

# Payment for Environmental Services, Rural Poverty Reduction and Agricultural Land Conservation in Oyo State Farm Settlements, Nigeria: Conceptual Approach

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**Abstract-** In the quest to mitigate rural poverty and agricultural land degradation, a market-based incentive mechanism called Payment for Environmental Services (PES) was found as a useful antidote for both rural poverty and degradation of agricultural land. It was observed that the phenomena (i.e. poverty and environmental resources degradation) could not be divorced from each other (Obayelu, 2010). However a need for identification of the poor is inevitable. Although many authors argued that property rights (land ownership rights) is a prerequisite for PES to be effective. This study stands to think in a contrary dimension. It critically intends to conduct the research in the Oyo state farm settlements, where no property rights were given to the farmers. This paper argued on the premise of lack of provision for social security and access to credit facilities, in Nigerian rural settings as the potential 'bait' for PES effectiveness and willingness of the farmers to participate in it. Nevertheless the extent of participation will be determined by the type of attributes PES offer to the rural farmers.

**Index Terms-** payment for environmental services, property rights, rural settings attributes

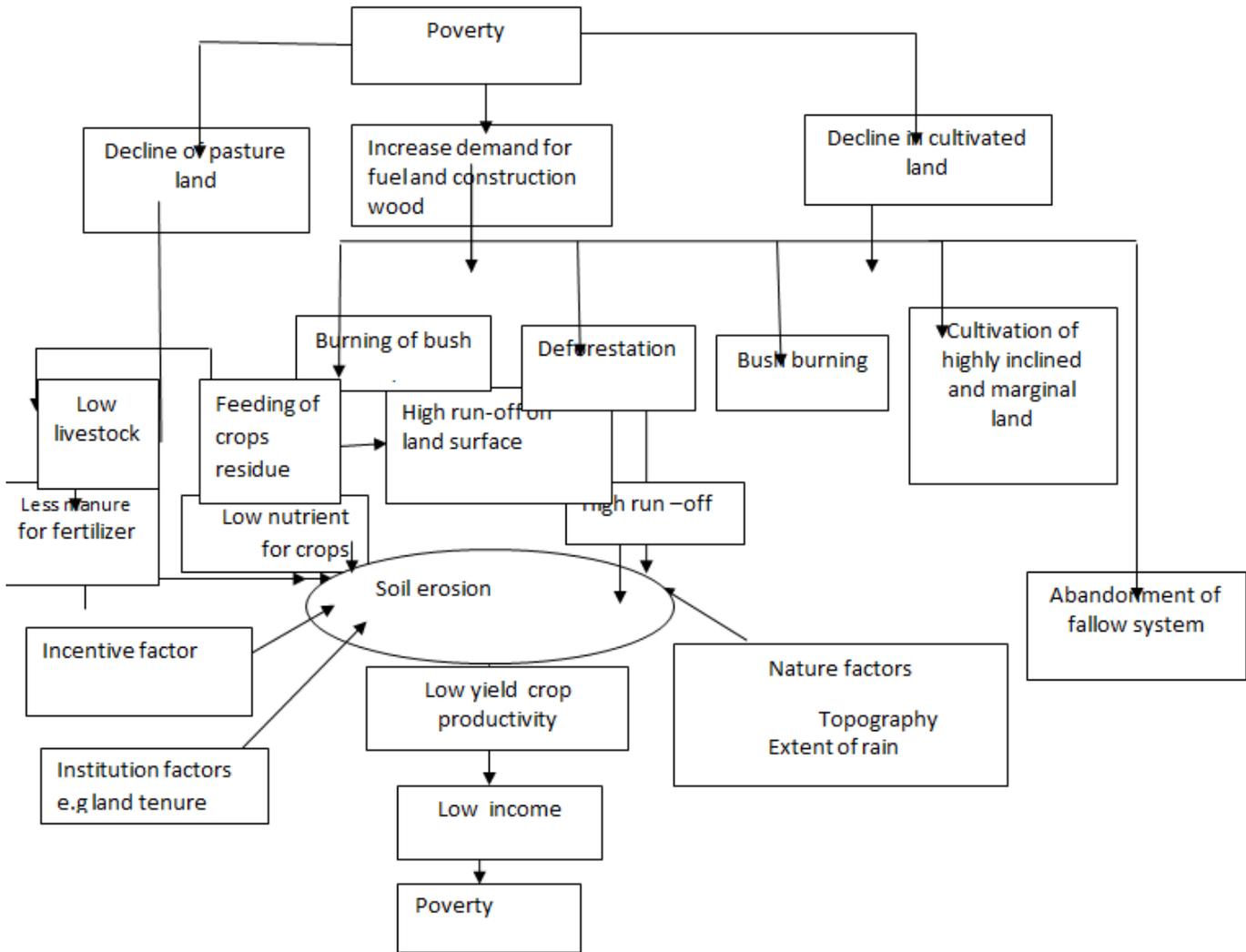
## I. INTRODUCTION

Successive Nigerian governments have recognized the necessity to tame poverty as it impedes socio-economic growth and development of her populace. From available statistics it is unarguable that a substantial numbers of poor reside in the rural settings and they depend on agriculture as the

means of livelihood (World Bank, 2000, NBS, 2012). Due to the low income associated with the agricultural practices that are characterized with poor productivity, it is difficult or almost impossible for farmers to maintain and sustain agricultural land, the aftermath effect of it, leads degradation of land. For the poor farmers to survive, they engaged in different kinds of environmental unfriendly practices, such as burning of bush/crop residues, deforestation, high degree of agricultural land intensification etc. All these activities led to declining cultivable and pasture land for crop growing and animal grazing. The incentive to invest on the land as to conserve the soil fertility is conspicuously absent. Hence farmers are left with the option of making do with the available margin lands, while remaining few livestock are contending with humans for crop residual, which could have served as a good source of fertilizer for the soil nutrients replenishment.

The problem becomes compounded due to non-availability of market-based incentive like Payment for Environmental Services (PES), which can spur farmers to invest on the land coupled with land tenure insecurity. These events eventually resulted to high volume of soil and wind erosion. With the presence of erosion, land degradation set in and lead to poor productivity. From the described scenario, low income abounds and poverty is set in. Studies such as Duraiapph(1999); Bhattacharya and Innes(2006) shared this school of thought, that poverty cause environmental degradation, hence this study follow these proponents.

Fig: 1 Schematic diagram of cause and effect of poverty and land degradation in the study area



## II. PROBLEM STATEMENT

Despite various programs undertaken by Nigerian governments to tackle poverty and environmental degradation over years, statistical records have proved beyond reasonable doubt that many Nigerians, especially rural dwellers are wallowing in acute poverty (IFAD, 2011; Adepoju & Yusuf, 2012). Also empirical evidence has revealed that Nigeria's forest is one of the most threatened on earth due to conversion of forest area to agricultural land, high population, timber and logging (Mongabay, 2014). This fact was also supported by FAO (2005), within the period of six years (i.e. 2000-2005) Nigeria lost 55.7 per cent of her primary forest to human-induced activities such as subsistence intensive agriculture, collection of fuel wood, logging etc., which was identified as the leading causes of land degradation in Nigerian rural settings.

The immediate question that rationally comes to mind is that "why is poverty is high among the rural people"? Alayande & Alayande (2004), argued that high rural poverty rate in Nigeria could be traced to some environmental problems associated with agricultural production. These environmental problems cannot be

solved without solving poverty concurrently (Andrew and Masozera, 2010, Obayelu, 2010; Gore, 2002). PES could be an effective round peg in the round hole, in this situation. A well designed PES program targeting poverty reduction and land degradation could bring smile to the rural poor (Bulthe, 2008).

However, a need to first of all identify the poor is necessary. Wendland (2008); Wendland, (2010), submitted that most of the PES erroneously rewarded the non-poor, this renders PES programs to be ineffective, apart from identification of the poor, it is necessary to ascertain categories of the poor. This categorization will prompt vibrant anti-poverty policies to address each category of the poor, unlike previous anti-poverty program that serve as "medicine for all cure". Oyekale (2012), affirmed that previous approaches to analyse poverty in Nigeria focused on income/expenditure approach. This could be responsible for the failure of the government anti-poverty measures, as the real poor in the society may not be adequately identified with income/expenditure approach, since poverty has been defined in a multidimensional manner.

Due to the communal tenure system in Africa settings, effective participation in PES could be a daunting task, since there is a positive link between investment and property rights,

there is a need to establish the property right status of the farmers with their preference to PES attributes. Many studies univocally submitted that for the rural poor to participate effectively in PES programs, property rights of the people need to be given a deserved attention (Kerr & Jindal, 2007; Pagiola, (2008); Dressler&Roth, (2011); McElwee,( 2012); Oluyede et al.,( 2012). According to Baseley (1995), there are three linkages between property right and investment: i. freedom from expropriation- an individual will not be interested to invest if not sure of what the future has for him in term of ownership of such investment. ii. A well-defined land rights that make it possible to use land as collateral, will in turn eliminate funding constraints of an investment and iii. If an individual is insulated to sell or even transfer his land, this will also encourage investment. Furthermore lack of an explicit institutional structure has been observed to be one of the reasons for the ill-functioning of most PES program (Barrett et al., 2005). In a nutshell *the wealth and wellbeing of Nigeria depends on her ability to conserve and manage her land resources*. It is a well-known fact that soil degradation not only results in decreased food production but also cause droughts, ecological imbalance and consequent degradation of the quality of life. In Nigeria, the most conspicuous symptoms of the negative impact of land degradation on food production are stagnating and declining yields and increasing levels of poverty.

With the above explanations, this study is set to investigate the preferences of the rural poor with regards to PES attributes of poverty reductions and environmental resources conservation. On this note, the study attempt to answer the following research questions.

### III. RESEARCH QUESTIONS

The main research question is: What are the preferences of the rural poor with respect to PES attributes of rural poverty reduction and environmental resource conservation, in the Oyo state farm settlement, Nigeria. The specific research questions include:

1. Who are the poor in the study area?
2. What are the categories of the poor in the study area?
3. What are the preferences of each of the categories of rural poor for PES attributes of rural poverty reductions and environmental resources conservation?
4. Does the rural poor socio-economic relationship determine their preferences for PES attributes of rural poverty reduction and environmental resources conservation?

### IV. RESEARCH OBJECTIVES

The main objective of this study is to establish the preferences of the rural poor with regards to PES attributes of poverty reduction and environmental conservation, in the farm settlement of Oyo State. The specific objectives include:

1. To identify the poor in the study area
2. To establish categories of the poor.
3. To investigate the preferences of each categories of the rural poor for PES attributes of rural poverty reduction and environmental resources conservation.

4. To establish socio-economic factors that determine the respondents preferences for PES attributes of rural poverty reduction and environmental resources conservation.

### V. RESEARCH HYPOTHESIS

**The following hypotheses were formulated:**

1.  $H_0$ : There is no significant relationship between the socio-economic characteristics of the respondents and their preferences for PES attributes.  
 $H_1$ : There is significant relationship between the socio-economic characteristics of the respondents and their preferences for PES attributes.
2.  $H_0$ : There is no significant relationship between property rights of the respondents and their preferences for PES attributes.  
 $H_1$ : There is significant relationship between property rights of the respondents and their preferences for PES attributes.
3.  $H_0$ : There is no significant relationship between poverty status of the respondents and their preferences for PES attributes.  
 $H_1$ : There is significant relationship between poverty status of the respondents and their preferences for PES attributes.

### VI. CONTRIBUTIONS TO KNOWLEDGE

Approaches of the previous studies on poverty and environmental resources conservation, with PES as incentive mechanisms, addressed poverty without being bothered to identify the right target group. This was observed by Wendland (2008) that the poor are not really benefiting from most of the PES programs implemented. Also Oyekale (2012); Innocent et al. (2013) argued that most of the poverty assessments studies in Nigeria employed monetary- based approach, which is not sufficient enough to ascertain who the poor is, hence faulty anti-poverty policies being formulated. This study differentiates itself from previous ones by identifying the poor multidimensionally in the study area. It goes further to avail itself of the Multidimensional Poverty attribute of decomposition component, to categorize poverty into different status according to both monetary and non-monetary poverty indicators. This will aid vibrant and specific anti-poverty policies for each class of poverty identified. This is more promising than the previous anti-poverty measures that was based on the uni-dimensional approach.

More importantly property rights attribute which is one of the impeding factors as observed by many authors, in investment process of environmental resources, need to be re-examined, in this context of study. The reason being that while in places like Latin America, South Asia, where property right is a relevant factor, it may not necessary be an issue in Nigeria rural environment. To this end, additional unfrequently used pertinent attributes were also included in this study, these are; land, labour and guarantee provisions. This also could be a very important contribution to the existing body of literature, when tested empirically.

Managerially, this study is of great significance to Nigeria in the formulation of a vibrant and all -enduring economic and environmental friendly policies, as empirical studies that explained roles of PES in poverty reduction and environmental resources conservation, is yet to be known in Nigeria, at least to the best of the researcher's knowledge. Finally, the study prevent un-necessary spending as the preference of the poor are sought before the implementation of PES projects which give room for re-defining of identified grey areas of the project in question. Also initial transaction costs may be minimized as PES in this context involved poverty reduction and environmental resources conservation simultaneously, this enhances reduction in the budgetary allocations which ordinarily would have been for anti-poverty and environmental management respectively.

## VII. LITERATURE REVIEW

The unprecedented increasing poverty profile in Nigeria is assuming a worrisome dimension, as many empirical evidences from various poverty related studies revealed. Population censor of 2006 and the follow-up updating figures provide the current 163 million as the population volume of Nigeria. Agriculture servers as the Nigerian economic mainstay before the advent of crude oil, Nigeria essentially depends on the crude oil since the early seventies for it budgetary revenues; as a result little attention was pay to agricultural sector. To this end, a wide policy gap exists between the rural and urban areas in Nigeria (World Bank, 2011), this was identified as one of the reasons for the abject poverty experienced in the rural communities of Nigeria. The Nigerian Bureau of Statistic (NBS) poverty profile of 2010 showed that more than 60 per cent of the rural people are multidimensional poor, with multidimensional index of 0.3796. Chukwuma(2012) noticed with passion that poverty of rural dwellers in Nigeria is more or less an artificial one, he attributed rural poverty to insincerity, corruption, cronyism and rent-seeking behaviours in governance. Evidences abound of the limited accessibility of rural people for credit facilities, new technology and source of inputs, all these led to low return on labour. Alayande (2004) stressed that there is high rate of incidence of poverty in Nigeria's rural areas which he further argued, that environmental problems associated with agricultural production is unconnected with the high poverty rate witnessed in rural settings of Nigeria. According to IFAD (2012), Nigeria has a total land area of 983,213 square kilometres, 773,783square kilometres are in the savannah zones, 75,707 square kilometres are in the derived savannah zones and 133,717 square kilometres are in the forest zones. The un-friendly interaction with the rural dwellers with their respective environment has left ineradicable mark on the landscape. It was estimated that the annual harvest of timber from high forest alone was 1.5 million cubic meters, which will take about 30 years to denude the forest of matured timber.

Poverty- environmental nexus has been a widely debated phenomenon by many scholars in the recent times, especially as it affects developing countries. It was evidently noticed that poor people are linked to environmental degradation, which further increase their poverty. Intuitively poverty and environmental degradation are cause and effect paradigm. Those schools of thought that support poverty-environmental linkage argued that

the lack of integration of environmental conservation in the equation of poverty reduction has made it difficult to curb poverty to the desired level, this observation was confirmed by Arild et al.(1995); Dasgputa and Mäler (1995) .Also recognition of poverty role in environmental resource degradation cannot be overemphasised. Hence, integration of development and conservation project is highly imperative; this will help in reducing the poverty and conserve environmental resources. In the last decade some countries in Latin America have involved in Integrated Conservation Development Program (ICDP), where it was observed that both poverty and environmental resources degradation were significantly reduced. Arild et al. (1995), vehemently submitted that "poverty-environmental hypothesis is part of the ruling development paradigm". From the foregone discussions, it could be inferred that both poverty reduction and environmental resources conservation are reinforcing each other. This, therefore calls for a mechanism that can act as a 'trouble shooter' between poverty and environmental resources degradation. The most recently mechanism employed by some of the developing countries is the Payment for Environmental degradation (PES).

Payment for environmental resource is defined is a mechanism to incentivized ecosystem services through direct or indirect payment to the environmental services provider for engaging in practices that produces external benefits to individual or society as a whole (Pagiola and Platis,2007; Engel et al.,2008; Wunder,2009) as cited in Adesiyan et al.(2014). Many authors have argued in favour of ability of PES to influence reduction of poverty and environmental degradation. This was archived through the payment vehicle used for the environmental services rendered. For example in Latin America PES contributed to poverty reduction and environmental resources degradation through cash payment to the Environmental Service (ES) providers. Also in the Rewarding the Upland Poor for Ecosystem Service (RUPES), where the poor farmers were identified, both objectives of poverty reduction and environmental resources conservation were achieved. Similar program called campfire program in Zimbabwe recorded a decrease in the incidence of poverty through increase per person income by \$15 ,therefore raise their standards of living. From the empirical information of the successes witnessed by the countries that implemented PES, Nigerian as a typical example of developing country should view PES as a veritable 'tool' to stem the surges of rural poverty and environmental degradation, which has been a 'recurring decimal' in the annals of the country.

### 7.1 PES Concept

Payment for Environmental Services(PES) is a non-market mechanism to incentivized ecosystem services. This could either be direct or indirect payment to the environmental services provider, for engaging in practices that produces external benefits to individual or society as a whole (Pagiola and Platis, 2007; Engel et al., 2008; Wunder, 2009). This conditional method is quite different from other other known conservation methods. Here, the PES condition recognizes hard trade-offs among the given attributes. Explicitly Payment for Environmental services is an incentive- based mechanism for sustainable resource conservation and management (i.e. it can be

used for preservation, restoration, and conservation of natural resources) and by extension for poverty alleviation (Adesiyun, et al. 2014). A widely accepted definition of PES contains the following elements: i. A voluntary transaction ii. A well-defined environmental service iii. At least a buyer iv. At least a seller and v. If and only if the environmental services provider secures service provision (conditionality).

Though contractual agreements are reached between the two concerned parties (i.e. environmental service providers and buyers) the main element in PES is trust between the environmental services sellers and buyers. Rural land users, especially farmers are often serve as the service providers, in the developing countries. Environmental buyers such as public sectors, Non-Governmental Organisations and Ecosystem certified products consumers could be the appropriate institutions in developing countries, where there are few or no market exist for environmental goods.

## 7.2 Choice Experiment Concept

Choice experiments (CE) are a stated preference valuation method which reveals the preferences of the environmental services producers. It gets around the absence of markets by creating hypothetical scenarios in which respondents make decisions that mimic the reality of markets (Mitchell and Carson, 1989). Succinctly, CE is used to quantify hypothetical preferences of the farmers, for different set of competing PES attributes presented to them. In the questionnaire, each choice that was presented to the respondents is called an hypothetical scenario (Wright and Adamowicz, 1998). Attributes is used to described the given sets of hypothetical goods (e.g. the amount of loan, payback period, task to perform, interest rate, land, labour and guarantor provisions). Different numbers of levels could be assigned to each attribute (e.g. long/medium loan for pay back periods attribute, 1/4, 1/2, 1 acre conversion to agroforestry land for task to perform 3%, 4%, 5%, 6%, 7%, 9% for interest rates, self or Environmental Services buyers to provide for land, labour and guarantor provisions).

The choice of CE over contingent valuation method was due to the following advantages of the former over the latter. It allows a multi-attributes valuation for the environmental goods and services. CE eases the estimation of the value that associated with the individual that environmental goods contain. Possibility of the identification of marginal value of environmental goods attributes. Advantage of benefit transfer is also embedded in CE method. It also employs the use of an econometric model that is consistent with the probabilistic choice theory (Bakti and Karim, 2013). CE, avoids the "yes-saying, since the respondents are given opportunity to choose one option or status quo option, instead of seeking for change (Brown, et al. 1996). Choice experiments can be used to determine the value of the given attributes presented to the respondents in the PES programme. Hence its hypothetical nature enhances prediction of preferences for a yet to implement programme. Many studies, such as Wright and Adamowicz (1998), Boxall et al (1998a), applied CE in environmental management problems. Louviere and Woodworth (1993); Louviere (1988, 1992) used CE method in marketing and transport studies and Hanley et al (1988) applied CE in environmental management study. Vega and Alpizar (2011) used CE in the ex-ante stage of the Costa Rica

hydroelectricity project and Barr and Mourato (2012) investigated the fishers' preferences for the design of marine payment for environmental services schemes in Tanzania.

This study embraces credit-based PES, in which access to credit is based on participation in conservation of agricultural land. Anderson et al., 2002; Mandel et al., 2009, in their studies, employed where good environmental behaviour was the prerequisite for eligibility to credit facilities. This approach is important in the developing countries, where the poor have limited accessibility to credit facilities (Nickerson and Hand, 2009). In this context, based on the percentage of contractual agreements fulfilled by participant, certain proportions of interest rate or interest plus the principal could be written off for the respondents that meet the conditions.

## 7.3 Property Rights Concept

Property rights are a contentious, theoretical construct in economies for determining how a resource is used, and who the owner of that resource is—government, collective bodies or individuals. Property rights as an attribute of economic good, has four main broad components: right to use the good, right to sell the good, right to transfer the good to others and rights to enforcement of property rights on the goods. The regimes of property rights includes i. open-access property: which is a property not owned by anyone ii. state/public property: the access and use is control by the state e.g. national park. iii. common or collective property: a property owned and control by group of individuals and iv. Private property: a property owned and control by private owner. The importance of re-examining property rights in this study can not be overemphasised. Many advocates of environmental conservation are of the opinion that, property rights of an individual is a stimulus to participation in environmental conservation. While this could be true in some environment, reverse could be the case in the Nigerian rural settings. Especially where incentive bundles have loan as 'bait component' for the farmers.

## VIII. METHODOLOGY

This chapter unveiled various procedures for achieving stated objectives listed above as well as description of the study area.

### 8.1 Description of the Study Area

Oyo state has nine farm settlements located mostly at the rural core and semi-rural areas. The farm settlements are Akufo Eruwa, Ijaye, Ipapo, Ilora, Iresaadu, Lalupon, Ogbomosho and Sepeteri. The choice of Oyo state farm settlements was informed from the non-empirical observation of the well pronounced agricultural land degradations. The cause of this obnoxious situation was casual thought to be from bush burning, intensified agricultural practices, lack of conservation practices, indiscriminate tree felling and all sort of un-environmentally friendly practices. It was further observed that the poor or near-poor users of the land almost have no form of property rights.

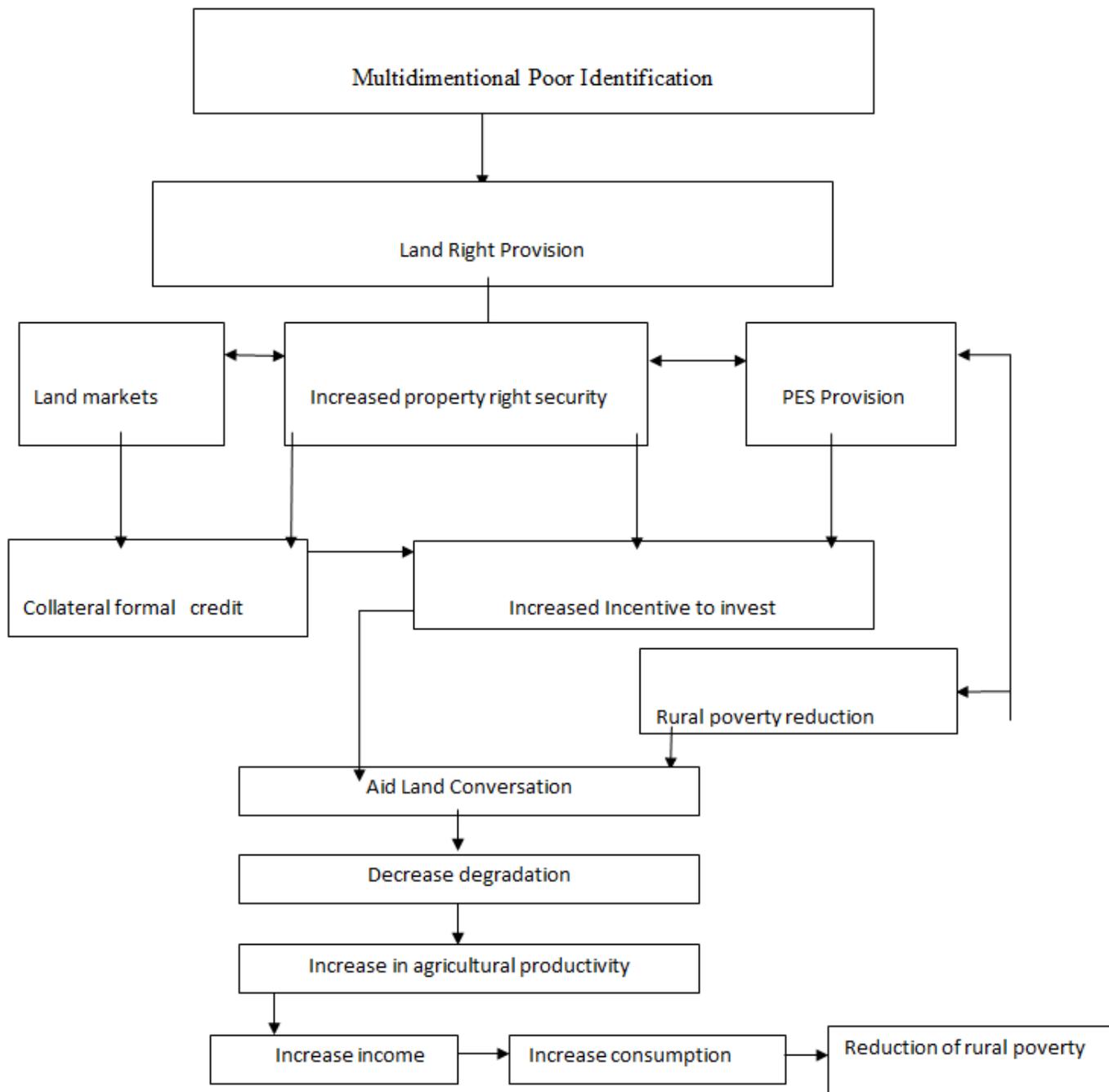
### 8.2 Research Framework

### 8.3 Conceptual Framework of the Study

The model for this study draws most of its variables from the tested model of previous studies in development and environmental economics, such as Place (2009); Kabubu (2002); Pagiola (2005) and Wunder (2008). Multidimensional poor identification was included, from the backdrop of various argument that large proportion of the poor are not benefited from PES program (Russo and Candela, 2006; Zbinden & Lee, 2005). The non-benefiting of the poor could not be far fetch from either non-identification of who the poor are (Pagiola, 2005) or the wrong yardstick of assessment of the poor (Omotola, 2008; Adesopo,2008). This later revelation was observed by Oyekale

(2012) in most of the poverty measurement related studies in Nigeria. Hence this study approaches identification of the poor through multidimensional poverty measurement. This approach will assist in breaking down poor into different stratum according to different poverty indicators, as to enhance an all-inclusive poverty policy. Though many author opined that lack of property rights is an obstacle to success of PES in the previous studies. This study is interested in verifying the veracity of this claim, hence it inclusion in the framework. PES which serves as gateway to both poverty reduction and agricultural land conservation through its attributes was examined hypothetically.

Fig 2 Schematic presentation of the Conceptual Model linking, property rights, payment for environmental services (PES), poverty reduction and environmental conservation.



#### 8.4 Material and Method

This is divided into two sections, the multidimensional aspect of the study and choice experiment aspect of the study.

##### i. The Multidimensional Poverty Aspect

Interviewer-administered questionnaires were administered through trained enumerators to obtain data for the study. The unit of analysis is household, farmers (an adult head of household) were questioned in Yoruba (one of the Nigerian local languages) in face-to-face interviews with trained enumerators in March-May, 2014. An adapted version of the survey modules used by

Ataguba et al. (2011) which was originally developed by a team of experts at the OPHI, was used to cover the three chosen dimensions (i.e. education, housing/standard of living, and consumption). Also the study employed 10 indicators for the study. Education indicators are: years of schooling, schooling attendance of school age child of 5 years. Housing/standard of living indicators are: improved floor, wall, sanitation, cooking material drinking water asset and consumption indicators are: monthly consumption on household on food and daily needs. (this was converted to adult equivalent consumption). The

dimensions and indicators chosen for the study follow Alkire and Foster(2007,2010b) and Alkire and Santos(2010) steps.

A multistage sampling technique was used to select households. To ensure adequate representation of both core-rural and semi-rural localities, the farm settlements was stratified into core-rural and semi-rural areas. Each community is classified as an Enumeration Area (EA). Because the predominantly core-rural of the farm settlement community makes up about 70% of the population of all the farm settlement (NBS, 2007), a random sample of approximately 70% of the population was drawn from it. The remaining household heads were drawn randomly and evenly from three EAs in such a way as to ensure probability proportional to size (PPS). A total number of 410 questionnaires were distributed, 317 of them are usable. Data on, socio-economic characteristics of the farmers, education, housing/standard of living, land ownership, asset and consumption were collected.

The methodology developed by Alkire and Foster (2007,2010b) was used to measure multidimensional poverty. This has also been recently used by Alkire and Santos (2013) to obtain multidimensional poverty indices for developing countries. This methodology essentially uses a dual cut-off approach to generate a new class of dimension-adjusted measures of multidimensional poverty. This is similar to the FGT (Foster, Greer and Thorbecke) class of indices. It satisfies axioms such as decomposability (useful in targeting) and dimensional monotonicity (Alkire and Foster, 2010), which is often violated by traditional measures (particularly for the FGT headcount). Interestingly, the methodology allows the researcher to use both generalized and equal weights for different dimensions.

Specifically, the deprivation headcount ( $H_0$ ) and the dimension-adjusted headcount ratio ( $M_0$ ), based on the Alkire and Foster (2010) methodology, are represented below. The dimension adjusted headcount  $M_0$  is obtained as  $MPI = M_0 = H_0 * A$ .  $H_0$  = percentage of people who are poor (it shows the proportion who are in poverty);  $A$  is the average deprivations share people suffer at the same time (It show the intensity of people's poverty). In general  $M_0$  can be written as  $M_0 = \sum_{j=1}^d \mu(g^0 * j^{(k)}) / d$  where  $g^0.j^{(k)}$  = the  $j^{th}$  column of the censored matrix  $g^0(k)$ .

Aside knowing the poor in multidimensional manner, three categories of poverty were constructed: i. education-based poverty (poor1), living standard based-poverty (poor 2), landownership-based poverty (poor3) and consumption-based poverty (poor4). The probit model stated below will be used to investigate variables that predict multidimensional, education, consumption and standard of living poverty. The model is specified as:

$$P(\text{poor}_i = 1/x_i) = P(\text{poor}_i > 0) = P(x_i b + u_i > 0/x_j) = P(u_i > x_i) = 1 - F(x_i) = 1 - F(x_{ib}) \quad (2)$$

Where  $P(\text{poor}_i = 1/x_i)$  = is the probability that a person is poor given vector  $x_i$  of the observable characteristics.

## ii. The Choice Experiment Aspect

### 8.5 Experimental approach

In the design of the experiment, the study take into cognizance the general concepts of payment type, general concepts of conditionality and opportunity cost in the choice of PES attributes. Levels for each attribute were chosen based on information from stakeholders (e.g. microfinance and agricultural banks, state ministry of agriculture, farmers cooperative associations), this was then followed with an extensive pretesting, which involved at least two pilot surveys with a total number of 58 participants. Questions about the questionnaire were also discussed with the respondents of the pilot study. A total number of seven attributes, 26 levels and three alternatives were used in the design of the experiment. Amount of loan has 8 levels, payback period has 2 levels, interest has 7 levels, land, labour and guarantor provision 2 levels each. The levels for amount of loan, are: N1,000,000, N900,000, N800,000, N700,000, N600,000, N500,000, N400,000 and N300,000, for payback period, the levels are: long time and medium time period, for the task to perform the levels are: 1/4, 1/2 and 1 acre conversion of land into agroforestry, for the interest rate, the levels are: 3%, 4%, 5%, 6%, 7% and 8%, for land provision, levels are: ES seller, ES buyer, for labour provision, levels are: ES seller, ES buyer and guarantor provision, levels are ES seller, microfinance/agricultural bank (table 1). The given conditions is that agroforest of choice by each of the farmers, will be maintained for a period of 5 years. Ten choice cards were given to each of the 317 respondents to choose among three alternatives A, B and C (where C, is the status quo option).

To avoid 'hypothetical bias' in the study, a cheap talk script was used before the choice experiment questionnaire was distributed. Carlsson et al. (2005) also used this method to test for the validity in choice experiment, and his result recorded an impressed reduction in hypothetical bias. Carlsson, et al. (2005) used cheap talk script as a test of validity in choice experiment. His result shows that there was reduction in the extent of hypothetical bias. On this note this study will use cheap talk script immediately preceding choice experiment questions. Another source of hypothetical biasness is 'yea saying' (Bennett and Blamey 2001). In this study, this was controlled by the use of inferred valuation (this by asking farmers of how much they believe other people will view the PES packaged attributes, especially in the amount of loan and interest attributes). Here it is believed that because the questions concern other people and not of the respondent, there should be no motivation to overstate the value (Lusk and Norwood, 2009).

### 8.6 Presentation to the Respondents

Each of the respondents will be requested to choose their preferred options from a set of mutually exclusive hypothetical alternatives. It is expected that each of the respondents are rational in their choices; hence they will choose those options with the highest expected utility (Barr and Mourato, 2012). The attributes presented to the farmers are, i. amount of credit, ii. Payback period, iii. interest rate, iv. labour provision, v. land provision and vi. guarantor provision. Each of these attributes take on a number of levels.

Table 1. Attributes and levels in PES hypothetical contract

ATTRIBUTE	DESCRIPTION	LEVEL
Amount of loan	Amount of money provided to farmers for conversion of land to agroforestry	N1,000,000,N900,000 , N800,000,N7000,000,N600,000 N500,000,400,000 N300,000
Payback period	Time period to back back the loan	Medium, long terms
Intrest(peryear)	Amount charged on top of loan given	3%, 4%, 5%, 6%, 7%, 8%
Task to perform	Conversion of land into agroforestry	1/4, 1/2, 1
land provision	Land provided for the task	ESseller, ESbuyer provide
Labour provision	Labourers to do the task	ESseller, ESbuyer provide
Guarantor provision	The person to stand as a surety for the borrower of loan	ESseller provide, Microfinance/ agricultural bank

NB: N= Nigerian currency

**8.7 Choice Experiment Model**

The choice of a particular PES packaged attributes by the farmers depends on the amount of utility derived from it. According to Ben-Akiva and Leman(1985), as the utility derived from the choice is increasing, the probability of making that choice also increases. The function is expressed as:

$$U_{in}=U(Y_{in}; S_k) \tag{1}$$

Where for any individual farmer n, a given level of utility will be associated with any given level of alternatives PES packaged attributes *i*

$Y_{in}$ ; = Vector of PES attributes. *in* = nth PES program,  $U_{in}$ = derived utility from the PES package,  $S_k$ ; =vector of characteristics of farmer  $K^{th}$ .

A farmer will choice alternative *i* over some option j iff  $U_i>U_j$ . These PES packaged attributes could be viewed differently by different farmers, whose sociodemographic characteristics *S* may also affect utility.

Assuming that utility function can be partitioned into two (because utility are determined by a large volume of characteristics by the decision makers, some are known while some are unknown) parts. (i) a deterministic and in principle observable and (ii) a stochastic and unobservable. The equation above could then be written as,

$$U_{in}=V(Y_{in}; S_k)+\varepsilon(Y_{in}; S_k) \tag{2}$$

The probability that individual farmer n will choice option j from the available set of a given PES packages, can be expressed as;

$$Prob(i|C) = \left\{ \begin{array}{l} ProbV_{in} + \varepsilon_{in} > V_{jn} + \varepsilon_{jn}, \text{ all } \\ j \in C \end{array} \right.$$

C= Complete choice set

To estimate equation 6 above, an assumption for the distributions of the error terms must hold. The assumption is that the errors are identical, independently distributed (iid) and also follows Gumbel distribution (or type 1 extreme value).Therefore the conditional choice probability of choosing *i* is:

$$\frac{exp^{\mu v_i}}{\sum_{j \in C} exp^{\mu v_j}} \tag{4}$$

Where  $\mu$ = scale parameter (is inversely proportional to the standard deviation of the distribution errors. It is assumed to be 1, (since it cannot be separated from the utility function, therefore it's normalized to 1).

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As  $\mu$  is approaching infinity ( $\infty$ ) the model becomes deterministic. Equation 5 could be estimated by Multinomial Logit regression, using Maximum Likelihood Estimation. Multinomial Logit model assumes that choice adhere to consistency and independent of irrelevant alternatives property (IIA), implying that any two alternatives is entirely unaffected by the systematic utilities of any other alternatives (Hanley, Mourato, Wright, 2001; Ben-Akiva and Lemon, 1985). In the event of violating IIA, we can then say if  $V(\cdot)$  is a linear such that  $V = \beta(X_n)$ , where  $X =$  vector of observable attributes and  $\beta =$  vector of parameter of interest to be estimated. If two choices  $i$  and  $j$  are presented to farmer. The probability of the farmer choosing  $i$  choice instead of  $j$  is  $Prob(i|C) =$

$$\frac{\exp^{-\mu\beta'(X_{in}-X_{jn})}}{1 + \exp^{-\mu\beta'(X_{in}-X_{jn})}} \quad (5)$$

## IX. CONCLUSION

The aim of this study was of two folds, firstly to ascertain the right respondents i.e. the poor people, which is a gateway for the entire study of employing PES to mitigate against poverty in a classified manner. As previously mentioned, non-identification of the poor was one major setback for most of PES programmes and anti-poverty policies which leave more to desire. Secondly, the study unfold ability of PES in the conservation of environmental resources, vis-à-vis agricultural land. A double edge property of dimensions of PES, made it possible. Property rights of land, has been majorly emphasized on as a necessary 'ingredient' for the participation of respondents in environmental resources conservation. Yet in this study design, re-examination of property rights is been investigated. This so because why it could be a limiting factor in some other environments, it may not necessary be in all cases. This may be the case of developing countries, where there are little or no access to loan, which this study offered.

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