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Resource Scarcity and Its Effect on Demand for Children and Child Mortality in Ethiopia: The Case of Machakel Woreda

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Abstract

Population growth rate, particularly, high fertility rate in these countries is perhaps related to unacceptable risk of child death, extreme poverty related to the deterioration of natural resource base like potable water, fodder and fuel wood. The general objective of this study is to analyse the relationship between the levels of resource scarcity and demand for children by households. The data were analysed using the Tobit and logit model. It was found that fuel wood scarcity proxy variable which is time required collecting fire wood and other proxy variables of resource scarcity that is distance to water source affect (demand for child) fertility affect positively. In addition as the Tobit regression shows child mortality also affect child fertility positively at 1% significance level. Another proxy variable of resource scarcity which is access to safe water as logistic regression indicates affect child mortality rate negatively but distance to health service affect child mortality positively. According to Tobit model result distance to health center, livestock holding, private land holding, education of wife, price of animal feed and age of wife were not significantly affect demand for children in rural households .On the other hand as logistic regression mode suggests education of husband and total livestock holding of were not significantly affect child mortality in rural farm households of the study area.

Keywords: *Logit model and Tobit Model,*

1. Introduction

Resource degradation appears to reinforce several links between poverty and high fertility. Degradation of land resources worked by women reduces their productivity and the opportunity costs of their labor time. Degradation of tree, range and drinking water resources can increase the time cost of fuel wood gathering, livestock pasturing and water fetching, activities that children can undertake, and that consequently increase their value to parents. Since these links are potentially strongest in areas where fertility is already high (Aggarwal et al., 2001).

In Ethiopia the vast majority of population around 80% lives in rural area which is engaged in agriculture. The substantial portion of the wealth of these people who are found in rural area usually shared common property resources. That is people in the group hold customary ownership of certain natural resources such as grazing land, forests, and water resources. Access and use of land by individuals and families is usually regulated obscure customary traditions, which control in residential groups in a variety of unsatisfactory arrangements. While members of the social groups exercising control over land allocation, have rights of access and use of common property resources (Zenebe, 2004).

On the other hand as concerned the study area, the problem of environmental good scarcity was sever and common resource ownership is a common phenomenon. It is believed that these resources are managed inefficiently and the availability would be limited or scarce. But how do these degraded resource conditions affect the well-being of people of the region as related to demand for children, especially for those rural households, who rely heavily on resource was analyze in the study. These goods are also scarce under the prevailing resource situations. It is believed that poor rural households may also have few feasible alternatives to substitute these resources (Berhanuet al, 2004).

Exploring part of the vicious circle, the link between population growth and the resource, has emerged as an important area of research in recent years (Aggarwal et al, 2006). The focus of most of this research has been on the impact that an exogenously given increase in population would have impact on the resource. However, in the study the situation was analyzed from the opposite angle, the impact of resource degradation on the demand for children and its mortality, in turn population growth. So in the study effect of resource scarcity on demand for children and child mortality were measured by taking time required collecting a bundle of firewood, Distance to drinking water sources, Price of fodder feed and Access to safe water as proxy variables, in addition to other socio economic variables.

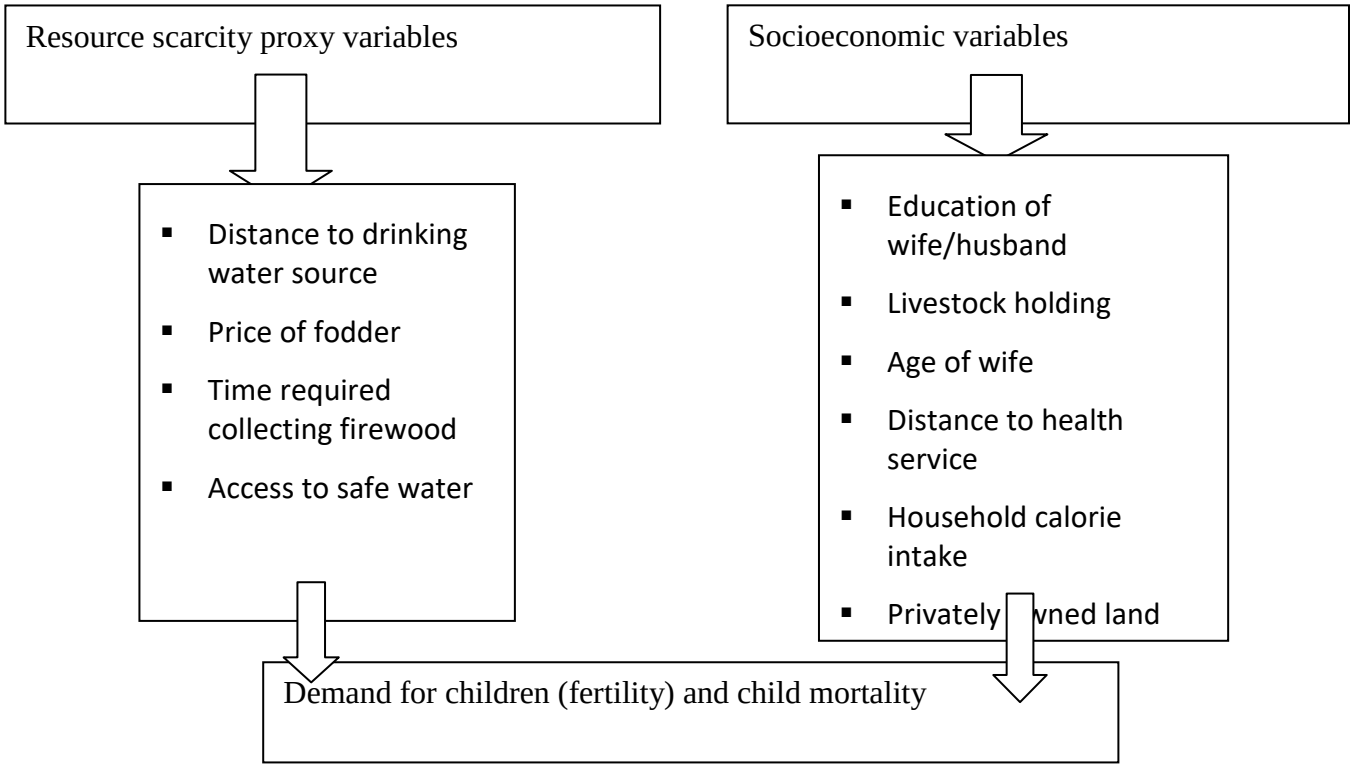
In least developing countries, especially in sub Saharan Africa (SSA), not only the prevailing mortality rate related to environmental factors is high, there is also high fertility like the previous years. Even though the average annual percentage growth rates of population declining at little rate between 1990 and 2015 the growth rate were 2.8 % up to 2.75%, the populations of this part of the content reach boom (World Bank, 2015). On the other hand in this part of Africa population grow on an average 2.7% percent annually from 2009 up to 2016whereas real Gross Domestic Product (GDP) growth fall from 3.8 to 1.5 because of economic volatility related to low economic diversification, low investment and climate change through resource degradation but 2016 it reaches 2.4%.This means that the average living standards of the people in Sub Saharan country were not show good progress (United Nation population division, 2017).

Most of the time in rural area major collectors of these resources is often children and women (Cooke, 2004). Women, in addition to these activities, participate in farm, off farm and other household activities. Therefore, as the resources are scarce, which require large amount of labor and/or time to collect, households were have incentives to have more number of children which in turn results in high fertility

rate. More of this demand for children was related to the high child mortality risk of the household faces. In resource scarcity areas there is also high child mortality rate related to less access to safe water and or malnutrition. The high mortality rate of children calls for high fertility considered desirable by households. Therefore, there exist an obvious link between resource degradation and demand for children and mortality (DeGraff, 2003).

So as indicated by many empirical studies, population pressure is considered as one of the most important factors contributing to resource degradation. However, whether resource degradation has effect on population pressure has not well studied. Besides, the relationship between socioeconomic factors and fertility decisions of households are complex in developing countries. The results are not always consistent across populations in terms of the strength and the direction of the effects of these factors on fertility (Farooq, 2001). These problems underscore the importance of conducting the study in line with available theoretical and empirical knowledge while taking account of the local situation in the study area. As result the general objective of the study were analyzed the effect of resource scarcity and socio-economic factors on demand for children by households and child mortality. Specifically to determine the effect of resource scarcity and other socio-economic factors on the fertility decisions of rural households.

The summery of relationship can be expressed and shown as follow in fig 2.1 conceptual framework



2. Research methodology

2. 1 methodology of the study

2.2 Description of the study area

Machakel District is found in East Gojjam Administrative zone, the District town is located 30 km North-West of Debre-Markos town on the way to Bahir Dar and have 23 rural sub district and 2 small town with an average rainfall of 1350 mm per annum. Of the total area, 37,022 ha (37.6%) are under cultivation dominated by annual crops.

The land use constitute 10,000 ha of grazing land, 14,000 ha of forestland, 5,000 ha under water, 13,000 ha under village and 18,396 ha unused land (MWADO, 2003). The area is currently highly degraded and the fertility status of the soil is very poor. To maintain the fertility status and to reduce the rapidly

increasing soil degradation and deforestation a lot of physical as well as biological soil and water conservation measures were taken in the past few years. In addition to this reforestation activity also undertake in the in the district to comeback the previous forest.

2.3 Sampling Procedure

In the study, random sampling technique was employed to draw sample households in the study area. The study used to reduce heterogeneity within sample households through sampling processes. In the study, households will be select on the condition that the husband and wife live under one roof and that the age of wife is in the range of 15-50 years. The households having wife in the specific ages are also not to be widow and/or they are not remarried to show clearly impact of resource degradation on fertility.

2.3.1 Sample Size Determination

The sample size for this study was determined using the formula given by Yamane(1967) in drawing an adequate sample size from a given population at 95% confidence level, 0.5 degrees of variability and 7% level of precision. According to Yamane (1967), 7% level of precision recommendable than 5% and 10% level of perception because if we take error of 5% sample size is high.

So rather than the two level of precisions taking error 7% is good because it results sample size which is between 5% and 10% precision level.

$$\boldsymbol{n} = \frac{\boldsymbol{N}}{\mathbf{1}+\boldsymbol{e}^{\mathbf{2}}\,(\mathbf{N})} \qquad (1)$$

Where n= the sample size

N= the total rural household head

e= the level of perception

$$\boldsymbol{n} = \frac{\mathbf{40915}}{\mathbf{1}+\mathbf{0.07}^{\mathbf{2}}(\mathbf{40915})} = 203$$

Therefore based on this formula 203 sample respondent was selected from40,915rural households. These rural households who are the target of the study live in rural area with farm activities and they are married.

2.3.2 Methods of data Analysis

The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation, and then drawing statistical inferences (Kothari, 2004).Because of this, different types of analytical methods will be used to evaluate the research results and make a sound conclusion for a given survey information. Accordingly, in the study descriptive and econometric models were used. After the data is collected from both primary and secondary sources, it was analyzed by using different methods of data analysis. The statistical analyses that was employed for this study includes descriptive statistics such as mean, frequencies and percentages.

2.4 Econometric model specification

As we stated before the aim of the study was determined the effect of resource scarcity and other socio economic factors on fertility decision and child mortality of households and the study will have two econometric models. The first model is used for analyze factors affecting fertility or demand for children of farm households. In case of this study since sample respondents who do not have any child which is included in the analysis with zero value of the dependent variable, the dependent variable failed to be continues. To estimate this, one important model in which the study was adopted Tobit model that is the hybrid of discrete (probit) and continues (linear regression) model. This model is originated by Tobin (1958)and commonly known as censored normal regression model. It assumes that many variables have a lower or upper limit that known as threshold value and take on this limiting value for substantial level

of respondents. In this case the threshold value is zero, which is the value assigned for dependent variable that rural households do not have any child. For the remaining sample respondents the variable takes on wider ranges of value above the limit. The explanatory variables in the model have may influence both probability of limit responses and the size of non-limit.

Therefore, the models were specified as follows:

$\boldsymbol{Y*= \beta 1 X_i + \mu_{i,}}$ i=1, 2 …

$\boldsymbol{Yi = Y * if Yi > 0}$

$\boldsymbol{Yi = 0 if Y * \leq 0}$

Where:

$Y_{i,}$ = is the observed dependent variable, in our case children ever born per rural household.

$Y*$=is latent variable which is not observed

$X_{i,}$ = is the independent variable.

β=unknown parameters

$\mu_{i,}$=are the error terms.

Finally, regression results were present in a tabular form with the appropriate test statistics and then an explanation of each parameter was given in line with the evidence in the literatures. Furthermore, various diagnostic tests such as normality, heteroscedasticity and multicolinearity test will be conduct to decide whether the model use in the study was appropriate and fulfill the assumption of classical linear regression model.

The second model was used in the study to estimate child mortality related to resource scarcity and other socio economic factors. Therefore,logit model is mostly require to estimate child mortality per household to identify the influence of various factors coming with resource scarcity, because the dependent variable of child mortality is express in twoprobabilistic alternatives. That is, the logistic distribution function (logit) model was used in the study to estimate child death/mortality/ that has taken either of the two values one if child died or zero if child is not died.

According to Vasisht (n.d), logit analysis produces statically sound results, which can be easily interpreted, and the method is simple to analyses. Assume the following basic model, it can be express the probability that *y*=1 as a cumulative logistic distribution function.

$$Y_i = \beta_1 + \beta_2 X_i + \varepsilon_i$$

$$P_i = E\left(Y = 1/Xi\right) = \beta_1 + \beta_2 Xi$$

The cumulative Logistic distributive function can then be written as:

$$p_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2)}} = \frac{e^{z_i}}{1 + e^{z_i}}$$

$$where, Z_i = \beta_1 + \beta 2 X_i$$

P_i= prob(Y = 1| X) is the response probability. The non-response probability (1- Pi) is also evaluated as:

$$1 - p_i = prob\left(Y_i = 0/X_i\right)$$

$$1 - P_i = 1 - \frac{e^{z_i}}{1 + e^{z_i}} = \frac{1}{1 + e^{z_i}}$$

Note that the response and non- response probabilities both lie in the interval [0, 1]; $Z_i$ranges from −∞ to +∞, and hence, are interpretable. There is a problem with non-linearity in the previous expression, but this can be solved by creating the odds ratio $\frac{P_i}{1-P_i}$ and its log-transformation.

$$\frac{P_i}{1-P_i} = \frac{prob\left(Y_i = 1/\mathbf{X}_i\right)}{prob\left(Y_i = 0/\mathbf{X}_i\right)} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Zi}$$

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_1 + \beta_2 X_i \text{ (Gujarati, 2004)}$$

Accordingly, the estimated model in the study will be present as follow.

$$Li = ln\left(\frac{p_i}{1-p_i}\right) = \beta 0 + \beta 1 EDUWM + \beta 2 CLEAWAT + \beta 3 DISTHEAL + \beta 4 TLHL + \beta 5 CALPCAP + \beta 6 EDHUSD + \varepsilon o$$

Where: ln=natural logarithm

$ln\left(\frac{p_i}{1-p_i}\right)$= the odd ratio

3. Results and discussions

3.1 Descriptive analysis

3.1.1 Child mortality in sample households

Table 4; **child death in sample households**

Child death	Frequency	Percent
0	**167**	**82.27**
1	**36**	**17.73**

Source; sample survey 2018

The sample households experienced on the average 0.18 child death in their life before the time of the survey period. As far as their fertility is concerned, on average the sample households gave births to 3 children based on the data collected on survey. The sample household survey result also showed that there is a tendency of 17.73 % death of child in the study area.Test of association indicates child mortality in household's hadstatistically significance at 5%

3.1.2 Resource scarcity and assets of the sample households

The farm households of Machakeldistrict are highly biomass dependent for their sources of energy and animal feed. Their source of fuel wood and fodder are from the natural forest. They depend on forests both in the collection of forests bushes and grazing land for a variety of needs, including building materials. Grazing areas with some regulation of use (restricted grazing areas) and unregulated areas are common in the rural of machakel district almost all restricted grazing areas are used exclusively by the villages that manage them. The restricted areas are used only during the period from September to November. A kebele may have one or two restricted grazing land. These restricted grazing lands are important sources of animal feed, provided through grazing, lopping of trees (cutting of branches) and cut and carry fodder collection in the form of hay. In the district as a whole, selling and buying of grass fodder from private land is a common phenomenon.

Most of the farmers reported that the natural pasture has not been enough for their livestock since grazing lands provide unemployed youth farm production. Farmers explain that shortage of pasture in

recent years they have been obliged to collect fodder to feed all livestock in addition to pasture. Most of the time hay, teff, and barley straw were commonly collected in harvesting season (pasture surplus season) and feed them in pasture deficit season (mostly one to two month before and onset of rainy season). The collected fodder has also been given to the livestock based on priority. Equines, cow and oxen are given higher priority to feed these fodders.Now day's farmers feed collected fodder for all species of livestock and collection of fodder from almost all crops harvested become common. In addition to grazing livestock, other allowed use of protected ones include cutting grass for feed or construction, fuel wood collection from dead trees, dung collection and beekeeping are common.

Households collect fuel wood, for cooking and heating, and for source of light in rural areas were commons. Crop residues, dried animal dung and wood from trees are also sources of domestic energy. As the survey indicates the degree of fuel wood scarcity were serious due to problem of deforestation. Use of animal dung and crop residues as a source of fuel is an indicator of fuel wood shortage, these materials has alternative uses as manure.

Sample households rely heavily depend on resource for different purposes and spend a significant amount of their time a day in collection. Firewood is the primary sources of energy for cooking, and during the week of the survey period, it is observed almost about 91.6% of the households were using it. As the survey none of the sample households used improved stoves as substitute for fuel wood uses. The other readily available substitute of fuel for these households is dung, charcoal and crop residue with the proportions of 0.09%, 2.4% and 4.9% respectively.

Table 6; **source fuel wood for rural household in machekel district**

Source fuel wood	Frequency	Percent
Fire wood	186	91.6
Cow dung	5	0.09
Crop residue	10	4.9
Charcoal	2	2.4

Source; sample survey 2018

As far as the collection and use of fodder is concerned, all of the sample households collect fodder for their livestock from private land in addition from common grazing land or to sell in cash. All of the sample households collect fodder from crop residues as a source of fodder. Those households reported that the use of crop residue in the survey week (crop residue users) on average consume more as sources of feed as compared to those who reported assource fuel wood. From this result, it is shown that firewood users on average collected small bundles of cow dung and crop residues as compared to crop residue users. On the other hand crop residue users and cow dung user's collected small bundles of firewood, both log and tree branches, as compared to firewood users. Therefore, it seems that if households do not face the scarcity of fuel wood, they will not interest to collect cowdung orfirewood

3.2 Econometrics Analysis

3.2.1 Factors determine child fertility and mortality

The study was used Tobit and logistic regression models to identify determinants of fertility decisions of households (demand for births) given the expected and experience of child mortality related with socio economic factors as well as the availability and scarcity of resource goods.A set of socio economic factorvariables such as age of wife, education of women, tropical livestock unit, private owned land area, distance of health center and education of husband have been identified to influence child fertility and mortality.In estimation of fertility decisions of households in response to resource, different levels and criteria of resource scarcity measurements were hypothesized with taken proxy variable. These are distance travel to sources of water and cleanse for drinking water scarcity, time required to collect a bundle of firewood for scarcity of fuel wood and price of a bundle of fodder for scarcity of natural pasture.

Testing Multicollinearity and Heterosecedasticity

Before interpreted the result, hypothesized explanatory variables were checked whether multicollinearity and Heterosecedasticity exists among the variables. Multicollinearity problem arises when two or more explanatory variables in a regression equation are highly correlated. If there is

presence of multicollinearity between independent variables, it is very difficult for use to estimate accurately the effect of the variables. Thus, it is important to test the presence of multicollinearity before running the regression. In order to test the existence of multicollinearity problem, VIF (Variance Inflation Factor) is utilized. As a rule of thumb for multicollinearity, test of the model states a variable whose value are greater than 10 or whose 1/VIF value is less than 0.1 indicates possible problem of multicollinearity. Correlation matrix illustrates bivariate relationship between two independent variables. Correlation matrix examines the extent or direction of relationship among two variables and how one variable is related to another. Correlation matrix also indicates problem of multicollinearity (Gujirate, 2004). Multicollinearity is a problem when the correlation result is above 0.80 and below -0.80. So as the variance inflated factor (vif) and correlation matrix result indicates were not exist in the two regression models.In the case of limited dependent variables, Maddala and nelson (1978) showed that if we ignore Heterosecedasticity, the result estimates are consistent. So this problem is solved using robust. The Tobit model was run to identify the factors responsible child fertility (demand for child birth), but logit regression model was run to identify factors for child death.

3.2.2 Determinant of demand for children (fertility)

The model identified three significant variables out of nine explanatory variables which are shown in table 8 below. The sign (positive or negative) of each individual Tobit regression coefficient implies the effect of a particular variable on dependent variable. A positive sign of the coefficient corresponding to each independent variable shows increase of the probability of child birth, whereas a negative sign of the coefficient shows decrease the probability of child demand.

Table 12, result of Tobit regression model estimate for factors determining child fertility

Variables	Coef.	Robust Std. Err.	T	P>t	dy/dx
DISHEAL	.0056303	.0742989	0.08	0.940	.0051238
AGWF	.0220967	.0150346	1.47	0.143	.0211642
CHD	.6611562	.2580502	2.56	0.011***	.6520048
TRCFW	.3016348	.1133214	2.66	0.008***	.2892504
DISWT	1.013335	.1835589	5.52	0.000***	.9797134
PRCFOD	-.4933053	.61827	-0.80	0.426	-.4915989
TLH	-.031323	.0222542	-1.41	0.161	-.0302162
PLARE	.0153236	.0486823	0.31	0.753	.0126342
EDWF	-.3752513	.25326	-1.48	0.140	-.3548241
_cons	.0230261	.9525835	0.02	0.981	
Number of obs=203Log pseudo likelihood=-378.06455 F(9,194)=5.915 left-censored observation at FER<=0 Prob>F=0.0000 188 uncensored observations Pseudo R2=0.0682 0 right –censored observations					

Note: ***, ** and * denotes significance at 1% probability level, 5% probability level and 10% probability level.

According to the above Tobit regression model estimates, out of the proposed nine explanatory variables three variables which have significant influence on dependent variable were identified. These variables are distance to water source (DISWT), child mortality (CHD) and time required collecting fire wood were found to be significant. Each of these important variableswas explained in the next section.

Time required collecting a bundle of firewood (TRCFW): - Time required to collect a bundle of firewood was positively affect demand for children at 1% significance level. Now day natural forest deforestation through over cutting of trees without afforestation activity leads scarcity of fuel wood experienced in rural farm households. In the study area households were spends long time for searching and collecting fire wood to get energy source for cooking and other purposes. Thus, the time spent in

collecting firewood is an indicator of resource scarcity and leads the demand for children is high and increase with 0.28 unit.

Mortality of children (CHD): -The regression result suggests Mortality of children in household was significantly affect fertility of children at 1% significance level. In rural household children's was died because of different causes of resource scarcity and other problems. When households face lovely child death, so their demand to get other child is increase with 0.65 unit to replace the lost one.

Distance to drinking water sources (DISWT):-The Tobit regression model shows that distance to drinking water source affect the dependent variable positively at 1% significance level. This implies Distance to drinking water sources increase in kilometers due to water scarcity; respondents waste much time to fetch water. Because currently most of water source in rural area like river, lake and spring water due to resource degradation. Deforestation and drought have great contribution water source are decrease in quantity and disappeared. It allows usually women and children walk away a long distance to fetch for home consumption and drink livestock's. This leads rural households required much labor for farm and off farm activities. To compromise the situation household's demand for children were increase to get additional labor ta reduce time wastage of households in fetching water in place of agricultural productivity. So as distance to water source increase households demand for children (fertility) increase with 0.97 units.

Education of wife's/women (EDWF): - Education of woman is a dummy variable that takes one if she is literate, and zero otherwise. In the study education of women were not significantly affect demand for children (fertility) in the farm household of rural area as Tobit regression indicates. Privately owned land area (PRARE): - This variable represents the area plot under the ownership of the household measured in timad (four timad is approximately equal to one hectare). But as Tobit regression shows private owned land area was not significantly affect demand for children. Livestock holding (TLH): -The study was measure livestock holding of sample households in tropical livestock unit, but regression result suggests livestock holding were not significantly affect demand for children. Price of fodder (PRCFOD): -This variable reflecting the status of availability of animal feed, and is used as a proxy for the scarcity of natural resource, natural pasture. But in the study price of fodder was not significantly fertility decision of sample households. Age of wife (AGWF): As Tobit regression indicates the age of wife was not significantly affect demand for children 1%,5% and 10% significance level. But survey shows that in aged woman family existence of child was comparatively than low aged woman. Distance to health services (DISHEAL): Distance to health service has effect on farm households to get better access like modern contraceptive and family planning service. But in the study distance to health service is not significantly affect the dependent variable demand for children.

3.3 Factors determine child Mortality

3.3.1 Binary Logistic Model Results

A binary logistic regression model was used to estimate and identify determinants of child mortality in rural farm households. In logistic regression to check association between explanatory variables correlation test was undertake. The main purpose of this section is to specify a logistic regression model fitted to identify the potential factors child mortality affect in the study area.From explanatory variables access to safe water and distance to health service were significantly affect child mortality.

Table**; Binary Logistic Model Results**

Variables	Coef.	Robust Std. Err.	Z	P>z	dy/dx
CLNWT	**-1.507805**	**.3191379**	**--4.72**	**0.000**	**-.3282921**
TLH	**.0603491**	**.0566259**	**1.07**	**0.287**	**.0140663**
EDW	**-.2816014**	**.3365447**	**-0.84**	**0.403**	**-.065179**
DISHEAL	**.3893734**	**.0976654**	**3.99**	**0.000**	**.090756**
EDH	**.5074542**	**.3307744**	**1.53**	**0.125**	**.1172784**
_cons	**-1.901942**	**.6187678**	**-3.07**	**0.048**	
Iteration 0: log pseudolikelihood =-136.12001					

Iteration 1: log pseudolikelihood		**=--117.09608**			
Iteration 2: log pseudolikelihood		**=--116.85968**			
Iteration 3: log pseudolikelihood		**=--116.85926**			
Iteration 4: log pseudolikelihood		**=--116.85926**			
Logistic regression					
Number of obs =	**203**				
Wald chi2(4)	**=**	**41.74**			
Prob> chi2	**=**	**0.0000**			
Log pseudo likelihood	**=**	**-116.85926**	**Pseudo R2**	**=**	**0.1415**

Note: ***, ** and * denotes significance at 1% probability level, 5% probability level and 10% probability level.

As it is showed the above table education of husband ,wives and total livestock holding were not significantly affect child mortality at 1%,5% and 10% significance level, but other two explanatory variables were influence child mortality 1% significance level. These variables are:-

Access to safe water (CLNWT): -As the logistic regression result shows access to safe water negatively affect child mortality at 1% significance level. Currently access to safe and clean water is serious problem in rural area. Most of the time problem of water safety and cleanse occur due to continuous drought caused by environmental change. Deforestation of natural forest for farm land, fuel wood and other purposes mainly speed up change environmental set up into uncomfortable conditions and affect economic growth and development. In the study area due to these factors accessibility of safe and clean water were difficult through time to time as sample respondents reported in survey. In this area water sources like spring and river water quality and quantity were decreased due to flood caused by soil erosion as compared the previous years and sometimes they become these water sources dried. This shows resources were scarce through degradation and existence of clean water is challenging in rural area. That is, low accessibility of safe or clean water because of deforestation and drought expose children's for serious disease and death in rural area. But access to clean and safe water sources increase child mortality in households decreased with**-0.33** units.

Distance to health services (DISHEAL): According to the logistic regression distance to health service was negatively affect child mortality at 1% significance level. Distance to health service has effect on farm households to get better access like modern contraceptive and family planning, vaccination, medical treatment and other services. When distance to health service is high it requires spending long time to walk health center. This hinders rural households was not vaccinated and check up their child health through time. In rural farm household's death of early child born in the study area was a common problem. So as distance to health service decrease in kilometers child mortality was decrease with 0.09 units.

Husband (EDH): - Education of husband is a dummy variable that takes one if she is literate, and zero otherwise. In the study education of husbands were not significantly affect child mortality in the farm household of rural area as Tobit regression indicates. **Livestock holding (TLH):** -The study was measure livestock holding of sample households in tropical livestock unit, but regression result suggests livestock holding were not significantly affect child mortality.

4. Conclusions and recommendations

The overall result of the study indicated that resource scarcity through deforestation and drought was a serious problem in rural farm households of the study area. It results most of the respondents were waste their golden time in fetching water from distanced water source and collecting fire wood from degraded natural forest. This situation causes agricultural productivity of farm households especially crop production were decreased and it allows national economic growth and development was not speed up. To solve the problem rural household were demanded to born child for to get additional manpower which reduces time wastage in searching natural resource and to become productive by investing their time in agricultural activities. On the other hand this trend allows in Ethiopia high population growth exists and unemployment rate was increase due to lack of private farm land.

The result of Tobit regression model indicates that time required for collecting fire wood, distance to water source and child death from different causes were significantly affect rural household to demand for children in the study area. But variables like total livestock holding, age of wife/woman, price of

fodder, education of wife, and distance to health service and private land area holding were not significantly affect households demand to children.

The survey shows in addition to resource scarcity in quantity, resource scarcity also exist in quality in the study area. This leads water and air borne disease were happen in rural farm household ,because of it child's who have low resistance were died. In the study the logistic regression model shows that access to safe and clean water and distance to health center service were significantly affect child mortality in rural households in the study area. But in the study logistic regression indicates distance to water source and livestock holding were not significantly affect child mortality at 1%, 5% and 10% significance level.

Based on the findings of the study, the following points need to be considered as possible policy implications in order to enhance household's participation in the planning and implementation of conservation activities of the park.

- The concerned body will be digging out hole to substitute spring water and river water source scarcity with underground water to minimize energy and time lose because of long distance from home to water source. If government or NGOs undertake this activity in the community health and water scarcity caused problems were reduced and households actively engaged in crop production to contribute economic growth and development.

- Implement effective family planning policy and strategies through create awareness in rural farm households to reduce child born in households and change the habit of seeing child as an asset and labor source. Currently as a country level population was increase through a time, so to restrict rapid population growth government should apply productive population policy.
- Access health service for the community in short distance to allow households and their child get vaccination and general medical treatment in low cost. It's also important to broad awareness about family planning and helps pregnant women's check and treats properly up to their child birth.
- Government or NGOs do spring water development and aware households protect water source from pollution caused by flood and animals. So the community should be differentiate animal and human being water source and prepare trace and also plant trees to protect flood caused by soil erosion. If this activity made in the community diseases prevalence related to water were reduced in alarming rate.

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Appendix A.1:

```
. mfx, predict (ystar (0,.))

Marginal effects after tobit
      y  = E(FER*|FER>0) (predict, ystar (0,.))
         =  3.2896719
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
DISHEAL	.0051238	.07205	0.07	0.943	-.136096	.146344	2.8931
AGWF	.0211642	.01459	1.45	0.147	-.007429	.049757	36.9754
CHD*	.6520048	.25421	2.56	0.010	.153769	1.15024	.17734
TRCFW	.2892504	.10829	2.67	0.008	.077009	.501492	2.99606
DISWT	.9797134	.17142	5.72	0.000	.643743	1.31568	1.81281
PRCFD	-.4915989	.59848	-0.82	0.411	-1.6646	.681402	.24665
TLH	-.0302162	.02161	-1.40	0.162	-.072564	.012132	7.24631
PLARE	.0126342	.04669	0.27	0.787	-.078868	.104136	4.52266
EDW*	-.3548241	.24269	-1.46	0.144	-.830484	.120836	.413793

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx

Marginal effects after logit
      y  = Pr(CHM) (predict)
         =  .36993132
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
EDW*	-.065179	.07698	-0.85	0.397	-.216062	.085704	.423645
CLNWT*	-.3282921	.06478	-5.07	0.000	-.455263	-.201321	.418719
TLH	.0140663	.01321	1.06	0.287	-.011831	.039964	7.00985
DISHEAL	.090756	.02312	3.93	0.000	.04544	.136072	3.66502
EDH*	.1172784	.07568	1.55	0.121	-.031055	.265611	.53202

(*) dy/dx is for discrete change of dummy variable from 0 to 1