Article **ECORFAN Journal**
December 2017 Vol.3 No.5 1-14

Environmental Services: Between Conservation and Use of Resources; Public Policy Recommendations

OLIVERA-VILLARROEL, Sazcha Marcelo*† & HERNADEZ-MURILLO, Ricardo

Universidad Autónoma Metropolitana
Banco Mundial

Received June 30, 2017; Accepted September 15, 2017

Abstract

The study addresses the issue of environmental services from the perspective of providing public goods and services, which must be regulated and regulated by the State. For this, a quantitative approximation is made that gives context to the proposed public policy recommendation. The main objectives of public policy recommendations are the conservation of plant coverage that provides environmental services to society. The conservation of the territory through the payment of the environmental service is a policy that crosses transversally, not only the environmental context, but also the social context; since it is recognized the contribution to the productive system of conservation efforts and resource management of peasant communities and national, departmental and municipal protected areas systems

Environmental services, Forest systems, Public policies, Land use, Natural resources

Citation: OLIVERA-VILLARROEL, Sazcha Marcelo & HERNADEZ-MURILLO, Ricardo. Environmental Services: Between Conservation and Use of Resources; Public Policy Recommendations. ECORFAN Journal-Republic of Peru. 2017, 3-5: 1-14.

* Correspondence to Author (email: satzcha@msn.com)
† Researcher contributing first author.

Introduction

The recognition of the services provided by the natural system to the existence of the planet, as we know it, is manifested in the multiple efforts that are generated in the world for its conservation and management. One of the efforts that has received the greatest boost in recent years is the payment of environmental services for the conservation of forest systems (Pagiola et al, 2014, Ruíz Perez, 2007).

This leads to the implicit recognition of the importance of the forest in the generation of environmental services, even when there is no research to corroborate this relationship explicitly (Pagiola et al, 2014, Ruíz Perez, 2007).

Given the relatively small participation in employment generation and in national income, national decision makers assign low priority to forest conservation and management activity compared to other sectors that compete for limited budgets, including in the environmental sector. (FAO, 2015).

For this reason, the creation of innovative financial mechanisms such as the payment of environmental services for the generation of water resources has been promoted.

It is precisely the use of water, as the main element and input of human activity, that has generated interest in conserving the sources from which the economy of this vital element is provided.

But this is only one of the services provided by the natural environment to human activity and analyzing it separately destroys the conception of the ecosystem that encompasses the management and conservation of natural systems, especially forest systems.

The services generated by a forest system or any natural environment are part of a system in which the interrelation and dependence of the parties is latent; therefore, administration policies must go to the management of the entire environment and not only of one of its parts (Landell-Mills and Porras, 2002, Bishop et al, 2012).

This recognition of the integrality of environmental services must be done from an ecological, economic, and social perspective and from a resource management approach; since in fact when paying for a service, for example biodiversity, we are conserving the forest in an integral way.

Otherwise, it would be recharging the costs of handling all services to only one group of users, in the case of payment for environmental water services, to potential users of the water service.

Rural landscapes contain stocks (stock) and generate flows (flow) that are used by the population in their existence and in their productive activities. These environmental assets and services provide benefits to the population in an area of influence greater than that of its landscape environment.

The physical sciences help us to understand the existences and flows of energy; while the economy accounts for them as positive externalities, which bring benefits to economic activities outside the area (Jackson, Robert B. et al., 2005).

Research, in this sense, will use environmental economics, ecology and processes of social organization as methods of analysis. To do this, tools from these disciplines will be used, starting with the division of environmental services between claimants and suppliers of the same, but based on existing systems and plant covers in an environment.

ISSN-On line: 2414-4819

From this analysis, public policy recommendations will be derived, which will have as a central axis the conservation of vegetation coverage that provide environmental services to society as a whole.

The conservation of the territory, through the payment of the service provided, is a policy that traverses not only the environmental context, but also the social context by recognizing the importance within the productive system of the peasant communities and the systems of protected areas national, departmental and municipal.

Offer of environmental services. The opportunity cost and the willingness to accept a payment from forest owners and / or managers

The characterization of environmental services in Bolivia starts by differentiating three large zones that have soil cover and differentiated management processes among themselves.

The first is the Andean area, the second is the sub-Andean region and the third are the great Amazonian plains and Chaco. These zones not only differ in their type of coverage but also in their management system and land use determined by their historical and social context.

Each of these regions has its own biogeographic characteristics with a set of flows of environmental services coming from them, for example: the endowment of water sources, stable rainfall, soil composition, type of vegetation cover, etc.

Based on these characteristics and services, society decides the function that will be given to its environment among urban, agricultural, livestock, forestry and conservation uses, among others.

This change in use starts to a large extent from the demands of society in the generation of goods and services for their subsistence and growth. Decision-making for this process of change is not easy and includes not only an economic decision, but a social and cultural one.

Unfortunately, considering environmental services as freely accessible goods and not recognizing the positive externalities provided by the environment, our society has been justly destroying the characteristics that led to use these areas for each of the functions it has been developing for the society (Olivera and Hernadez, 2016)

The greatest pressure to change land use is usually in the conversion of areas of high-quality agricultural use to urban areas, with the consequent increase in the pressure to open new cultivation areas with the substitution of forest areas or other types of soils. So appropriate for agriculture.

This leads to the loss of significant extensions of land surface with vegetation cover that provide other types of environmental services that are ultimately more valued by the economy than agricultural or livestock use..

The distribution of land in Bolivia

The current distribution of land in Bolivia stems from the agrarian reform process that began in the early 1950s. Until 1992, the reform process legally distributed 43% of Bolivian territory to approximately 620,000 beneficiaries, but due to an undue process of land appropriation especially in the eastern region of the country, it is decided to change the distribution system and initiate a process of sanitation of titles through the enactment of law No. 1715 of the National Agrarian Reform Service in 1996. (Sanjines, 2005)

ISSN-On line: 2414-4819

This process of land sanitation, which is still in process, it should be noted that 52% of the territory does not have its proper title, so the legal status of these territories is still in question. Many of these territories belong to the national system of protected areas (20% of the territory), to indigenous communities of the Amazon region and the Andean region of the country.

The Payment of Ambient Services

The payment for environmental services -PSA- consists of the process of direct compensation to the owners, administrators or users of the land for the environmental services they produce (Pagiola et al, 2014). In this way, direct incentives are generated so that the owners or users of the land include these services in their decisions on land uses. Both Costa Rica and Mexico, among others, have explored this type of payments for the best conservation of their forest cover and the maintenance of their systems and natural environments.

The methods of payment, with more than 800 cases documented to date worldwide, range from cooperative agreements -intra and intercommunity-, to true derivatives markets such as the Clean Development Mechanism of the United Nations Framework Convention. on Climate Change.

The inherent difficulty in measuring "intangibles" as the positive externalities of the forest have been called, has led the different contracting parties to adopt various proxies in order to evaluate compliance with the agreements (Mendoza and Garbarino, 2016)

In local bilateral agreements, the "buyer" usually has an idea of the driving behaviors that he wishes to modify or incentivize, as well as the objective manifestations of them.

Even in more complex cases such as the Catskills, the formulation of a management plan per farm has allowed identifying specific actions and parameters such as the construction of a bridge to channel the passage of livestock without affecting the course of the stream.

In massive programs such as calls for payment of environmental services operated by forest authorities, the simple conservation of a parameter such as the percentage of forest cover, is agreed as the indicator synthesis of control of pests, fires and illicit, essential for the conservation of the forest. forest.

In the biodiversity projects, indicator species are usually adopted that, in the same way as the canopy cover, can summarize a series of processes that would guarantee the conservation of said species.

Two currents of thought are faced in daily practice:

a) That which sustains the social relevance of forest conservation and the willingness to pay of society that explains the existence of bilateral agreements and public programs, tariffs, subsidies, investments and conditional transfers to the conservation of the source of environmental services.

b) Those who would like to condition social action to a scientific certainty based on means of measuring environmental services whose complexity makes it difficult to adjust reality to a simple model where there is a producer and a user and in which their agreements are conditioned to monitoring of the fulfillment of precise parameters that would be based on a scientific knowledge always in construction (Bishop et al, 2012).

ISSN-On line: 2414-4819

In the first case we are witnessing a treatment of "public good" where society is more interested in the preservation of natural capital and environmental service-aware of the cost to society in case of losing them-and the need to build institutions (social agreements and rules) that guarantee the willingness to pay and exclusion from the free rider given the difficulty of exclusion intrinsic to the positive externalities generated by forest ecosystems.

Without ignoring the need to advance in the efficient allocation of costs and the benefits of their care, this current warns about the risks of trying to achieve it based on models limited to known and measurable variables that do not manage to capture the dynamics of these systems complex.

In the second case, scholars (and some detractors) ignore the strategic dimension of a social phenomenon such as the emergence of the environmental services market, convinced that only positive knowledge of the variables of a linear model of cause and effect that explains the anthropogenic conditions for the provision of a service (and the evidence to "convince" a potential buyer) will generate a market that guarantees not only its permanence but also the greater efficiency in the allocation of costs and benefits as if the objective were limited to the generation of private goods (products), when the challenge lies precisely in the preservation of the complex system of stocks and flows generated by ecosystem services valued by society.

The owner's decision to conserve the forest, improve its management or change land use:

Basic stages in the decision of the forest owner

- Identification of opportunities sets.
- Definition of the disjunctive.
- Correct calculation of costs: opportunity, irrecoverable, marginal

The set of opportunities shows what are the options that the owner of the land has, regardless of whether this is a small, a large owner or the State itself. Each of these actors will have preferences, budget and time constraints that limit the set of real options for each actor. Even within the restrictions there can be a strong trade-off between the real options, and what the correct calculation of costs will have to contribute is an objective weighting when analyzing the options.

Due to the nature of the stock of natural capital required to guarantee the flows of environmental services, the contractual arrangements have to be medium and preferably long-term.

The declaration of protected natural areas, the ecological easements or "land easements", and the contracts of adhesion to programs of compensation for the environmental services of the forest and the conservation of the hydrological basins are all instruments to ensure the natural base of an economic activity, in the long term (Olivera and Hernandez, 2016).

On the other hand, the economic environment that has characterized agricultural production, the main cause of change in the use of forest land in the 60s and 70s, especially in the last 30 years, is one of great uncertainty: a) the industrial revolution ended, the State has stopped supplying supplies, credit and rural extension, there are no longer guarantee prices and subsidies; and b) commercial openness confronts rural producers with subsidized competition from North America and Europe.

Agricultural activity has become, at least for the moment, a high-risk activity that increasingly demands more inputs and capital, and that offers ever lower profit margins with lower certainties of income generation.

ISSN-On line: 2414-4819

The owner of the land may be convinced that we are going through a process of revaluation of planetary natural resources, surely he shares the vision of Mark Twain who advised: "son, buy land, they are not doing more!". But the truth is that the market today still does not reward it. The return of their productive activity is not recognized, but the rural owner clings to the land for cultural reasons or because he senses the future value of his assets (Olivera and Ferro, 2016).

In this context, a medium or long-term instrument may be attractive that guarantees an income that, although modest, allows it to: a) minimize its present risk, and b) preserve its option value.

In addition to the strictly economic certainty, the institutional arrangements that promote the Payment of Environmental Services, explicitly or implicitly, also constitute an acknowledgment of rights over environmental services and, therefore, over the ownership of the land and the biological resources that produce them.

Property rights

In addition to the ex ante condition proposed by Coase to ensure efficient exchange and allocation through the market, the allocation of property rights is the greatest social, legal and economic challenge in the case of environmental services. The possibility of claiming property rights and the ability to exclude is, in fact, simpler in some goods: historically in the goods produced by the artisan-man. The greater difficulty of claiming property rights and the exclusion of their benefits from "stowaways" or free riders, has always depended on the construction of institutions that regulate legitimately and effectively.

A good as "intangible" as the contribution to climate regulation through the function of carbon "sink" that forests exercise, has been strictly regulated by the Clean Development Mechanism, demonstrating in a paradigmatic way, how institutional construction can effectively handle the difficulty of exclusion present in these goods.

To understand the process of appropriation / allocation and subsequent commitment of rights over environmental goods and services, it is useful to disaggregate them as follows (Rosa et al, 2004):

- Access: Right to enter a defined physical space and enjoy non-extractive benefits, such as recreational activities.
- Withdrawal: The right to extract resources or products from a system (eg fishing, firewood, water for irrigation or human consumption, etc.).
- Management: Right to regulate internal use patterns and transform the resource.
- Exclusion: Right to determine who has rights of access, withdrawal, management, and how these rights are transferred.
- Disposal: Right to transfer management and exclusion rights.

From the review of cases it can be concluded that the main actors affected by PES schemes are the owners or forest owners.

For owners of natural resources, the implications of the Payment for Environmental Services schemes identified include (Madrid, 2006):

- Change in land ownership.
- Total or partial restriction on access and use of biological spaces and resources.
- Changes in management practices.
- Without changes.

.

ISSN-On line: 2414-4819

Demand for Environmental Services. The Willingness to Pay for Change in Land Use

It can be said that all the inhabitants of the earth are demanding environmental services, being able to demand services from a local, regional or global perspective. Environmental services in most cases are in fact a public good, so they must be treated as such. The classic definitions of public goods and services attributed to them as characteristics: non-rivalry and non-exclusion in their consumption, as well as being a good or service of free access. The recognition of the actual or future shortage of services reflects the emergence of rivalry in a good that, with being public, begins to show its finitude and the recognition of the complexity of the forest ecosystems that produce them has led to the construction of institutions (agreements and rules) that allow the exclusion and "payment" to the owners or "caretakers" of the forest.

This implies that the management of environmental services policy, especially those considered public services, must start from a system of market regulation, this implies that in its analysis all the problems of the provision of public goods intervene. This does not exclude the possibility of agreements between private parties that generate service exchange agreements for a specific payment.

To develop the management of public goods from the economic perspective, Samuelson's rule on the optimal distribution of public goods can be used. Which is a general theoretical construction that indicates that society should optimally provide a public good until the sum of the marginal rates of substitution between the public good and the rest of the private assets of society equals the marginal rate of transformation of the production of this public good by society. (Sterner, 2003).

This rule can answer the following type of questioning: how many hectares of forest would be willing to substitute to obtain so much wood or other goods from the forest? In a competitive society, forest areas should expand or contract until the value of the sum of the marginal rates of substitution of forests by other goods among all individuals decreases and equals the marginal rate of transformation of forests by other goods (Vogel, 1994).

For the case of the conservation of the biological diversity and with it the environmental services that it provides, it supposes a direct policy: all the simultaneous values generated by the biological diversity and the environmental services that it provides are added and it is recommended to conserve the habitat until the The cost of the last hectare conserved equals the increasing added value.

However, there is a fundamental theoretical problem in the methodology: preferences are unstable throughout human generations and any recommendation based on current preferences may result in underestimated values of the preferences of future generations (Vogel, 1994).

Therefore, to maintain a minimum of areas that conserve biological diversity, society should not be guided by economic criteria but by minimum safe standards - the precautionary principle- (Declaration Rio, 1992).

What happens with the rest of the areas that contribute biological diversity and environmental services to society; but that fall outside the priority conservation areas ?, should we leave them aside? For this type of environments that provide environmental services for society but that are framed in the competitive management with other types of land uses, if it is possible to use Samuelson's rule (Duran, 2103).

ISSN-On line: 2414-4819

For this, the change in preferences over time must be taken into account. This implies that it is possible to calculate the contribution of environmental services to the society of these environments and from them determine which habitat to conserve and to what extent; but only in a timely manner at a moment in time, since their contribution must be modified according to the changes in society's preferences.

The owners of the forest and of any natural environment decide to conserve, restore and / or use in other activities portions of the territory according to the preferences and the benefits that their natural environment provides them.

Therefore, if there is a willingness on the part of society to recognize economically the services provided by the natural environment, forest owners will have an additional element to analyze the conversion of the forest to other activities or its conservation as a natural environment.

Therefore, using Samuelson's rule, we will see the contribution in value of these services to the economy in general, that is, the demand for them. Based on this argument, policies of conservation and management of the areas that provide these services will be postulated.

Calculating the willingness to pay for the change in land use

For this calculation process, the definition of the second part of Samuelson's rule will be used, that is, the marginal rate of transformation of the production of this public good by society will be used. That is, we will see the marginal contribution of public goods provided by natural environments to the production of the economy as a whole.

For this, an indirect technique will be used, which is to calculate the contribution of the entire natural environment of an economy within the production function of society, that is, the territory is considered explicitly as an input of the aggregate production function . This allows to obtain the value of the marginal product of the natural environment

$$Y = f(N, P, K, S, L) \quad (1)$$

It will be considered a production function with three productive factors, capital made by the hand of man or artificial (K), natural inputs understood as the environment as a whole (forests, pastures, agricultural land, etc.) (S) and the labor (L) and two indicators that affect factor productivity, environmental quality (N) and technical progress (P).

$$PMS = \partial f(N, P, K, S, L)/\partial S \quad (2)$$

We proceed to calculate the marginal productivity of the natural environment, which multiplied by the product gives us an approximate value of the marginal product of the environment, which varies from year to year according to the behavior of the product and the preferences of society.

$$marginal\ product\ value = PIB * \partial f(N, P, K, S, L)/\partial S \quad (3)$$

A series of assumptions must be used to approximate this phenomenon; it is considered that the environment provides society with a series of environmental products and services in aggregate form, so in a first stage it is only possible to calculate the average value of the marginal product of the environment, which is only the marginal value in joint divided by the total unit of analysis of the environment. There is a fixed amount of land but it has a variable demand over time, which is observed through the productivity index of the territory.

ISSN-On line: 2414-4819

The calculation process to determine the willingness to pay for the maintenance of environmental services, will start by determining, through an aggregate production function type Solow-Stiglitz (Belloc, 2008).

The marginal productivity of the natural environment, which multiplied by the product gives us an approximate value of the marginal product of the environment.

Weighting this value of the product by the surface unit of the environment, we obtain the average value that society is willing to pay for leaving the current use of the land in its current conditions.

From this point; since the environment is considered as an input of the production function, the particular demand of each one of its parts must be calculated as a demand derived from the productive process of the society.

The marginal contribution of each one of the parts of the environment is deduced from a system of equations that characterizes the behavior of each one of the types of vegetal coverages, from indices of production and behaviors in the agricultural population.

To do this, a unit of measurement of the natural environment must be used. In this case, surface units will be used, hectares of land (total surface area), differentiated according to the type of vegetation cover existing in the analysis environment, the higher the degree of differentiation the greater the degree of accuracy in the calculation of the contribution of each of the parties.

Although current systems for accounting for national income suffer from serious limitations, GDP remains the basis for evaluating the economic performance of different sectors of the economy (FAO, 2015).

Therefore, using this measure as a basis for the production function is only an approximation of the true process that generates the income of a country, but provides inputs from which government and society generate public policies for the allocation of resources.

The econometric model

The process was calculated to determine the willingness to pay for the maintenance of environmental services, starting by establishing the marginal productivity of the natural environment through an aggregate production function type Solow-Stiglitz (Belloc, 2008), with an exogenous technological progress that is observe a change in productivity of territory and labor force, where K represents the stock of capital of the economy, measured by gross fixed capital formation- FBKF; l represents the economically active population - PEA- corrected by the unemployment rate and multiplied by an activity index; S the natural environment- EN- expressed in surface units weighted by the productivity of the agricultural and non-agricultural environment:

$$\ln(\text{PIB}) = \beta_0 + \beta_1 \ln(k) + \beta_2 \ln(l) + \beta_3 \ln(s) \quad (3)$$

Which is framed in a system of equations that shows the behavior of the plant cover system

$$\ln(s) = \alpha_0 + \alpha_1 \ln(sa) + \alpha_2 \ln(PP) + \alpha_3 \ln(F) + \alpha_4 \ln(O) + \alpha_5 \ln(PA) \quad (4)$$

The databases of the "World Development Indicator" and the "FAO-Stat" were used in its 2015 version, the base used considers the years 1986 to 2002, it was chosen as the year of beginning 1986 because there is a significant structural change in the economy Bolivian year 1985, which introduces a lot of noise to the regression.

The method of minimum tables in two stages, allows to correct problems of multicollinearity in the system of equations, as well as to develop a consistent estimate that gives an inference that uses the interrelations of the system of equations.

Although the model allows to discuss beyond the average profitability of the type of plant cover, entering into this discussion takes the issue under debate from analysis, that is, the payment of environmental services through recognition as a productive input of the related services provided by each type of vegetation, especially forest and shrub cover.

Total area	Arable	Permanent Pastures	Forest	Other Type of Coverage	Adjustment by Agricultural Population
S	*Sa*	*PP*	*F*	*O*	*PA*
0.14937	0.0174	0.05128	0.05133	0.00814	0.0212

Table 1. Average Elasticity by Type of Vegetable Coverage.

By means of a small calculation, the elasticity of each one of the vegetal covers can be recovered by means of the multiplication of the partial elasticities, table Nº 3.

Year	Global	Arable	Permanent Pastures	Forest	Other Type of Coverage
1986	5.45	31.31	6.15	3.58	5.61
1987	5.99	34.02	6.76	3.95	6.02
1988	6.33	35.61	7.14	4.19	6.22
1989	6.50	36.20	7.28	4.31	6.44
1990	6.70	37.62	7.52	4.46	6.46
1991	7.36	40.56	8.18	4.91	7.31
1992	7.77	42.19	8.64	5.21	7.42
1993	7.90	42.03	8.69	5.32	7.68
1994	8.24	41.43	9.07	5.57	7.84
1995	9.25	43.91	10.18	6.29	8.64
1996	10.19	46.82	11.21	6.96	9.24
1997	10.92	45.58	12.01	7.50	9.91
1998	11.71	47.21	12.88	8.08	10.37
1999	11.41	45.58	12.56	7.92	9.76
2000	11.56	46.70	12.72	8.06	9.46
2001	11.05	45.09	12.16	7.74	8.69
2002	10.75	43.77	11.82	7.55	8.27

Table 2. Average Contribution by Type of Vegetable Coverage

Expressed in American dollars

In turn, using the concept of value of the marginal product seen in the previous section, you can find the average value that the company receives for each type of coverage. Table Nº 4. Which shows the average elasticity of each of the coverages multiplied by the product of the whole economy.

This entire calculation process allows us to reveal indirectly the amount that the company receives for having the current land cover in Bolivia, an amount that can be equated according to the Samuelson equation to the willingness to pay to conserve the current state of conservation of the plant cover.

Of these provisions to pay, it is a priority to give emphasis to two: the first is the payment for the conservation of forest cover and the second, the conservation of other types of cover, especially scrub systems. These two types of coverage with their respective ecosystems are to a large extent the suppliers of a multiplicity of environmental services that are not yet recognized by society.

The recognition of this contribution in monetary form, will provide the opportunity to society as a whole, managers and owners of the forest and shrub systems to reevaluate the conservation and management of this system, by generating a policy that enables this payment to the administrators and managers of these systems, the original communities and the systems of protected areas.

ISSN-On line: 2414-4819

Between the Offer and the Demand: Public Policy Proposal for the Management of Environmental Services

From the moment we recognize the existence of a public good, and observe that there is a tendency to its loss or deterioration, it is necessary to define an intervention to correct the lack of recognition -and allocation of resources- of the market to guarantee the adequate provision of these services to society.

If we identify an externality derived from the activity of an individual, (the owner or "caretaker" of the forest), which affects the welfare of another (society as a whole through its impact on national economic activity), without You can charge a price for it, we are facing a market failure that requires State intervention.

The intervention can take the form of:

- **Retribution.** When looking to compensate the owner for the cost incurred in the production of the SA**.**
- **Compensation.** When a payment is made equivalent to the income lost by the producer of the SA (Opportunity cost).
- **Subsidy.** When a transfer of public resources is made through an investment or through a direct payment, as an incentive to the SA producer to avoid the loss of a public good**.**
- **Payment.** When the production of an environmental service is recognized (and valued) as a result of a "productive" activity, recognizing the producer the direct and indirect costs, the risk and its legitimate right to a profit (Surplus of the producer).

As it is a public good that requires State intervention, it represents the demand. The decision process of the claimant is equivalent to that of the forest owner, or offeror, described above.

- Identification of opportunity sets.
- Definition of the dilemmas.
- Correct calculation of costs.

In the analysis of opportunities you must identify your second (s) best option (s): Are there other potential sources? What would not achieve the purpose of the intervention? What is the cost to society of losing these environmental services? What is the replacement cost, if this possibility exists? and finally; What is the cost incurred by the producer of the service for producing, maintaining the service or letting go of other opportunities?

Here, it is important to understand the preference framework and to develop the calculations of the monetary and non-monetary benefits that society is given for maintaining the current plant cover.

Within the context of the Bolivian economy, the management and conservation of natural resources may be governed by a productive logic and / or by the greater certainty in land tenure:

- In the first case, economic preferences prevail due to the system of generation of resources, which take precedence over productive processes.
- The second responds to the system of exclusion in production systems related to the market and the poor distribution of land in Bolivia.

ISSN-On line: 2414-4819

Which can lead to the logic of destruction of the land prevail over the process of conservation of territories unsuitable for agricultural production and livestock, since to ensure ownership of the land, the original vegetation cover is destroyed; responding to the concept that the earth is for those who work it and conservation does not represent work for this type of logic.

Both processes are evident in the reduction of forest areas in the country; but from different senses: the first, from the objective of producing food or generating economic resources via agricultural, forestry and livestock production; the second, from the need to secure the property rights of a territory.

The payment of environmental services, tries to face both sides of this coin:

- First, it is based on the recognition of environmental services provided by plant coverage, so it is necessary to pay the service to the owners and administrators of this territory by charging the services to the whole society. This payment means that the owners of the territory, before making a change in land use, have an additional element in their cost structure that allows them to face the benefit of conserving a forest system or dedicating the territory to a productive activity.

- Second, the instrument in fact recognizes the right of property of the community or of the owners of the territory, without the need to develop productive activities in lands not suitable for this type of productive processes.

The payment of environmental services traditionally starts by recognizing the average opportunity costs of the producers, this payment pretends not to use the forest cover existing in traditional production processes, such as agriculture and livestock. In this case, it is proposed that the payment of the environmental service be the average valuation that society has on the forested areas and whether the producer decides whether or not to make the change in land use. Thus the choice of the producer depends on the behavior of the economy as a whole (on which the payment is calculated), of the producer preference framework and of the personal opportunity costs given his productive activities. This can be made operative from a tax collecting and modifying behaviors.

This type of tax is called Pigouvian tax and has a double purpose (not always easy to balance):

- **Collection** To finance the management and conservation of natural resources and "reward" forest owners or caretakers.

- **Modification of behaviors.** To generate incentives, positive or negative, that incline the ground in favor of desirable behaviors or to the detriment of those that are intended to eliminate or reduce.

The advantage of this payment system is that it will be carried out by intensity of use, so that users with higher income and greater intensity of use will be those who pay a greater percentage of the program.

Through a simulation that considers the average collection of environmental services per family for the year 2002, this would not exceed three US dollars per month (approximately 25 Bs.).

ISSN-On line: 2414-4819

The simulation is developed using the data in Table No. 4, with payment coverage of 25% of the territory occupied mainly by forest systems.

As noted, a significant amount of territory can be included in the payment of environmental services without this representing a substantial increase in family spending

Conclusions

Given the current political conditions in Bolivia (taking into account the development of a new political constitution of the Bolivian State), it is necessary to introduce into the discussion the concept of environmental services, but not only as a tool for forest conservation and management, but as an integral tool that allows facing the environmental conflicts and social conflicts that afflict the country.

This is due to the inequity in access to resources and the non-recognition of the contributions made by the peasant communities to the productivity of the whole society, especially agricultural systems and urban centers, by conserving large areas of forests and shrub lands.

The work starts by defining and exemplifying the payment processes of environmental services and then introducing the need to recognize as a society the importance of managing forest conservation in an integral way, going beyond conservation concepts to reach the contributions of ecosystems.

To the productivity of a territory. If you want to conserve this productivity it is necessary to conserve and manage the resources that generate it.

The main lesson we obtained from this research process is that a small adjustment in the system of rights for the use of drinking water, electric power and fuel use, can help to conserve and manage in an efficient and sustainable way over time, via the payment of environmental services, a significant portion of Bolivian territory in the hands of indigenous and peasant communities.

Although this is a new topic in the academic, social and political discussion in Bolivia, it is necessary to face it from different perspectives, this work being one of these visions, which mainly seeks to put on the table the topic of discussion and advance in the development of the same.

References

Azqueta Oyarzun, D., & Oyarzun, D. A. (1994). Valoración económica de la calidad ambiental (No. 333.7 333.339). McGraw-Hill.

Banco Mundial. (2005). World Development Indicator. Washington.

Belloc, M., D'Alessandro, S., Di Maio, M., Drago, F., & Vertova, P. (2008). Technology and the environment in the history of the economic thought. International Journal of Global Environmental Issues, 8(4), 311-334.

Bishop, J., & Pagiola, S. (Eds.). (2012). Selling forest environmental services: market-based mechanisms for conservation and development. Taylor & Francis

Declaration, R. (1992). Rio declaration on environment and development.

Durán Cabré, J. M., Espasa Queralt, M., Esteller Moré, A., Jofre Monseny, J., Montolio, D., Sorribas, P., & Vázquez Grenno, J. (2013). Imposición y equidad

ISSN-On line: 2414-4819

Faostat, F. A. O. (2015). Statistical databases. Food and Agriculture Organization of the United Nations

Jackson Robert B., Esteban G. Jobba´gy, Roni Avissar, Somnath Baidya Roy, Damian J. Barrett, Charles W. Cook, Kathleen A. Farley, David C. le Maitre, Bruce A. McCarl, Brian C. Murray. (2005). Trading Water for Carbon with Biological Carbon Sequestration. Science, December 23 Vol. 310, pp. 1944-1947.

Landell-Mills, N., & Porras, I. T. (2002). Silver bullet or fools' gold?: a global review of markets for forest environmental services and their impact on the poor.

Madrid, Sergio et al. (2006). Estudio de casos. Consejo Civil Mexicano de Silvicultura Sustentable. México. (inédito).

Mendoza, A. B., & Garbarino, M. C. C. (2016). El Régimen Internacional del Cambio Climático y los Retos para México.

Olivera Villarroel, S. M., & Ferro Azcona, H. (2016). Factores geográficos y determinantes de la distribución de la flora en las áreas naturales protegidas de Bolivia: un modelo predictivo de la riqueza de especies en un territorio. Acta Botánica Cubana Vol, 215(1), 38-47.

Olivera Villarroel, S. M., & Hernandez , R. H. (2016). Payment For Environmental Services: The Forest Resources Management. Интеллект. Инновации. Инвестиции, (12), 138-144.

Pagiola, S., Honey-Rosés, J., & Freire-González, J. (2016). Evaluation of the permanence of land use change induced by payments for environmental services in Quindío, Colombia. PloS one, 11(3).

Rosa, H., Kandel, S., & Dimas, L. (2004). Compensación por servicios ambientales y comunidades rurales: lecciones de las Américas y temas críticos para fortalecer estrategias comunitarias. Instituto Nacional de Ecología

Ruíz Perez M., García Fernández, C. (2007). Los servicios ambientales en los bosques. Asociación Española de Ecología Terrestre. Pp. 81-90. Septiembre. http://www.ccmss.org.mx/documentacion/482-los-servicios-ambientales-de-los-bosques/

Sanjines , E. (2005). La Aplicación del Proceso de Reforma Agraria en Bolivia. Agro Nuevo, (7), 39-56.

Sterner, T. (2003). Policy instruments for environmental and natural resource management. Resources for the Future.

Vogel, J. H. (1994). Genes for sale: privatization as a conservation policy. Oxford University Press on Demand.

ISSN-On line: 2414-4819