>	

<sup>a</sup> Hypothesized impacts: (+) positive impact: poverty reduction, or increased welfare of the poor; (-) negative impact: poverty increase, or reduced welfare of the poor; (+/-) uncertain impact: depends on case-specific circumstances

Source: Pagiola S., Arcenas A., and Platais G. (2005) 'Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America', *World Development*, Vol. 33, No. 2.

As pointed out by the Millennium Ecosystem Assessment, availability and method of utilizing ecosystem services has direct relationship with poverty. Degradation of resources would increase poverty and also make poor people more vulnerable. Hence, resource use mechanisms have to address the issue of poverty reduction, while also conserving the resource. In this regard, PES schemes have been looked as a tool to reduce poverty by diverting some part of the benefit derived by resource users to service providers. For instance, in the case of watershed downstream users paying for the upstream people for practicing conservation methods to protect watershed from soil

erosion, water quality, etc. It should be noted that in the beginning PES was conceptualized as a tool for resource management, than as a mechanism for poverty reduction. However, in recent years the positive impacts of PES on poverty have been identified, which motivated to consider PES as a tool for poverty reduction. Pagiola *et al.* [7] opines that the main mechanism by which PES would contribute to poverty reduction is through the payments themselves, which are thought to go mainly to poor land users. However, it should be noted that the CES programmes might also create negative impacts on poor (see Box 2).



<b>Box 2: Impacts of markets for key assets held by poor households</b>	
<p><b>Potential benefits</b></p> <p><i>Natural assets</i></p> <ul style="list-style-type: none"> <li>• Increase forest values due to improved management and new market opportunities</li> <li>• Where markets lead to regularization of land tenure, this raises value of natural assets</li> <li>• Positive spin-offs for other natural assets, e.g. soil fertility and agriculture, water flows and quality, air quality due to reduced forest fires</li> </ul> <p><i>Physical assets</i></p> <ul style="list-style-type: none"> <li>• Infrastructure development – transport, market infrastructure, research, health care</li> </ul> <p><i>Human assets</i></p> <ul style="list-style-type: none"> <li>• Education and training – environmental management, enterprise development, project management, marketing, negotiations, etc.</li> <li>• Improved health– more varied diets, improved water supply (quantity and quality), improved air quality, investment in health clinics, improved disposable income for medical treatment</li> </ul> <p><i>Social assets</i></p> <ul style="list-style-type: none"> <li>• Increased tenure security where markets spur rights formalisation</li> <li>• Increased managerial and organizational capacity of community-based organizations to tackle common problems</li> <li>• Protection of forest-based cultural heritage</li> </ul> <p><i>Political assets</i></p> <ul style="list-style-type: none"> <li>• Increased political representation and voice due to improved organizational capacity (see social assets above) and contacts in private and public sector.</li> </ul> <p><i>Financial assets</i></p> <ul style="list-style-type: none"> <li>• Income from sales of environmental services</li> <li>• Income from related employment (e.g. NTFPs, fuelwood, timber, ecotourism, transport)</li> <li>• Improved security and stability of income due to diversification</li> </ul>	<p><b>Potential risks</b></p> <p><i>Natural assets</i></p> <ul style="list-style-type: none"> <li>• Last access and use rights due to increased competition for resources</li> <li>• Last use values (e.g. timber and NTFP) where new harvesting restrictions imposed</li> <li>• Negative spin-offs for other natural assets, e.g. worsened water quality due to replacement of natural forests with fast-growing plantations for carbon sequestration</li> </ul> <p><i>Physical assets</i></p> <ul style="list-style-type: none"> <li>• Dismantling of local infrastructure, e.g. roads, to ensure sustained supply of environmental services</li> <li>• Increased inequality with investment in physical infrastructure targeted at certain market participants</li> </ul> <p><i>Human assets</i></p> <ul style="list-style-type: none"> <li>• Inappropriate education diverts spending away from broader skill development</li> <li>• Poor capture few educational and skill development opportunities since offered only menial jobs</li> <li>• Reduced health where poor are excluded from collecting NTFPs for domestic consumption and last disposable income</li> </ul> <p><i>Social assets</i></p> <ul style="list-style-type: none"> <li>• Reduced tenure security where markets lead to displacement of poor who lack formal property rights</li> <li>• Erosion of cooperative arrangements due to increased divisions between those that gain and lose.</li> <li>• Threats to cultural heritage where markets and commercialization undermine local value system</li> </ul> <p><i>Political assets</i></p> <ul style="list-style-type: none"> <li>• Loss of political representation where markets lead to increased competition for resources and exclusion of poor from forest areas.</li> </ul> <p><i>Financial assets</i></p> <ul style="list-style-type: none"> <li>• High costs of bringing services to market (transaction costs and opportunity costs) means many poor suppliers excluded</li> <li>• Income associated with forest exploitation may fall due to new restrictions.</li> <li>• Poor excluded from new markets since lack necessary skills and assets</li> <li>• Reduced security where contract design is inflexible (e.g. long-term contracts do not allow suppliers to respond to short-term shocks)</li> </ul>

Source: Landell-Mills, Natasha and Ina T Porras [8] Silver Bullet or Fools' Gold: A global review of markets for forest environmental services and their impact on the poor, International Institute for Environment and Development (IIED), London.

While attempts are being made to develop PES as a mechanism for natural resource management and poverty reduction, one needs to look at the effectiveness of PES under poverty. How do PES schemes would perform when majority of the participants are poor? Considering the positive and

negative impacts it is necessary to address issues such as (i) who are the actual and potential participants in PES, and how many of them are poor? (ii) what are the obstacles to the poor's participation in RES? and (iii) what are the impacts of PES on participants, while

understanding the poverty dimensions of PES schemes [7].

When environmental services form livelihood base, particularly for poor, functioning of PES schemes may be affected in several ways, depending upon composition of poverty among environmental service providers and buyers. Poverty may be seen in different dimensions, in terms of lack of resources/ assets, low income, lack of property rights and tenure, lack of social capital like education, health etc. Performance of PES schemes further, depend upon the number of participation and magnitude of potential impacts on labour, food crop and other markets [7].

PES schemes seek people to participate in resource conservation or use without modifying or damaging much of the ecosystem. These practices might reduce income of participants, for instance, income declines in initial stages of organic farming. Any fall in income does not motivate people for participation. Further, effective functioning of PES schemes requires collective participation by community, but poverty and dependence on natural resources for livelihood limits participation. Households decision to participate in PES program depends some factors – (1) factors that affect the eligibility to participate, (2) factors that affect their desire to participate and (3) factors that their ability to participate [7]. In order to increase participation and be effective, PES schemes need to be profitable, particularly to poor. PES schemes need to provide more income than people were getting from their earlier resource use practices, or there should be additional income when people adopt environmentally benign uses of ecosystems.

Similarly, lack of property rights, improperly defined property rights and tenure insecurity are also cause poverty, and these features in any community work as hindrance to the functioning of PES schemes. Absence of property rights and fixed tenure for resource use may not motivate people for investment and management of natural resources for conservation. Under these circumstances PES schemes might not function effectively. Implementation of PES schemes may benefit only property rights holders and those who do not possess property rights may be left out from the programmes.

Performance of PES schemes vary under the following three situations, when (1) both service providers and buyers are poor, (2) only service providers are poor, and (3) only buyers are poor. In circumstances where both service provider and buyer groups have large number of poor people PES schemes likely to be less effective in terms of their participation. Lack of resources, property rights and tenure limits the capacity of service providers to participate in negotiation for creating market for environmental services, while inadequate affordability among buyers

also restricts their participation in negotiation. This definitely cripples the process of market development for ecosystems services.

When environmental service providers are poor and buyers are rich, service providers may not participate effectively in the market for environmental services because of the above mentioned problems. Although buyers can afford to pay for services, lack of resources and property rights restricts emergence of market and thus trading of services. Hence, PES schemes may not function effectively. In majority of ecosystems, service providers generally live in upstream areas modifying ecosystem for their livelihood. Distribution of poverty in any particular ecosystem varies between upstream and downstream areas. As evidences reveal upstream areas possess more number of poor people than downstream areas [7]. However, this situation can be altered to develop a market for environmental services by establishing well defined property rights and resources to poor and making them to participate in conservation activities.

Functioning of PES schemes also differs when large numbers of buyers are poor, while sellers are rich. Buyers' community, having large number of people poor, lack purchasing power, and hence may not participate in environmental services market, which leads to non-functioning of PES market. Similarly, wealthy sellers also may not participate in environmentally friendly uses as it may reduce their income. In these circumstances, it is necessary for the PES schemes to provide higher rewards to motivate people.

## CONCLUSION

Life support needs of ecosystems services have necessitated conserving and protecting ecosystems. PES is one of the schemes gaining importance as a measure of natural resource conservation by providing rewards or incentives for the practitioners. Although PES schemes are recent development more significance is being attached by many governments, policy makers and individuals, as an important mechanism for resource conservation. Number of countries particularly Latin American are implementing PES schemes as a way of protecting ecosystems. However, effective functioning of PES schemes depends upon various factors like poverty, institutions, market, etc. The close relationship between poverty and environment impacts differently on poverty and also functioning of PES schemes. Studies have revealed both positive and negative impacts of PES schemes on poverty. Similarly, under the conditions of poverty PES schemes are less likely to be effective depending upon different dimensions of poverty. However, these schemes may be developed as pro-poor provided adequate measures are taken to ensure that the rewards are enough to motivate poor farmers to participate in resource conservation activities and also equitable distribution of rewards.

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