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Economic valuation of *Phytolacca dodecandera* in Semen Shewa Zone, Amhara Region, Ethiopia

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ABSTRACT

Phytolacca dodeccandra is an indigenous genetic resource which has many prospects on pharmaceutical and bio fertilizer industries, which shows the ability of the resources for access and benefit sharing. However, the study on valuation of *Phytolacca dodecandra* has not been so far conducted. Accordingly, the Economic Valuation of *Phytolacca dodecandra* was conducted implication for Access and Benefit Sharing Agreement. The result of this study identified the direct and indirect use values of *Phytolacca dodecandra*. Majority of the respondents1 (98.6%) were willing to pay for *Phytolacca dodecandra*. The cumulative estimates of willingness to pay (WTP) values were 37,626.05 birr with an average annual willingness to pay of 261.3±139.05 birr. In this study R^2 = 0.327or 32.7% of

the dependent variable can be explained by the independent variables. Regarding to the mean willingness to pay of *Phytolacca dodecandera* across different socio –economic classes, the highest mean willingness to pay was recorded at high income level and the lowest mean willingness to pay was recorded at low income level of the respondents. The respondents' sex (sig.0.022), and income (sig. 0.000) had significant influence, on the amount the respondents willing to pay for *Phytolacca dodecandera*. Of the seven variables, income level of the respondents makes the largest unique contribution (beta = 0.497), followed by sex of the respondents (beta -0.189). This is an indication that WTP for *Phytolacca dodecandera* might be determined through the sex, and income of the respondents. Therefore, because of its prospect for the production of many pharmaceuticals and bio fertilizer industries, bio prospecting companies require to access the genetic resources following the Ethiopian legislation of Access and Benefit Sharing.

Keywords: Willingness To Pay (WTP), *Phytolacca dodeccandra, Valuation,* Access and Benefit Sharing (ABS)

1. INTRODUCTION

Biodiversity has major economic value. Most of these values are often not captured by the market. Hence, the potential of biodiversity is often underestimated. Such an underestimation is considered as one of the factors for rapid depletion of biodiversity and loss of habitats and species. Valuation of bio-resources would facilitate in identifying the real value of genetic resources and obtaining a reasonably better share of the overall benefits of genetic materials to the local communities, who are involved in its management. Most of our biodiversity is on common land and its property rights are not clearly defined. Hence, the goods and services derived from biodiversity experience market failure (TEEB, 2010). Even if biodiversity goods (bio-resources) have a market, they are imperfect and experience market distortions. Biodiversity valuation normally entails measuring the economic value of 'biological resources', not the intrinsic value of biodiversity (Anil, 2008). In consequence, valuation does normally not entail measuring the economic value of biodiversity as such. Instead, valuation typically focuses on the economic values of the goods and services generated by biodiversity resources and/or functions the so-called ecosystem services (CBD, 2007; Moran and Bann, 2000; Nijkamp *et al*., 2008).

The demand, supply and price mechanisms of biological resources do not function effectively as they do in the case of other commodities. Hence, the existing "price" of bio-resources at the collection point does not reveal its real "value" (Moran and Bann, 2000). Providers/ sellers and buyers have limited knowledge and information about both the "price" and "value" of a product. In exchange, the users of bio-resources have better knowledge about their potential value than the providers. However, the providers (local communities) are often exploited since they are little aware of about the potential of resources for value addition, product development and subsequent commercialization. Thus, the negotiations on determining the benefit sharing element could be potentially compromised where the provider is unaware of the potential use and value while the user has specific use and potential market in mind (Pearce and Moran, 1994; Nelliyat and Pisupati, 2003; Prakash and Balakrishna, 2013).

In this context, the valuation of biodiversity/ecosystem goods is a fundamental step towards determining the real value of bio-resources, and operationalizing the ABS provisions under Nagoya Protocol on ABS to capture the 'fair and equitable' provision of the ABS negotiations appropriately with full and informed participation of the local people and/or providers of the resources around the study area. In this regard *Phytolacca dodeccandra* is an indigenous bio resource which has many prospects on pharmaceutical, soap berry and bio fertilizer industries, which shows the ability of the resources for access and benefit sharing (Jared *et al*., 2017; Karunamoorthi *et al*., 2008; Ganesan *et al*., 2016; Misganaw Nure *et al*., 2012). Because of its prospect for the production of many pharmaceuticals and fertilizer, bio prospecting companies require to access the resources following the domestic legislation of ABS. However, *Phytollacca dodecandra* is one of the wild indigenous plants which have not proper value. Valorization of *Phytolacca dodecandra* is the primary prevailing gap for operational vitality of ABS agreement. Therefore, this research aimed at studying the economic valuation of *Phytolacca dodecandra,* for access and benefit sharing in North Shewa Zone, Amhara region, Ethiopia.

2. MATERIALS AND METHODS

Description of the study areas

Semien Shewa or "North Shewa" is one of 10 Zones in the Ethiopian Amhara Region. Semien Shewa takes its name from the kingdom or former province of Shewa (figure 1). The Zone is bordered on the south and the west by the Oromia Region, on the north by Debub Wollo, on the northeast by the Oromia Zone, and on the east by the Afar Region. The highest point in the Zone is Mount AbuyeMeda (4012 meters). There are around 22 districts in Amhara North Shewa zone. The study was conducted in four

selected districts (Menz Gera Midir, Menz Keya Gebreal, Mojana Wadera and Tarmaber) (https://en.wikipedia.org/wiki/North_Shewa_Zone_(Amhara), Wikipedia the free encyclopedia).

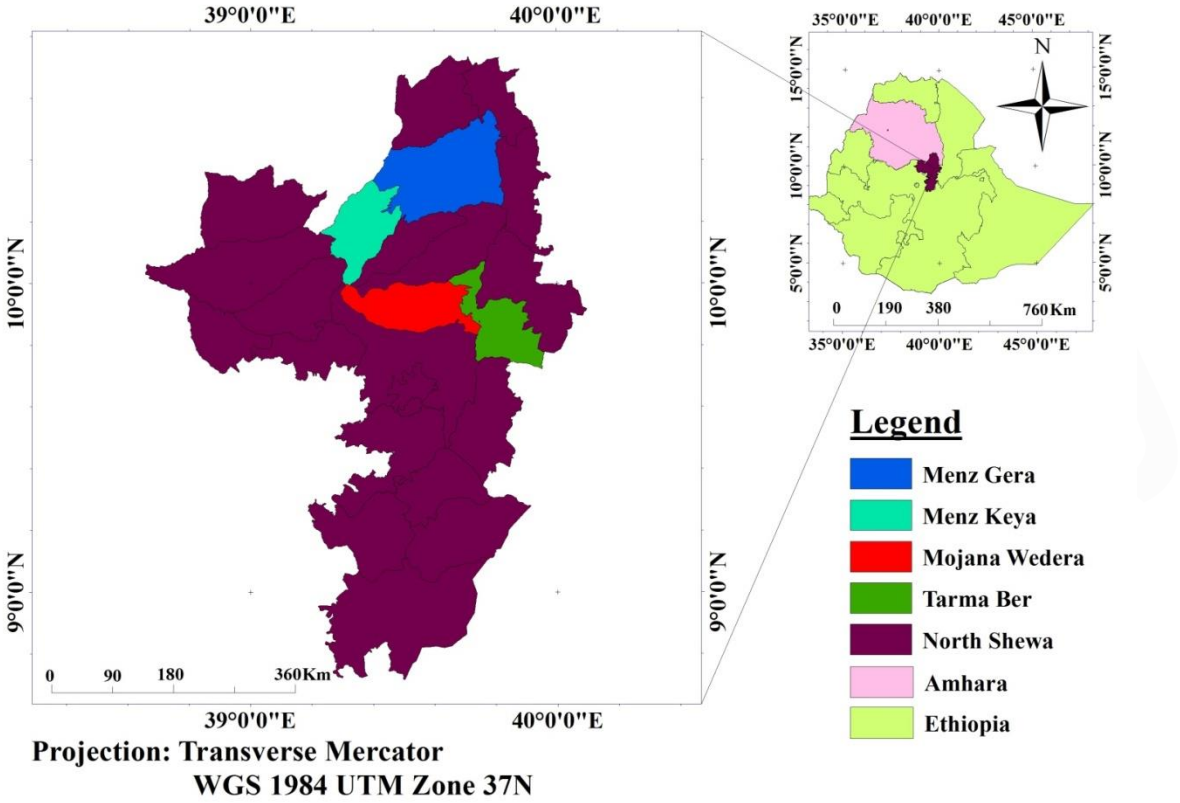

Figure 1 Administrative Map of the study areas

Sampling Design

The study areas were selected purposely based on the abundance of *Phytolacca dodecandera*. According to the recommendations of zonal agricultural office four potential *Phytolacca dodecandera* growing districts were selected from Amhara region, North Shewa Zone. These were: -Menz Gera Midir, Menz Keya Gebreal, Mojana Wadera and Tarmaber. In addition, based on the information from districts agricultural offices three Kebeles were selected from each district bringing the total number of sampled Kebeles to 12 where *Phytolacca dodecandera* was abundantly found (table 1).

Methods of data collection

A reconnaissance survey was made to determine the initial bids of *Phytolac cadodecandera*, to select the stud zones, districts and kebeles and to pre-test the questionnaires which helped to make necessary modifications of it which suited the prevailing local circumstances.

Accordingly, the main instrument of primary data collection was a structured and pretested questionnaire. Secondary source of data was obtained from the agricultural office of the districts, from different books, journals and research articles.

Taking into consideration cost, labor and time, the researchers were determined the sample size, using the formula: N > 50 + 8m (Tabachnick and Fidell, 2007), where m number of independent variables. A total of 144 respondents, 12 from each kebeles were selected purposively to the semi structured interview. Respondents were selected with the help of kebeles extension agents based on experience on the ethno botanical knowledge of *Phytola ccadodecandera*.

Table 1 Total number of selected districts, kebele and respondents for the study

No.	Selected Districts for the study	Selected Kebele from each district	Total No. of respondents in each Kebele	Total No. of respondents in
1.	Menz Gera	09-Menz Gera	12	36
		11-Menz Gera	12	

		15-Menz Gera	12	
2.	MenzQeya	09_Menz Qeya	12	36
		11_Menz Qeya	12	
		12/Zeret	12	
3.		Sina	12	36
		Wef wash	12	
		Debiremaza	12	
4.	Mojanawedera	Asofe	12	36
		Begoch Gat	12	
		Filagenet	12	
		Total number of respondents in the selected study areas =		144

Variables determining willingness to pay

Assumption

The explanatory variables/factors that determine willingness to pay of *Phytolacca dodecandera* were: age, sex, income level, marital status, household size, size of land and education status (table 2).

Table 2 Factors selected to determine willingness to pay of *Phytolacca dodecandera*

S.No.	Variables	Descriptions	Remark
1.	Age	Age of the respondents	Independent variables
2.	Sex	0 : Female 1 : Male	
3.	Income level	0 : Low 1 : Medium 2 : High	
4.	Marital status	0: Married 1:Unmarried 2: Divorce 3 : Others	
5.	Household size	Number of people in the given family	
6	Size of land	The size of land the respondents possess in hectare	
7.	Education status	0: Non educated 1 :Informal education 2:Primary education 3: Secondary education 4: Preparatory : 5.Higher education	
Amount of money Willingness to pay for *Phytolacca dodecandera*		Dependent/ output variable	

Data analysis and interpretation

The collected data was subjected to SPSS software version 21 and analyzed as well as interpreted using descriptive statistics and inferential statistics. Regression Analysis (using SPSS) was used to test models to predict outcomes of variables. The predictor (independent) variables can be either categorical or continuous, or a mix of both in the one model. Inferential methods were used for detail analysis of the variables. Different percentages, graphs and Chi-square values were calculated for selected variables.

The appropriate model for the nature of the dependent variable was served as an inferential model. The WTP bids were also regressed with various explanatory variables. The bid functions were arrived at using multiple linear regression analysis, starting from all the potential explanatory variables, removing the least significant one and re-estimating the model until all remaining variables were significant at 95% level (Horton *et al*., 2003).

The valuation function was:

$WTP = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5$----------$\beta_nX_n + \beta_nX_n+e_n$---(1)

Where WTP= respondents willingness to pay for *Phytolacca dodecandera*, $\beta_{0=}$ constant, β_1- $\beta_{n=}$ coefficients, X_{1-} X_n= variables influencing WTP, e_n= random error or in elaborated manner :-

WTP = f(X1+X2+X3+ X4 + X5 + X6 + X7 + ...Xn+e) (2)

Where WTP = Willingness to pay, X1 = Age, X2 = Sex, X3 =Marital status, X4 = Educational level, X5 = Household size, X6 = Size of land in hectare, X7= Income level, e = error term

Three functional forms were tried in order to choose the one with the best performance.

Linear: WTP = bo + b1 X1+ b2X2+ - - - - - - - - b7X7+ Ed (3)

Semi log: WTP = Lnbo+b1LnX1+b2LnX2+..... b7LnX7+ LnEd (4)

Double Log: LnWTP = Lnbo + b1Ln b1X1 +b2LnX2+ b7Ln X7+LnEd (5)

Where, bo = constant, b1b2...b7 = Regression coefficient for WTP

Ed = Residual or error term, Ln = Natural logarithm

3. RESULT AND DISCUSSION

Households Characteristics

A total of 144 respondents, 101[70.1%] males and 43[29.9%] females, were interviewed from January to March 2018. The age of respondents varied between 19 years old (the minimum age) and 75 years old (the maximum age) with mean age of 42.35±12.848 years, and range 56 years. Majority of the respondents (84.7%) were married, 9.7% unmarried, 3.5% divorce and 2.1% of them were widowed.

Regarding to the education status of the informants, 31(21.5%) were uneducated, while 26(18.1%) had informal education, 70(48.6%) had attended primary school,14(9.7%) secondary school education and insignificant number of the respondents 3(2.1%) had attended Preparatory school education. Assessment in the size of the land that the respondents possessed indicated that almost half 73(51.5%) of the respondents had 1–2 hectares, whereas a little below half of the household heads 61(42.3%) had less than two hectares and only 6.2% of the respondents had more than two hectares. The maximum size of land possessed by the informants was 6.5 hectares while the minimum was 0.25 hectare with mean 1.0859 ±0.920,range 6.25 hectares and mode 1 hectare. Regarding to the economic status of the respondents, almost half of them 71(49.3%) had medium income, 43(29.9%) had low income and 33(20.8%) the respondents had high income.

Direct and indirect use values of *Phytolacca dodecandra*

Direct use value is the value derived from direct use or interaction with environmental resources and services. Indirect use value relates to the indirect support and protection provided to economic activity and property by the ecosystem's natural functions. Most of the respondents 78(54.2%) have used *Phytolacca dodecandra* for traditional medicine. All the informants (100%) have used *Phytolacca dodecandra* for washing clothes (Table 3).

Table 3 Respondents' statement about the use value of *Phytolacca dodecandra*

No.	Values of *Phytolacca dodecandra*	Yes		No		Total
		Frequency	Percent	Frequency	Percent	
1.	Traditional medicine	78	54.2	66	45.8	
2.	Washing clothes	144	100	-	-	
3.	Animal feed	65	45.1	79	54.9	
4.	Strengthening fence	121	84.0	23	16.0	
5	Wind break	124	86.1	20	13.9	
6.	Income source	68	47.2	76	52.8	144
7.	Beatify the surrounding	114	79.2	30	20.8	
8.	Increase soil fertility	119	82.6	25	17.4	
9.	Increase water table	35	24.3	109	75.7	
10.	Prevent soil erosion	122	84.7	22	15.3	
11.	Skin softening/Tanning purpose	5	3.5	139	96.5	
12.	Honeybee forage	20	13.9	124	86.1	

The willingness to pay of the respondents for Phytolacca *dodecandra*

Majority of the respondents 142(98.6%) were willing to pay for *Phytolacca dodecandra*. According to the respondents' reports, the main reasons of willing to pay for *Phytolacca dodecandra* were due to its different use values such as washing clothes, strengthening fence, traditional medicine, increase soil fertility, prevent soil erosion, animal feed, income source etc. On the other hand, insignificant number of the respondents 2(1.4%) were not willing to pay for *Phytolacca dodecandra*. Moreover, 96.5% respondents were willingness to pay for Conservation of *Phytolacca dodecandra* whereas only 3.5% of the respondents were not

willingness to pay for Conservation of *Phytolacca dodecandra* in the study areas. This might be indicated that majority of the respondents give value for *Phytolacca dodecandra*.

The Mean Willingness to pay of *Phytolacca dodecandera* across Different Socio –Economic Classes

The yearly mean willingness to pay of the respondents across different socioeconomic classes (age, sex, marital status, educational status and income level) has been investigated. Accordingly, in the age socio-economic class, the highest mean willingness to pay was 328.20 birr within the range of 25_44 age class. This could be due to the fact that this age class (25_44) contains active working age group. Contrary to this, the least mean willingness to pay (158.43 birr) was observed in 65_80 age class which might be because this age class was almost at the age of retired. As to the sex socio-economic class, the mean willingness to pay of females respondents (289.12 birr) was greater than male's respondents (233.68 birr). This could be because the most noticeable use value (washing clothes) was mostly females dependent in Ethiopia case.

Concerning to the impact of marital status of the respondents on willingness to pay of *Phytolacca dodecandera*, mean willingness to pay of married and unmarried respondents were 287.54 and 294.93 birr respectively. This result might be indicated that willingness to pay of *Phytolacca dodecandera* did not depends on marital status of the respondents. This could be because both married and unmarried respondents had almost similar views on the use values of *Phytolacca dodecandera*. The mean willingness to pay of the divorce and widowed respondents were 179.6 and 155.33 birr respectively. This much variation in the mean willingness to pay of married and unmarried respondents(287.54 and 294.93 birr) to the divorce and widowed respondents(179.6 and 283.53 birr)might be due to the insignificant number of the divorce and widowed respondents (Table 4).

As to the educational status of the respondents, the highest mean willingness to pay was recorded at Primary Education (5_8) respondents (288.98 birr) but the minimum average willingness to pay was recorded at Preparatory school respondents (240.095birr). This indicated as education levels increase, the average willingness to pay of the respondents' decrease. This could be because as the educational level of the respondents increase, the consciousness to traditional use value of the genetic resource decrease which might be directly related to modernization.

Regarding to the income level of the respondents, the highest mean willingness to pay was recorded at high income level (369.48 birr) and the lowest mean willingness to pay was recorded at low income level of the respondents(134.17 birr).This indicated that as the income level of the respondents increases the mean willingness to pay also increases. This could be due to as the income level of the respondents increase, they are stressed-free to pay for the use value of the genetic resources but as their income level decrease, they become hesitant to pay the use value of the given genetic resources (Table 4).

Table 4 Mean Willingness to pay per year across Different Socio –Economic Classes

No.	Socio –Economic Classes	Number of respondents in each Socio – Economic classes		Mean willingness to pay in Birr per year	Total
1.	Age	willing to pay	Not willing to pay		
	15 _ 24	8	-	287	
	25 _ 44	75	-	328.20	
	45 _ 64	52	-	271.87	144
	65_80	7	2	158.43	
2.	Sex				
	Female	43	-	289.12	144
	Male	99	2	233.68	
3.	Marital Status				
	Married	120	2	287.54	
	Unmarried	14	-	294.93	
	Divorce	5	-	179.60	144
	Widowed	3	-	283.53	
4.	Educational Status				
	Non-Educated	30	1	273.55	
	Informal Education	24	1	270.97	
	Primary Education(1_4)	19	-	244.29	144
	Primary Education(5_8)	51	-	288.98	

	Secondary Education(9_10)	14	-	248.71	
	Preparatory	3	-	240.095	
5.	Income Level				
	Low	43	2	134.17	
	Medium	71	-	280.55	144
	High	20	-	369.48	

Average and Cumulative Estimates of WTP values for *Phytolacca dodecandra*

The cumulative estimates of willingness to pay values were 37,626.05 birr with an average annual willingness to pay of 261.4±139.05 birr with std. error of mean 11.586 for *Phytolacca dodecandra*. The maximum willingness to pay was 817 birr while the minimum WTP for *Phytolacca dodecandra* was 17 birr. The mode of willingness to pay was 400 birr.

Results of multiple regression analysis

The independent variables show at least some relationship with the dependent variable (above 0.3 preferably). In this study, income level (0.510) of the respondents correlate extensively with amount of money the respondents willing to pay for *Phytolacca dodecandra* followed by age (-0.170), sex (-0.121), marital status (-0.107), size of land in hectares and educational status (0.041) and household size (0.032) respectively. The correlation between each of the independent variables is not too high. If two variables with a bivariate correlation of 0.7 or more in the same analysis, it is probably don't need to include in the given analysis. In this situation, it may need to consider omitting one of the variables or forming a composite variable from the scores of the two highly correlated variables (Pallant, 2011). In this study, the correlation of the independent variable age with sex 0.164, age/marital status; -0.118, age/educational status;-0.260, age/household size; 0.335,age/size of land in hectares; 0.123and age/income level;-0.094 etc. Generally, in this study, the correlation of each of the independent variable to each other is less than 0.7; therefore all variables were retained in the analysis.

Multicollinearity

Multicollinearity exists when the independent variables are highly correlated (r=0.9 and above). In this study the independent variables were not highly correlated so that multicollinearity does not exist. In addition to this the possibility of multicollinearity can be checked by Tolerance and VIF. Tolerance is an indicator of how much of the variability of the specified independent variables is not explained by the other independent variables in the model and is calculated using the formula $1–R^2$ for each variable. If this value is very small (less than 0.10), it indicates that the multiple correlations with other variables is high, suggesting the possibility of multicollinearity. In this study, the tolerance values were between 0.766 and 0.951 which is greater than 0.1indicating multicollinearity did not exist. Other value given is the VIF (Variance inflation factor), which is just the inverse of the Tolerance value. VIF values above 10 would be a concern here, indicating multicollinearity. In this study VIF values were between 1.052 and 1.306 which is less than 10, indicating-multicollinearity did not occur (Table 5).

Table 5 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	227.586	50.981		4.464	.000	126.768	328.404					
	Age	-23.802	16.001	-0.118	-1.488	.139	-55.444	7.840	-.170	-.127	-.106	.799	1.251
	Sex	-57.627	24.784	-.189	-2.325	.022	-106.639	-8.614	-.121	-.196	-.165	.766	1.306
	Marital Status	-33.041	17.702	-.144	-1.866	.064	-68.048	1.967	-.107	-.158	-.132	.847	1.180

Educational status	5.121	7.816	.051	.655	.513	-10.335	20.578	.041	.056	.046	.821	1.219
Household size	5.120	5.699	.071	.898	.371	-6.151	16.390	.032	.077	.064	.810	1.234
Size of land in hectares	-1.606	11.541	-.011	-.139	.890	-24.429	21.217	.041	-.012	-.010	.879	1.137
Income level	124.796	18.276	.497	6.828	.000	88.654	160.938	.510	.505	.485	.951	1.052

a. Dependent Variable: amount of money willing to pay for *Phytolacca dodecandra*

Evaluating the model

R^2 value indicates how much of the dependent variable (Amount of money willing to pay for *Phytolacca dodecandra*) can be explained by the independent variables (Age, Sex, Marital status, Educational status, Household size, Size of land in hectares and Income level). In this study, the value is 0.327, this means that our model (which includes Age, Sex, Marital status, Educational status, Household size, Size of land in hectares and Income level) explained 32.7% of the variance in Amount of money willing to pay for *Phytolacca dodecandra*or, R^2 = 0.327or 32.7% of the dependent variable can be explained by the independent variable (Table 6).

From the three functional forms that were tried in order to choose the one with the best performance, double log has the best performance having recorded the highest coefficient of determination (R^2) of 32.7% which intern helped to identify the best explanatory variables that determine willingness to pay of *Phytolacca dodecandera* (Table 6). The respondents' sex (sig.0.022) and income (sig. 0.000) had significant influence, on the amount of the respondents willing to pay for *Phytolacca dodecandera*. This is an indication that WTP for *Phytolacca dodecandera* might be determined through the sex and income of the respondents.

Table 6 Regression results for explanatory variables that determine willingness to pay of *Phytolacca dodecandera*

Regression	Bo	X1.Age	X2.Sex	X3.Marital Status	X4.Educational level	X5.Household size	X6.Size of land in hectare	X7.Income level	R^2	Adj. R^2	Sig. F
Linear	227.586 (50.981)	23.802 (16.001)	-57.627 (24.784)	-33.041 (17.702)	5.121 (7.816)	5.120 (5.699)	-1.606 (11.541)	124.796 (18.276)	0.315	0.280	8.945
Semi-Log	411.347 (140.633)	-45.013 (37.107)	-64.366 (24.492)	-67.938 (30.891)	2.876 (7.805)	20.493 (25.803)	13.951 (14.990)	119.890 (18.055)	0.318	0.283	9.060
Double-Log	6.891 (0.729)	-0.497 (0.192)	-0.186 (0.127)	-0.158 (0.160)	0.000 (0.040)	(0.068) (0.134)	0.070 (0.078)	0.645 (0.094)	0.327	0.292	9.420

Evaluating each of the independent variables

In this step it is necessary to identify which of the variables included in the model contributed to the prediction of the dependent variable (Table 5). To compare the different variables it is important to look at the standardized coefficients, not the un-standardized ones. 'Standardized' means that these values for each of the different variables have been converted to the same scale so that it can compare them. In constructing a regression equation, it would be used the un-standardized coefficient values listed as B (Pallant, 2011).

In comparing the contribution of each independent variable, it is used the beta values. In the Beta column, find which beta value is the largest (ignoring any negative signs out the front (Tabachnic and Fidell 2007). In this study, the largest beta coefficient is 0.497, which is for income level of the respondents. This means that this variable makes the strongest unique contribution to explaining the dependent variable, followed by sex of the respondents (-0.189). The Beta values for the other variables were lower, indicating that it made less contribution.

For each of the independent variables (Age, Sex, Marital status, Educational status, Household size, Size of land in hectares and Income level), check the value in the column marked Sig (Coefficient Table 5). This indicates whether this variable is making a statistically significant unique contribution to the equation. This is very dependent on which variables are included in the equation

and how much overlap there is among the independent variables. If the Sig. value is less than 0.05 (0.01, 0.0001, etc.), the variable is making a significant unique contribution to the prediction of the dependent variable. If greater than 0.05, it can be concluded that the variable is not making a significant unique contribution to the prediction of the dependent variable. This may be due to overlap with other independent variables in the model. In this study, income level (Sig.0.000) and sex (Sig. 0.022) of the respondents made a unique, and statistically significant, contribution to the prediction of willingness to pay for *Phytolacca dodecandra*.

In the coefficients table, the other potentially useful information is the Part correlation coefficient which is referred as semi partial correlation coefficients in the literature (Tabachnick & Fidell, 2007). The square of this value is an indication of the contribution of that variable to the total R square. In this study, the Age, Sex, Marital status, Educational status, Household size, Size of land in hectares and Income level of the respondents have a part correlation co-efficient of -0.106,-0.165,-0.132,0.046,0.064,-0.010 and 0.485 respectively. The squares of each of this value is (multiply it by itself) 0.0112, 0.0272, 0.0174, 0.0021, 0.0041, 0.0001 and 0.2352 respectively, indicating that each of the independent variable in this study (Age, Sex, Marital status, Educational status, Household size, Size of land in hectares and Income level) uniquely explains 1.12%, 2.72%, 1.74%,0.21%, 0.41%, 0.01% and 23.52% of the variance in the total willingness to pay for *Phytolacca dodecandra* respectively (Table 5).

The total R square value for the model (in the current study,0.327, or 32.7% explained variance) does not equal all the squared part correlation values added up (1.12% + 2.72% + 1.74% + 0.21% + 0.41% + 0.01% + 23.52%= 0.297). This is because the part correlation values represent only the unique contribution of each variable, with any overlap or shared variance removed. The total R square value (32.7%), however, includes the unique variance explained by each variable and also that shared. However, in this study, the seven independent variables are not strongly correlated with each other's which were between, r = 0.335 Age/Household size and r= 0.019 Marital status/Size of land in hectares as shown in table 5; therefore, there was a small difference between all the squared part correlation values added up (29.7%) and the total R square value of the model (32.7%).

Finally, the model, which includes Age, Sex, Marital status, Educational status, Household size, Size of land in hectares and Income level, explains 32.7% of the variance in willingness to pay for *Phytolacca dodecandra*. Of the seven variables, income level of the respondents made the largest unique contribution (beta = 0.497), followed by sex of the respondents (beta -0.189).

4. CONCLUSION AND RECOMMENDATION

For ABS purposes estimating the real value of bio-resources at its collection point based on the bio prospecting value and value addition capacity is substantial. Since there are no proper markets for such resources at its collection point, the existing price for the product is not revealing its actual value. Actual value may be more than the existing market price. The Economic Valuation of *Phytolacca dodecandra* was conducted its implication for Access and Benefit Sharing Agreement. The result of this study identified the direct and indirect use values of *Phytolacca dodecandra*. Majority of the respondents 142(98.6%) were willing to pay for *Phytolacca dodecandra*. The cumulative estimates of willingness to pay values were 37,626.05 birr with an average annual willingness to pay of 261.3±139.05 birr for *Phytolacca dodecandra*. In this study R^2 = 0.327 or 32.7% of the dependent variable can be explained by the independent variables. Regarding to the mean willingness to pay of *Phytolacca dodecandera* across different socio –economic classes, the highest mean willingness to pay was recorded at high income level (369.48 birr) and the lowest mean willingness to pay was recorded at low income level of the respondents (134.17 birr). The respondents' sex (sig.0.022), and income (sig. 0.000) had significant influence, on the amount the respondents willing to pay for *Phytolacca dodecandera*. Therefore, because of its prospect for the production of many pharmaceuticals and biofertilizer, bio prospecting companies can be able to access the resources following the Ethiopian domestic legislation of Access and Benefit Sharing (ABS).

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