INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE & MANAGEMENT

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

Indexed & Listed at:

Ulrich's Periodicals Directory ©, ProQuest, U.S.A., EBSCO Publishing, U.S.A., Cabell's Directories of Publishing Opportunities, U.S.A.,

Open J-Gage, India [link of the same is duly available at Inflibnet of University Grants Commission (U.G.C.)],

Index Copernicus Publishers Panel, Poland with IC Value of 5.09 & number of libraries all around the world.

Circulated all over the world & Google has verified that scholars of more than 2022 Cities in 153 countries/territories are visiting our journal on regular basis.

Ground Floor, Building No. 1041-C-1, Devi Bhawan Bazar, JAGADHRI – 135 003, Yamunanagar, Haryana, INDIA

http://ijrcm.org.in/

CONTENTS

CALL FOR MANUSCRIPTS

We invite unpublished novel, original, empirical and high quality research work pertaining to recent developments & practices in the area of Computer, Business, Finance, Marketing, Human Resource Management, General Management, Banking, Insurance, Corporate Governance and emerging paradigms in allied subjects like Accounting Education; Accounting Information Systems; Accounting Theory & Practice; Auditing; Behavioral Accounting; Behavioral Economics; Corporate Finance; Cost Accounting; Econometrics; Economic Development; Economic History; Financial Institutions & Markets; Financial Services; Fiscal Policy; Government & Non Profit Accounting; Industrial Organization; International Economics & Trade; International Finance; Macro Economics; Micro Economics; Monetary Policy; Portfolio & Security Analysis; Public Policy Economics; Real Estate; Regional Economics; Tax Accounting; Advertising & Promotion Management; Business Education; Management Information Systems (MIS); Business Law, Public Responsibility & Ethics; Communication; Direct Marketing; E-Commerce; Global Business; Health Care Administration; Labor Relations & Human Resource Management; Marketing Research; Marketing Theory & Applications; Non-Profit Organizations; Office Administration/Management; Operations Research/Statistics; Organizational Behavior & Theory; Organizational Development; Production/Operations; Public Administration; Purchasing/Materials Management; Retailing; Sales/Selling; Services; Small Business Entrepreneurship; Strategic Management Policy; Technology/Innovation; Tourism, Hospitality & Leisure; Transportation/Physical Distribution; Algorithms; Artificial Intelligence; Compilers & Translation; Computer Aided Design (CAD); Computer Aided Manufacturing; Computer Graphics; Computer Organization & Architecture; Database Structures & Systems; Digital Logic; Discrete Structures; Internet; Management Information Systems; Modeling & Simulation; Multimedia; Neural Systems/Neural Networks; Numerical Analysis/Scientific Computing; Object Oriented Programming; Operating Systems; Programming Languages; Robotics; Symbolic & Formal Logic and Web Design. The above mentioned tracks are only indicative, and not exhaustive.

Anybody can submit the soft copy of his/her manuscript **anytime** in M.S. Word format after preparing the same as per our submission guidelines duly available on our website under the heading guidelines for submission, at the email address: **infoijrcm@gmail.com**.

GUIDELINES FOR SUBMISSION OF MANUSCRIPT

1. **COVERING LETTER FOR SUBMISSION:**

DATED: _____________

THE EDITOR
IJRCM

Subject: **SUBMISSION OF MANUSCRIPT IN THE AREA OF .**

(e.g. Finance/Marketing/HRM/General Management/Economics/Psychology/Law/Computer/IT/Engineering/Mathematics/other, please specify)

DEAR SIR/MADAM

Please find my submission of manuscript entitled '____' for possible publication in your journals.

I hereby affirm that the contents of this manuscript are original. Furthermore, it has neither been published elsewhere in any language fully or partly, nor is it under review for publication elsewhere.

I affirm that all the author (s) have seen and agreed to the submitted version of the manuscript and their inclusion of name (s) as co-author (s).

Also, if my/our manuscript is accepted, I/We agree to comply with the formalities as given on the website of the journal & you are free to publish our contribution in any of your journals.

NAME OF CORRESPONDING AUTHOR:
Designation:
Affiliation with full address, contact numbers & Pin Code:
Residential address with Pin Code:
Mobile Number (s):
Landline Number (s):
E-mail Address:
Alternate E-mail Address:

NOTES:

a) The whole manuscript is required to be in ***ONE MS WORD FILE*** only (pdf. version is liable to be rejected without any consideration), which will start from the covering letter, inside the manuscript.
b) The sender is required to mention the following in the **SUBJECT COLUMN** of the mail:
New Manuscript for Review in the area of (Finance/Marketing/HRM/General Management/Economics/Psychology/Law/Computer/IT/Engineering/Mathematics/other, please specify)
c) There is no need to give any text in the body of mail, except the cases where the author wishes to give any specific message w.r.t. to the manuscript.
d) The total size of the file containing the manuscript is required to be below **500 KB**.
e) Abstract alone will not be considered for review, and the author is required to submit the complete manuscript in the first instance.
f) The journal gives acknowledgement w.r.t. the receipt of every email and in case of non-receipt of acknowledgment from the journal, w.r.t. the submission of manuscript, within two days of submission, the corresponding author is required to demand for the same by sending separate mail to the journal.

2. **MANUSCRIPT TITLE**: The title of the paper should be in a 12 point Calibri Font. It should be bold typed, centered and fully capitalised.

3. **AUTHOR NAME (S) & AFFILIATIONS**: The author (s) **full name**, **designation**, **affiliation** (s), **address**, **mobile/landline numbers**, and **email/alternate email address** should be in italic & 11-point Calibri Font. It must be centered underneath the title.

4. **ABSTRACT**: Abstract should be in fully italicized text, not exceeding 250 words. The abstract must be informative and explain the background, aims, methods, results & conclusion in a single para. Abbreviations must be mentioned in full.

5. **KEYWORDS**: Abstract must be followed by a list of keywords, subject to the maximum of five. These should be arranged in alphabetic order separated by commas and full stops at the end.

6. **MANUSCRIPT**: Manuscript must be in ***BRITISH ENGLISH*** prepared on a standard A4 size ***PORTRAIT SETTING PAPER***. It must be prepared on a single space and single column with 1" margin set for top, bottom, left and right. It should be typed in 8 point Calibri Font with page numbers at the bottom and centre of every page. It should be free from grammatical, spelling and punctuation errors and must be thoroughly edited.

7. **HEADINGS**: All the headings should be in a 10 point Calibri Font. These must be bold-faced, aligned left and fully capitalised. Leave a blank line before each heading.

8. **SUB-HEADINGS**: All the sub-headings should be in a 8 point Calibri Font. These must be bold-faced, aligned left and fully capitalised.

9. **MAIN TEXT**: The main text should follow the following sequence:

   INTRODUCTION

   REVIEW OF LITERATURE

   NEED/IMPORTANCE OF THE STUDY

   STATEMENT OF THE PROBLEM

   OBJECTIVES

   HYPOTHESES

   RESEARCH METHODOLOGY

   RESULTS & DISCUSSION

   FINDINGS

   RECOMMENDATIONS/SUGGESTIONS

   CONCLUSIONS

   SCOPE FOR FURTHER RESEARCH

   ACKNOWLEDGMENTS

   REFERENCES

   APPENDIX/ANNEXURE

   It should be in a 8 point Calibri Font, single spaced and justified. The manuscript should preferably not exceed ***5000 WORDS***.

10. **FIGURES & TABLES**: These should be simple, crystal clear, centered, separately numbered &self explained, and **titles must be above the table/figure**. **Sources of data should be mentioned below the table/figure**. It should be ensured that the tables/figures are referred to from the main text.

11. **EQUATIONS**:These should be consecutively numbered in parentheses, horizontally centered with equation number placed at the right.

12. **REFERENCES**: The list of all references should be alphabetically arranged. The author (s) should mention only the actually utilised references in the preparation of manuscript and they are supposed to follow **Harvard Style of Referencing**. The author (s) are supposed to follow the references as per the following:

- All works cited in the text (including sources for tables and figures) should be listed alphabetically.
- Use (**ed.**) for one editor, and (**ed.s)** for multiple editors.
- When listing two or more works by one author, use --- (20xx), such as after Kohl (1997), use --- (2001), etc, in chronologically ascending order.
- Indicate (opening and closing) page numbers for articles in journals and for chapters in books.
- The title of books and journals should be in italics. Double quotation marks are used for titles of journal articles, book chapters, dissertations, reports, working papers, unpublished material, etc.
- For titles in a language other than English, provide an English translation in parentheses.
- The location of endnotes within the text should be indicated by superscript numbers.

PLEASE USE THE FOLLOWING FOR STYLE AND PUNCTUATION IN REFERENCES:

BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

WEBSITES

- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

FERTILITY DECISIONS OF HOUSEHOLDS IN RESPONSE TO ENVIRONMENTAL GOODS SCARCITY: THE CASE OF SEKOTA DISTRICT, WAG HIMRA ADMINISTRATE ZONE OF THE AMHARA REGION, ETHIOPIA

ZEWDU BERHANIE
LECTURER
DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCES
BAHIR DAR UNIVERSITY
ETHIOPIA

ABSTRACT

The current population boom unparalleled in human history is largely concentrated in developing countries. 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. In many empirical studies, population increase is considered as one of the most important factors contributing to environmental degradation. However, the reverse effect has not been well documented. Therefore, the general objective of this study is to analyze the relationship between the levels of environmental goods scarcity and fertility decisions of households. Both primary and secondary data sources were used for this purpose. The data were analyzed using the Tobit model. It was found that fuel wood and water scarcity, part of environmental good scarcity, affect fertility negatively. Another variable, which is also related to environmental good scarcity, was risk of child mortality rate that affect fertility positively. In addition to these factors other than environmental goods that affect fertility were household calorie intake per capita, women age category, and education of women. As far as the responsiveness of these factors concerned, it was found that fuel wood scarcity is the majour determinant of fertility decisions of households in absolute value followed by household calorie intake per capita. Water scarcity, rate of child mortality risk, women age category, and women's education were the third, fourth, fifth and sixth determinants of the fertility decisions of households in absolute value, respectively.

KEYWORDS

Fertility, environmental good scarcity, child mortality, demand for children, tobit.

1. INTRODUCTION

The current population boom unparalleled in human history is largely concentrated in developing countries. These countries account for more than 95% of the total increment of world population. The key element behind the change in population of these countries where the growth is so rapid, is the level and patterns of fertility

Population growth rate, particularly, high fertility rate in these countries is perhaps related to unacceptable risk of child death, and extreme poverty related to the deterioration of natural resource base like potable water, fodder and fuel wood. That is, if the natural resources and customary ownership common property for the society are deteriorated, it calls for high fertility rates related to child labour.

Bromley and Cernea (1999) argued that even in a situation of common property ownership, increase in the demand for common property resources through population growth may lead to unrestricted access to these resources. The foregoing situation will result the deterioration or undermine the institutional arrangements. As a result, the traditional uncontrolled and free ridings of the natural resources results in sever degradation.

In addition, labor productivity is low in the region in general and in the study area in particular not only because capital is scarce, but also the environmental resources are scarce too. As a result, each household needs many hands, and the overall usefulness of each additional hand increases with declining resource availability. When environmental goods are scarce, households will have to spend more time collecting these products, which significantly increase the work burden of women and children.

The major concern for this framework is related to the importance of children as resource collectors and decisions related to the risk associated to high child and infant mortality. In poor countries children are useful as income earning assets. Poor countries are for most part biomass based subsistence economies. Households in environmental degraded areas, particularly in low-income countries and rural areas do not have access to the source of domestic energy and water on tap (Desgupta, 1992). This means that the relative prices of alternative sources of energy and water faced by rural households are often prohibitively expensive. This provides a link between high fertility and degradation of the environmental resource base of the rural community.

According to Aggarwal *et al* (2001), resource scarcity is likely to affect fertility on two pathways. The first pathway is through the effect of resource degradation on the production of child quality and the second is through its effect on the production of aggregate good. With the first effect alone, an increase in resource scarcity can be viewed as increasing the price of child quality, hence leading to a fall in demand for child quality. The fall in child quality would lead to an increase /or decrease/ in the demand for children depending on whether quantity and quality are perceived as substitutes (complements) in preferences. In the second effect, an increase in resource scarcity leads to a fall in the production of the aggregate food and a fall in marginal productivity of adults and children.

Nerlove (1993) also argues that environment is assumed to affect fertility decisions through its effect on survival probability of birth and/or the ability of surviving children to support their parents. If parents' utility depends only on the number of survival children and is concave function of that number, and there are no ex-ante costs of childbirth, the utility maximizing birth can be shown to be a decreasing function of the probability that a birth will survive.

Nerlove (1993) also suggested another interesting pathway through which resource degradation may affect fertility. He pointed out that those children in less developed countries have a comparative advantage, relative to adults, in animal husbandry as opposed to crop production. Since poorer quality environments have a large component of livestock production than crop production, this leads to a higher demand for children. Some form of resource degradation may also exert a significant positive influence on mortality risk (for instance, in the form of greater incidence of water born disease due to the supply of deteriorate quality of drinking water). Increasing mortality risk is, in turn, likely to affect fertility rates, though the sign of this effect is generally regarded as being ambiguous.

Given the multiple pathways, the effect of resource degradation on fertility is quite complex. Nerlove (1991) argues that positive relation between resource degradation and fertility rates is more likely to be observed at low level of resource degradation. According to Nerlove, with continued deterioration of the resource base, this relationship must eventually turn from positive to negative. This could be due to a number of reasons. In highly degraded environments, the perceived costs of raising children may exceed the benefits they provide as producer of goods. Also at high level of resource degradation death rates may raise sharply but fertility rate may not continue to rise as there is an upper limit on the number of children a woman can have. This suggests that the relationship between resource degradation and fertility is likely to differ across regions and also within the same region in its different stage of development. This makes it an interesting empirical issue.

Filmers and Prithet (1996) and Desgupta (1992) also argue that greater environmental degradation could lead to increase in population growth if increased scarcity of environment resources goods leads to a higher relative value of children. This is possible if the comparative advantage of having children, as household producers, in the acquisition of environment resources for the family does not incur the full cost (for example, collection of fuel wood, fetching water, or grazing of livestock from an open access land). This would be possible if the increase in relative value of children in face of increased scarcity of environmental goods could out weigh the increase in productivity effects from privately owned resources and lead to a higher demand for children.

According to Filmer and Prithet (1996) and Muller and Cohn (1977), it is possible that at stages of low population density initial increases in population density will lead to greater demand for children. This population demand in turn accelerates environmental degradation and raises the scarcity value of the open access resources. As long as the resources remain open access this will (or empirically may) lead to the increase in the demand for children. Once an environment is privatized, the negative externality disappears and is internalized by the household. From that point on, households respond to further deterioration in availability by reducing their demand for children.

Exploring part of the vicious circle, the link between population growth and the environment, has emerged as an important area of research in recent years (Aggarwal *et al*, 2001). The focus of most of this research has been on the impact that an exogenously given increase in population would have on the environment. However, the situation could also be analyzed from the opposite angle, the impact of environmental degradation on the demand for children, in turn population growth. Therefore, the main aim of this study is to analyze the effect of environmental good scarcity on the demand for children by families.

As indicated by many empirical studies, population pressure is considered as one of the most important factors contributing to environmental degradation. However, whether environmental degradation has effect on population pressure has not well documented. 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 and DeGraff, 1988). This underscores the importance of conducting a case study in line with available theoretical and empirical knowledge while taking account of the local situation. Consequently, this study is intended to analyze the socio economic factors and environmental resource scarcity on households' fertility decisions.

OBJECTIVES OF THE STUDY

The general objective of this study is to analyze the relationship between the levels of environmental goods scarcity and demand for children by households. The specific objective is to determine the effect of environmental goods scarcity and other socio-economics factors on the fertility decisions of farm households.

2. METHODOLOGY OF THE STUDY

2.1 THE STUDY AREA

Sekota is located between $12^0 23^1$ and $13^0 16^1$ north longitudes and $38^0 44^1$ and $39^0 21^0$ east latitudes. It extends for about 98 km in the north south direction and 67 km in the east west direction. It has compact shape and an area of 3058 km^2 (SERA, 2001). The district is located in the eastern part of Wag Himra Administrative Zone (WHAZ) of the Amhara National Regional State (ANRS). WHAZ, which is one of the 11 administrative zones in ANRS, represents the Agew ethnic group and comprises of three districts: Sekota, Dehana & Zequala. Sekota shares borders with Ziquala district in the west, Dahna district in the south and southwest, Tigray National Regional State in the north and east, North Wello Zone in the south. Sekota town, the capital of the zone, is 795 km north of Addis Ababa and 540 km northeast of the regional state capital, Bahir Dar. The area is characterized by Sub moist major agro ecological zone with SM_2 (tepid to cool sub moist mid highland) and SM_1 (hot to warm sub moist lowland).

The results of the 1994 population and housing census also shows the total population of Sekota was 130,229 in the year 1994 and projected to reach 167,504 in the year 2005. As far as the rural population of the district is concerned it is projected to reach 153, 539 in the year 2005 (BOPaED, 2004). According to this projection it is expected that about 92 % of the population lives in rural areas. The density of the rural population is 50 people per km^2.

It is expected that the rural national average as well as the regional average of population density is higher than the rural district of Sekota. But it does not mean the rural district has no population pressure relative to the national and the regional average. Because the land escape and soil in the area is not much suitable for agriculture, the already existing population is more than the caring capacity. When we see the topography, quarter of the district has a slope less than 2 % while 37 % of the district has a slope more than 30 %. Areas that lie on these groups are not suitable for agriculture (SERA, 2001).

The people in Sekota district are suffering from continuous food, fuel wood, water, and grazing land shortage. The topography of the district is characterized by rugged and a chain of mountain terrains most of which is covered by patchy grasses during the small rainy season. For the remaining season the terrain has been covered by bare rock. The forest and bush cover of the area is concentrated in specific areas most of which are communally owned or are the property of the church.

For all households, firewood is the most important source of energy for cooking followed by dung. The depletion of firewood has currently led to the extraction of former vegetation cover. The area has virtually been stripped of vegetation and shortage of grazing and fuel wood scarcity is ever increasing. In spite of the effort of extension program to popularize tree planting and encourage establishment and proper management of farm wood lots it has registered little success.

The study undertaken by SERA (2001) indicated that shortage of grazing is the widest spread as reported by 75% of the households in the study. All grazing areas belong to the PAs and all households are using it as communal grazing grounds. These unregulated communal grazing plots have a character of open access property regime, which resulted in over exploitation, and degradation of the pasture.

As far as the infrastructure of the area is concerned, road network and public transportation system is extremely under developed. The electric power and telecommunication network is concentrated only in the district capital, Sekota town. In the whole district, the scarcity of potable water is a common phenomenon including the capital town.

Crop production in the area is not a promising enterprise due to shortage of farmland, depletion of soil fertility, and moisture stress. However the area is known from its high small ruminant and poultry population even if one of the food insecure district in the region as well as in the nation.

2.2 TYPES OF DATA AND METHODS OF DATA COLLECTION

The study was conducted in three PAs in Sekota district of the ANRS. The sampling units were wives and husbands of the household members. A two-stage cluster sampling procedure was adopted to select three PAs, namely Zarota, Addis Alem and Maheber Selassie. In the first stage, the whole rural area was categorized in to three clusters based on the level of environmental goods scarcity and availability. This was done based on the information from key informants and secondary data. From the categorized three clusters one PA was randomly selected for each. A peasant association provided the sampling frame of households having wives in the age interval of 15-49 years old, while respondents were selected randomly. In Zarota, Addis Alem and Mahebere Selassie PA's 32, 46 and 44 households were selected for formal survey, respectively.

In this study, households were selected on the condition that the men and women live under one roof and that the age of women is in the range of 15-49 years. The households having women in the specified ages should not to be windowed and/or remarried. So the sampling unit is men and women satisfying aforementioned criteria and the sampling frame are households satisfied the criteria. The data made available for this study in different clusters were aggregated and analyzed to the household levels. Some parameters were used to characterize the demographic features as well as the environmental goods scarcity level differences among the clusters.

The data used for this study were obtained both from primary and secondary sources. Primary data were collected through structured questionnaire. This was conducted in two stages. First, a preliminary survey was conducted to obtain general information about the PAs such as the level of environmental good availability and scarcity, population distribution pattern and agricultural system of the area. During the preliminary survey, lists of relevant guidelines were used and guided discussions were held with respondents. The result of this survey was used to develop workable hypothesis and structure questionnaire for the formal survey. Moreover, the result of the preliminary survey provides a general background of the study area regarding to environmental goods scarcity and fertility decisions of the households.

Following the preliminary survey, structured questionnaire was developed for the formal survey. The developed survey questionnaire was administered in pilot survey using trained enumerators. This helps to pre-test the survey instrument, identify any shortcoming and make modification in some question before the actual data collection. The second stage was the basic data collection, which includes demographic characteristics, income and assets, environmental goods scarcity, and the observed mortality and fertility of the households. Secondary data were obtained from reports and other official documents.

2.3 THEORETICAL FRAMEWORK

To develop a model for demand for children by households, it is assumed that children are demanded both for the consumption they provide as well as their contribution to household production (Schultz, 1981; Desgupta1993; Aggarwal *et al.,* 2000). That is, the household's demand for children can be categorized in to consumer demand and producer demand. So we can postulate that the household maximizes a long run concave utility (U) derived from the number of children (N), child quality (q), and final un-traded consumption good (z). Following Aggarwal *et al* (2001); and Schultz (1981), the mathematical model for demand for children is given as follows.

$$U=U(N, q, z) \qquad U_i>0 \;\text{ for } i= 1, 2, 3 \qquad (1)$$

Where U_i is the the marginal utility.

This utility function is maximized subject to the production function for number of children (N), child quality (q), final un-traded consumption commodities (z), time constraint for women (T), men (M) and children (t), and a full income constraint. For simplicity it is assumed that child bearing is a women's activity (which is a common phenomenon in Ethiopia); the non-separable households are subsistence farmers, and production of the number of children is a function of a fixed input technology of women's time (T_N) and purchased good (x_N) required in the bearing of each child.

The child quality model denotes the health and nutritional status of the child. Thus, higher levels of child quality also imply higher chance of survival. Households may take care about child quality because it gives higher consumer and producer demand for the households. It is assumed that quality per child is constant across siblings and it is a function of the inputs of women's time to keep the quality of the child (T_q), purchased good to keep the quality of the child (z_q), and measure of the state of resource scarcity (s).

$$q=q(T_q, x_q, s), \qquad q_1>0,\; q_2>0,\; q_3<0 \qquad (2)$$

Where q_1, q_2, q_3 are marginal values for T_q, x_q *and s*, respectively.

Note that, in the above formulation, child quality is assumed to be a decreasing function of s. This is consistent with the growth evidence that, resource degradation exerts a negative influence on child health. Finally the production of the final un-traded consumption commodities, z, is given as

$$z= z(T_z, t_z, x_z, H_z, s) \qquad z_1>0,\; z_2>0, z_3>0,\; z_4>0 \quad z_5<0 \qquad (3)$$

Where T_z is women's time input in the prodution of z, t_z is children time input in the production of z, x_z is purchased good in the production of z and M_z is men's time input in the production of z. z can be thought as final un-traded consumption commodities that are valued by the households. Among these consumption goods is cooked food, which requires raw food, fuel, water, labor as inputs. Given this interpretation, it seems reasonable to include s as inputs in the production of z. It is assumed that a more degraded environment leads to a lower z and lower marginal products of other inputs ($z_{i5} < 0$, for i= 1, 2, 3, 4). Also note that children contribute to the production of this aggregate good. Therefore they are demanded not only as consumption good but also a productive asset.

Women's allocate their total time (T) between the following activities: Child bearing (T_N), investing in child quality (T_q), in the production of final un-traded consumption commodities (T_z) and working in the labor market (T_L)

$$T = NT_N + NT_q + T_z + T_L \qquad (4)$$

It is also assumed that children allocate their total time (t) to production of final un-traded consumption commodities. Note that the productivity of children depends on their quality. So, in the quality units children's time constraint is given as

$$t_z = Nqt \qquad (5)$$

Men allocate their total time (M) in the production of final un-traded consumption commodities (M_z) and working in the labor market (M_L).

$$M= M_z + M_L \qquad (6)$$

The full income budget constraint is given as

$$p(Nx_q + x_z + Nx_N) = w_w T_L + w_h M_L + V \qquad (7)$$

Where p is price of purchased goods, w_w, and w_M are the wage rate for women's and mens; and V is non human wealth of the households.

Maximizing (1) subject to (3)-(7), or maximize (8), with respect to the decision variables, number of children the households desire to have (N), mothers time allocation for child quality (T_q), and amount of goods purchased for child quality (x_q) and decision of mother working in the labor market (T_L), gives equation (9)-(12), respectively.

Equation 1 can be written as

$$U = U\left[(N, q\,(Tq, xq, s), z\left[(T-NT_N - NT_q - T_L).Nqt\frac{W_W}{p}.T_L + \frac{W_M}{p}.M_L + \frac{V}{p} - N.X_q - NX_N.M - M_z,\; S)\right]\right] \qquad (8)$$

$$U_1 - U_3z_1(T_N+T_q) + U_3z_2qt - U_3z_3(x_q + x_N) = 0 \qquad (9)$$

$$U_2q_1 - U_3z_1N + U_3z_2Ntq_1 = 0 \qquad (10)$$

$$U_2q_2 - U_3z_3N + U_3z_2Ntq_2 = 0 \qquad (11)$$

$$U_2q_1 - U_3z_3w_w/p - U_3z_1 = 0 \qquad (12)$$

Manipulating equation (10)-(12) yields

$$z_1/z_3 = q_1/q_2 = w_w/p \qquad (13)$$

This is the standard condition that the marginal rate of substitution between time and market inputs in the production of final un-traded consumption good, z, and the production of child quality, q, is equal to the ratio of their opportunity costs (w_w/p)

Equation (9) can be written as

$$U_1 + U_3z_2qt = U_3z_1(T_N+T_q) + U_3z_3(x_q + x_N) \qquad (14)$$

The left hand side of this equation represents the marginal benefits from the dual function of children as pure consumption good and as producers' goods. The right hand side represents the marginal cost of children in terms of the foregone consumption of mother's time and market goods that are used up in the bearing of an additional child and investing in child quality.

The system of equation (9) – (12) can be solved to get the reduced form equation which express the various endogenous variables in the system (N, q, z, x_N, x_q, x_z, T_N, T_q, T_z, T_L, t_z, H_L, H_z, as a function of the exogenous variables (s, w_w, p, V). The key equation of interest here is the reduced form equation for the demand for children given as

$$N^*=N^*(s, w_w, p, v) \qquad (15)$$

Where- N* is the derived number of children

2.4 ECONOMETRICS MODEL

Qualitative response models are numerous that are applied in different situations. What they have in common is that they are models in which the dependent variables have a discrete out comes, such as 'yes' or 'no' decision, so that conventional regression methods are inappropriate for analyzing this type of data. A conventional regression method also fails to account for the qualitative difference between limit (zero observation) and non-limit (continuous) observation (Maddala, 1997).

In addition, the discrete out comes may have also censoring of values in certain ranges. A very common problem in microeconomic data is censoring of the dependent variable. When the dependent variable is censored, values in a certain range are all transformed to (or reported as) a single value. A conventional regression method is biased towards the censored value, in our case is, zero. For many studies a dependent variable that has a significant fraction of zero or some constant values of observations have used Tobit model (Green, 2000).

The major reason to use the Tobit model in this study was due to 22.1% and 16.4% of the sample households have zero birth of child in the five years and ten years, respectively. The actual time for year's gap, five and ten were used as a dependent variable for comparison. The last analysis of the Tobit model was children ever born before ten years to estimate fertility.

When data are censored, the distribution that applied to the sample data is a mixture of discrete and continuous distributions. To analyze the distribution of observed variable, y, we can transform y to the latent variable, y^*, by

$$y_i^* = \beta' x_i + \varepsilon_i,$$

Where **Y = 0** if **y* ≤ 0**

Y = y* if **y* > 0**

Where, y is observed variable and y* latent variable or unobserved.

The distribution of observed variable has two categories, that is, if $\text{Prob}(y=0) = \text{prob}(y^* \leq 0) = \Phi\left(\frac{-\mu}{\sigma}\right) = 1 - \Phi\left(\frac{\mu}{\sigma}\right)$, if $y^* > 0$ then y has the density of y*, and $y^* \sim N(\mu, \sigma^2)$. So the general formulation is given by

$$y_i^* = \beta' x_i + \varepsilon_i,$$

$$y_i = 0 \quad \text{if} \quad y_i^* < 0 \qquad (16)$$

$$y_i = y_i^* \quad \text{if} \quad y_i^* > 0$$

Where: y_i^* _ K×1 vector of latent dependent variable, in this case desire to give birth;

β _ K×1 vector of unknown parameters;

x_i _ K×1 vector of explanatory variables;

y_i _ the vector of observed dependent variable (observed fertility);

ε_i _ Residuals that are independently and normally distributed, with mean zero and common variance σ^2.

For an observation randomly drawn from a population which may or may not be censored the conditional mean of y_i is

$$E(y_i|x_i) = \Phi\left(\frac{\beta' x_i}{\sigma}\right)(\beta' x_i + \sigma\lambda_i) \qquad (17)$$

Where $\lambda_i = \frac{\phi(\beta' x_i/\sigma)}{\Phi(\beta' x_i/\sigma)}$ and ϕ and Φ are probability density function (PDF) and cumulative density function (CDF) of the standard normal, respectively.

To calculate the conditional mean of equation (17) there is a need to know the parameters β and σ^2. So the task here is to estimate β and σ^2 on the basis of N observations on x_i and y_i. For their estimation the usual log likelihood was followed. The likelihood function of the Tobit model is

$$L = \prod_0 \left[1 - \Phi(\beta' x_i)\right] + \prod_1 \frac{1}{(2\pi\sigma^2)^{1/2}} e^{-(1/2\sigma^2)(y_i - \beta' x_i)^2} \qquad (18)$$

Where the first product is over the N_0 observations for which Y_i=0 and the second product is over the N_1 observations for which Y_i>0

$$LogL = \sum_0 \left(\left[1 - \Phi(\beta' xi)\right]\right) + \sum_1 \log \frac{1}{(2\pi\sigma^2)^{1/2}} - \sum_1 \frac{1}{2\sigma^2}(y_i - \beta' xi)^2 \qquad (19)$$

The summation $\sum_0$ is over the N_o observations for which $y_i = 0$ and the second summation is over the N_1 observations for which $y_i > 0$. By taking the first derivatives of log L with respect β and σ, we can estimate the parameters β and σ.

To determine the elasticity of the significant variables (determinants of fertility), the formula for derivatives was used. In this part of analysis the exogenous variables, which had only significant effect on the demand for children was considered. For marginal effect of the explanatory variables, the following equation was used.

In censoring regression model with latent regression $y^* = \beta' x_i + \varepsilon$ and observed dependent variable $y = a$ if $y^* \leq a$, $y = b$ if $y^* \geq b$, and $y = y^*$ otherwise, where a and b are constants, let $F(\varepsilon)$ and $f(\varepsilon)$ denotes CDF and PDF of ε. Assuming that ε is a continuous random variable with mean 0 and variance σ^2, and $f(\varepsilon|x) = f(\varepsilon) = 0$ then

$$\frac{\partial E(y|x_i)}{\partial x} = \beta \times prob\left[a < y^* < b\right] \qquad (20)$$

Note that this general result includes the censoring in either or both tails of the distribution and it does not assume that ε is normally distributed. For the standard case with censoring at zero and normally distributed disturbances, the result specifies to

$$\frac{\partial E(y_i|x_i)}{\partial x_i} = \beta\Phi \frac{(\beta' x_i)}{\sigma} \qquad (21)$$

The above marginal effect of the change in x has the following decomposition

$$\frac{\partial E(y_i \mid x_i)}{\partial x_i} = prob(y_i > 0)\frac{\partial E(y_i \mid x_i, y_i > 0)}{\partial x_i} + E(y_i \mid x_i, y_i > 0)\frac{prob(y_i > 0)}{\partial x_i} \quad (22)$$

Thus a change in x_i has two effects; it affects the conditional mean of $y_i{}^*$ in the positive part of the distribution and it affects the probability that the observation will fall in the part of the distribution.

2.5 HYPOTHESIS (VARIABLES EXPECTED TO AFFECT FERTILITY)

In the estimation of fertility we used the number of ever born children in the last ten years (NEBCTY) and the number of ever born children in last five years (NEBCFY) per women in the sample.

In theoretical part of this study (Equation 15), we have seen that the demand for children is a function of the women's wage rate, price of different commodities, households' nonhuman wealth and the state of the environment. The task here is to identify the proxy variables of the above factors from the survey data.

Education of women (EDWF): - Education of woman is a dummy variable that takes one if she is literate, and zero otherwise. Almost all the sample rural households do not participate in formal labor market and so wage rate data are not available for most women. It is a common practice to use complete years of schooling as a proxy for women's wages (Aggarwal *et al*, 2001; Schultz, 1981). However, women's education may also have several independent effects on fertility other than as a proxy of wages. Female education often delays the age at marriage. It may also alter preferences. In particular, it may lead mothers to place higher value on the education of their children and thus induce a shift from quantity to quality of children. Female education is also commonly found to be associated with higher probabilities of child survival. This may reduce fertility in so far as fewer births are required to meet a desired family size. Education may also increase the ability to effectively use family planning services. All of these channels imply a negative relation between fertility and women's education. Therefore, it is expected that this variable is negatively related to the rate of fertility.

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. Environmental good scarcities increase the value of children to parents and will result in higher rate of fertility. However, according to Farina *et al* (2001); and Nerlove (1993) frequent drought and environmental resource degradation and food scarcity are often recognized as factors reducing impact of fertility in less developing countries. Price of fodder, as a proxy for pasture scarcity, is an alternative measures of others pasture scarcity. These are distance to pasture area, amount of bundle of fodder collected per pulses and cereals produced and amount of bundle of fodder used per livestock holding. Among the possible alternative measurements of scarcity of natural pasture, price of fodder is selected due to the exogenous nature of the variable. Where as, the other possible alternatives are functions of households' decisions; therefore, they are endogenous from the theoretical background. As a proxy for pasture scarcity, price of fodder is expected positively relate to fertility decisions.

Distance to drinking water sources (DISTWTR): -Distance to drinking water sources can be used as proxy for water resource scarcity. For the scarcity of environmental goods, which are under communal ownership, distance is not the only indicator of the scarcity of the good. Rather, it is the weighted sum of the distance traveled to the source and the time required to collect or fetch. The later factor is a function of population density and the concentration of the good per unit area. According to the results of the preliminary survey, however, the density of the population per unit of the resource and/ or the concentration of drinking water per unit area is homogeneous in the rural *Sekota.* Therefore, only distance of this resource is used as proxy for scarcity of the good. As a proxy for a natural resource scarcity, distance to drinking water sources is also expected positively relate to fertility rate or demand for children (Aggarwal *et al.* 2000).

Time required collecting a bundle of firewood (TMFRWOOD): - Scarcity of fuel wood can be proxied by time required to collect a bundle of firewood (Filmers and Prithet, 1996). As the scarcity of this fuel wood increase, the time required to collect per bundle increases. The time spent in collecting firewood is an indicator of resource scarcity and, therefore, is expected positively relate to fertility rate.

Mortality of children (PNCED): - The state of the environments also affects child quality, and hence, indirectly, the demand for children. To measure child quality, Aggarwal *et al* (2000) believe the use of anthropometrical data on the height and weight of children or their nutritional intakes are most appropriate. Schultz (1981); Farooq, and DeGraff (1988) believe the use of athletics performance, school age and IQ standards are most appropriate. However, all these variables need sufficient time and resource to measure and collect; and it was difficult to do so in this study. Therefore, child mortality rate was used as a proxy for quality of children.

The effect of mortality risk on fertility depends, amongst other things, on the curvature of the utility function, the perceived risk of mortality and the cost of an additional child (Schultz, 1981; Aggarwal *et al.* 2000). It was hypothesized that the risk of child mortality rate is positively related to fertility rate, in which demand for children is price inelastic. On the other hand it is negatively related to fertility when demand for children is price elastic. The demand elasticity of children depends on the type of utility they provide to households. If children were sought by parents only as a household financial investment, for their supply of labor and as a future means of assuring parental old age support, the demand for children could be quite elastic with respect to the changes in cost of the survivor (Schultz, 1981). On the other hand, if households consider children only as consumption good, the demand for children could be inelastic with respect to changes in cost of survivor. Therefore, it is difficult to hypothesize the direction of risk of child mortality rate effects on demand for children.

Age of women (AGEWIFE): - As the age of women increase the demand for children may increase or decrease depending on different situations. First an increase of age may result in increase in demand for children for old age security, and at the same time decrease the demand for children presumably due to couples adopt one or another method of birth control toward end of their child bearing year. It is believed that at on set of marriage households will not respond to control their fertility. So it is difficult to hypothesize the effect of age of wife on the demand for children a priori.

Distance to health services (DISTHEAL): This variable is also expected to have impact on the demand for children through better access to modern contraceptive and family planning. So it is hypothesized that access to family planning/ health organization is negatively related to demand for children (Filmers and Prithet, 1996).

Household calorie intake per adult (CALPCAP): -Among the very poor, increase in income reduces malnutrition and disease, and thus improve the ability of women to bear children. After threshold level of income is reached, fairly early, any further increases in income are expected to lead to fertility decline (Farina *et al*, 2001). It is hypothesized that as this ratio increases the households tend to increase demand for children. We expect that increase in income of households proxy by the household calorie intake per adult, is positively related to the demand for children (Schultz, 1981).

3. RESULTS AND DISCUSSION

3.1 ESTIMATION PROCEDURE

In the theoretical model, resource scarcity affects demand for children in two principal channels. It directly affects the productivity of children as resource collectors (equation 3). Resource scarcity also affects child quality (equation (2), and hence, indirectly, the demand for children. To measure child quality, the use of anthropometrical data on the height and weight of children or their nutritional intake are most appropriate. It is also believed that the use of athletics performance, school age and IQ standards are most appropriate.

However data on the above are almost non-existence except school age. School age cannot appropriately measure the quality of children given highly subsidized on the education of children of the nation at large. In addition almost all of the schools of *Sekota* district are beneficiaries on school feeding program. So as an alternative, data on child mortality rate was used as proxy for child quality.

Under the assumption that households' preferences have rigid target of a minimum number of survivors at a certain age of their life cycle (as old age security or otherwise), parents seek only survivor child. So the mortality effect determines fertility by changing the potential biological supply of births to parents and by changing their behavioral demand for children. Factors operating on the supply side include primarily biological process and it is stochastic effects that are not associated with the preferences of a couple (Schultz, 1981). Where as factors affecting demand include couples preferences on the number of children given the probability of deaths of children in their life. That is hoarding, ex-ante response to expected mortality, and replacement, ex-post response to experienced mortality. It is useful to draw the distinction between the demand for surviving children and the demand for births. In this study we emphasized on the demand for births given a goal of surviving children. Households' preferred level of fertility responds to variation in experienced and expected child mortality. So the objective of the study is to identify determinants of fertility decisions of households (demand for births) given the expected and experienced child mortality rate; the availability and scarcity of environmental goods and other socio economic factors.

Given the potential endogenous of child mortality on household fertility decisions, the Haussian test of endogenous was checked. The result showed that the null hypothesis of probability limit of d ($b_{IV} - b_{LS}$) = 0 (where b_{IV} is the estimates of the parameter coefficient using instrumental variable method and b_{LS} is the estimates of the parameter coefficient using least square method) was rejected using the Wald statistics. As a result, the instrumental variable method was used to estimate the fertility equation. A set of variables such as age of wife, education of women, livestock holding, private owned land area, distance of health center, cleanness of water dummy, calorie intake per adult equivalent and education of men have been identified to influence mortality. The predicted value of child mortality regressed on explanatory variables, which had no impact on fertility but had significant effect on mortality, has been used as one explanatory variable to estimate fertility. Hence, only the structural form of fertility estimation is presented.

In the theoretical model, it is also shown that number of children demanded (equation 15) is a function of non-human wealth. However, in our sampled household data it was not possible to accurately identify the different sources of nonhuman wealth. It can be proxy by household calorie intake per household calorie requirements, livestock holding and total area cultivatedThese explanatory variables have some correlation in each other from theoretical background. Therefore, using these variables simultaneously as a proxy for non-human wealth may create multicolinearity. From these alternative proxies for non-human wealth, household calorie intake per capita requirement was used for its comprehensiveness. However, this variable is not exogenous to household fertility decisions from the theoretical background. Parents may decide to increase their consumption foregone of bearing child and vise versa. So it is necessary to test the exogenous of these variables in the Tobit model. It was found that the exogenous of household expenditure was rejected using the Haussian test of the Wald statistics.

Therefore, to get unbiased and consistent estimator, the predicted household calorie intake per requirement was used as an explanatory variable of the usual instrumental variable techniques. Therefore in the estimation of fertility the structural form of the regression was used.

TABLE 1: REGRESSION OF HOUSEHOLD CALORIE INTAKE IN PULSES AND CEREAL EQUIVALENTS PER HOUSEHOLD REQUIREMENTS

Variable	Coefficient	Standard Error	t-ratio	Mean of X
Constant	0.62***	0.20	3.098	
Age of husband	-0.76E-02*	0.41E-02	-1.84	40.62
Education of husband dummy=1 if literate	-0.11E-01	0.66E-01	-0.16	0.37
Private area cultivated in ha	0.21E-01	0.13E-01	1.570	5.00
Share crop in area cultivated in ha	0.23E-01**	0.81E-02	2.847	3.35
Adults per total household number	0.56***	0.19	2.917	0.44
Dummy of PA=1 if Zarota	0.39***	0.78E-01	5.06	0.26
Dummy of PA=1 if Maheber Selassie	-0.82E-01	0.74E-01	-1.108	0.36
Adjusted R-squared	0.28885***			
Number of Observations	122			

The predicted household calorie intake per requirement was highly significant and some explanatory variables used in the prediction of this variable were found significant. So the predicted value of the variable was well explained by the explanatory variables.

In this study, the observed fertility was used to measure the desired family size. Observed fertility is a result of the interaction between demand and supply of children. However, there is insufficient information to separately identify demand and supply factors. Hence the model of observed fertility that we estimated includes both demand and supply factors (Aggarwal *et al.* 2000). So it is important to regress the observed fertility of different woman's age groups separately to avoid the supply bias of the fertility decisions of households. However, due to the smallness of the sample households, dividing into different women's age groups will result in inefficient log likelihood estimates (Maddala, 1997; and Green, 2000). So, to avoid the supply side bias and to have large sample size, women's age group dummies were included as an explanatory variable rather than simply women's age.

In estimation of fertility decisions of households in response to environmental goods, different levels and criteria of environmental good scarcity measurements are hypothesized. These are distance travel to sources of water 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. A potential problem with the measurement of these resource scarcities was that do not capture the inter-seasonal variation in resource availability in a given community. This is due to, for example, water and wood for domestic use cannot generally be stored over an extended period. However, the collection of fodder has no problem on this regard. Therefore the measure of resource scarcity concerning fuel wood and drinking water in our data did not reflect seasonal variation of the goods that the community faces. The data collected for the specific period, amount of bundle of firewood collected within a week for example, does not take in to account the season's variation. However, it is plausible to assume that the scarcity of these resources vary within seasons uniformly among individuals within a cluster and/ or among clusters. So there is no significant difference in taking either the annual season averages or specific seasons or days of a year.

Another important problem with this measurement was an exogenously given level of stress posed by the local environment and the households' response to this stress. Thus, for instance, due to scarcity of the pasture for the specific season of the year, households may use different areas for the sources of this natural pasture, as a result they may respond different distance of pasture but facing the same level of scarcity of the good. Another example, it is possible for two households who face the same level of exogenous scarcity of water and firewood, to report different time requirement per trip to fetch water or to collect the same bundle of firewood.

The proxy for pasture scarcity, price of fodder, however has no problem regarding to endogenous to households decisions. As far as the scarcity of fuel wood and drinking water are concerned, which have proxy by time require to collect firewood and to fetch water respectively have an endogenous problem. A theoretical better alternative would be to eliminate the resource scarcity variable of the household level effect and isolate a cluster specific measure of scarcity by running cluster level regression (Aggarwal *et al.* 2000). To reduce the endogenous problem, it would be to look at cluster average of these variables which inturn implies the assumption that all households within a given cluster face the same exogenous level of scarcity. The two environmental good scarcity variables were regressed in the following fashion (see equation 23). The structural of these resource scarcity variables used for the estimation of fertility.

$$RS_{ij} = a_j + X_{ij} + u_{ij} \text{ where } j = 1,2,3 \quad (23)$$

Where RS_{ij} was resource scarcity in cluster j and household i, X_{ij} was the explanatory variables that may affect the households respond to scarcity in specific cluster variables, a_j is the cluster specific fixed effect and u_{ij} is a random disturbance term with mean zero and constant variance σ^2. To predict water and fuel wood scarcity, women's education level, dependency ratio and predicted household consumption were used as an explanatory variable for the three clusters. For scarcity of pasture, price of fodder was taken as exogenously on the assumption that households' decision to purchasing and selling of fodder has no effect on the price of fodder.

There is also a potential problem with examining the impact of resource scarcity on fertility rates through the estimation procedure. The problem is that fertility rates in a given community are important components of its population level. Neither the population growth rate nor the intensity of environmental resource use is exogenously given. They are determined jointly by complex combination of history, opportunities, human motivation, ecological opportunities and chance factors (Boserup, 1990). So if population level affects resource use, or there are omitted variable that affect both, the estimated parameters will be biased. For example, it is often observed those social norms and other community factors play a very important role in determining fertility rates.

Often neglected institutional forms that arguably play major roles in agrarian economy and demographic outcomes are family and gender systems, village and community structures, government's administrative arrangements and legal systems (McNicoll and Cain, 1990). Cultural factors also influence the use and management of common resources. However, as information on cultural factors is not available, the estimated coefficients on the resource scarcity variables may reflect either the impact of resource scarcity or different in cultural factors. To avoid such bias we used cluster/ PA as dummy variable, on the assumption that social norms and community natural resource managements are homogenous within the cluster/ PA level.

Before households' decision on fertility was estimated, multicolinearity check up was made on the explanatory variables. The multicolinearity test was undertaken using variance inflation factor (VIF) for continuous variables and contingency coefficients (CC) for the discrete variables. It was found that no multicolinearity problems for all the explanatory variables that we used.

3.2 DESCRIPTIVE ANALYSIS OF THE VARIABLES

The variables considered in the model are:

- NEBCTY= Number of Ever Born Children in the last Ten Years
- NEBCFY= Number of Ever Born Children in the last Five Years
- EDUWM= Education of women
- CALPERCA= Household calorie intake per adult
- PNCED = Mortality of children
- PRCFOD = Price of fodder
- DISTWTR= Distance to drinking water sources
- TMFRWOOD = Time required collecting a bundle of firewood
- DISTHEAL = DISTHEAL
- AGWSCOH =Age of women second category (a dummy variable)
- AGWTHDCO = Age of women third category (a dummy variable)
- AGWFOR = Age of women fourth category (a dummy variable)
- AGEWIFIV = Age of women fifth category (a dummy variable)
- AGEWSIXC = Age of women sixth category (a dummy variable)
- ZAROT = *Zaraota* PA (a dummy variable)
- MAHEB = *Mahiber Selassie* PA (a dummy variable)

Table 2 summarizes mean value of the explanatory variables used in the estimation of Number of Ever Born Children in the last Ten Years (NEBCTY) and Number of Ever Born Children in the last Five Years (NEBCFY) period specifications. It summarizes the mean value of each explanatory variable in the three clusters and provides the general average value for the district. The dependent variables are NEBCTY and NEBCFY. NEBCTY was highest in PA1 (2.87 children per women), followed by PA2 (2.85 children per women) and the smallest in PA3 (2.77 children per women). The sample households' birth on average was 2.83 children per women in the last ten years. Likewise, the NEBCFY was highest in PA3 (1.52), followed by PA2 (1.5) and the smallest birth in PA1 (1.47). The sample households' birth per women on average was 1.5 children in the last five years. All the explanatory variables that are used in the estimation of fertility were presented in the table both the sample households and cluster mean level.

Education of women (EDWN): - Education of woman is a dummy variable that takes one if she is literate, and zero other wise. It was 0%, 9% and 4% in PA1, PA2 and PA3 respectively; and 5% for the district average

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. Price of fodder, as a proxy for pasture scarcity, is an alternative measures of others pasture scarcity. These are distance to pasture area, amount of bundle of fodder collected per pulses and cereals produced and amount of bundle of fodder used per livestock holding. Among the possible alternative measurements of scarcity of natural pasture, price of fodder is selected due to the exogenous nature of the variable. Whereas, the other possible alternatives are functions of households' decisions; therefore, they are endogenous from the theoretical background. It was found that 8.08, 8.00 and 9.52 Birr/ bundle in PA1, PA2 and PA3, respectively. The district average was 8.57.

TABLE 2: MEAN VALUE OF EXPLANATORY VARIABLES USED IN THE ESTIMATION OF FERTILITY

Variables	Mean Values			
	PA1	PA2	PA3	Total
NEBCFY	1.4688	1.5000	1.5227	1.5000
NEBCTY	2.87	2.85	2.77	2.83
EDUWM	0.00	.09	.04	.05
CALPERCA	4.54	0.81	0.83	0.83
PNCED	0.81	0.58	0.65	0.63
PRCFOD	8.08	8.00	9.52	8.57
DISTWTR	0.29	0.44	0.39	0.38
DISTHEAL	2.76	1.81	2.29	2.23
TMFRWOOD	2.43	1.51	2.06	1.95
AGWSCOH	0.22	0.15	0.27	0.21
AGWTHDCO	0.22	0.33	0.23	0.26
AGWFOR	0.25	0.26	0.18	0.23
AGEWIFIV	0.22	0.15	0.14	0.16
AGEWSIXC	0.06	0.07	0.09	0.07
ZAROT	1.00	0.00	0.00	0.26
MAHEB	0.00	0.00	1.00	0.36

Distance to drinking water sources (DISWT): -Distance to drinking water sources can be used as proxy for water resource scarcity. For the scarcity of environmental goods, which are under communal ownership, distance is not the only indicator of the scarcity of the good. Rather, it is the weighted sum of the distance traveled to the source and the time required to collect or fetch. The later factor is a function of population density and the concentration of the good per unit area. According to the results of the preliminary survey, however, the density of the population per unit of the resource and/ or the concentration of drinking water per unit area are homogeneous in the rural *Sekota.* Therefore, only distance of this resource is used as proxy for scarcity of the good. Distance of drinking water was 0.29, 0.44 and 0.39 hrs in one way walking in PA1, PA2 and PA3 respectively; 0.38 was the district avegae.

Time required collecting a bundle of firewood (TMRCFRWD): - Scarcity of fuel wood can be proxied by time required to collect a bundle of firewood (Filmers and Prithet, 1996). As the scarcity of this fuel wood increase, the time required to collect per bundle increases. The time spent in collecting firewood was 2.43, 1.51 and 2.06 hrs/ bundle in PA1, Pa2 and PA3 respectively; and the district average was 1.95 hrs/ bundle

Mortality of children (PNCED): - The state of the environments also affects child quality, and hence, indirectly, the demand for children. To measure child quality, Aggarwal *et al* (2000) believe the use of anthropometrical data on the height and weight of children or their nutritional intakes are most appropriate. Schultz (1981); Farooq, and DeGraff (1988) believe the use of athletics performance, school age and IQ standards are most appropriate. However, all these variables need sufficient time and resource to measure and collect; and it was difficult to do so in this study. Therefore, child mortality rate was used as a proxy for quality of children.

The effect of mortality risk on fertility depends, amongst other things, on the curvature of the utility function, the perceived risk of mortality and the cost of an additional child (Schultz, 1981; Aggarwal *et al.* 2000). It was hypothesized that the risk of child mortality rate is positively related to fertility rate, in which demand for children is price inelastic. On the other hand it is negatively related to fertility when demand for children is price elastic. The demand elasticity of children depends on the type of utility they provide to households. If children were sought by parents only as a household financial investment, for their supply of labor and as a future means of assuring parental old age support, the demand for children could be quite elastic with respect to the changes in cost of the survivor (Schultz, 1981). On the other hand, if households consider children only as consumption good, the demand for children could be inelastic with respect to changes in cost of survivor. Therefore, it is difficult to hypothesize the direction of risk of child mortality rate effects on demand for children.

Household calorie intake per adult (CALPCAP): - Household calorie intake per adult is used as a proxy for income of the households. Among the very poor, increase in income reduces malnutrition and disease, and thus improve the ability of women to bear children. After threshold level of income is reached, fairly early, any further increases in income are expected to lead to fertility decline (Farina *et al*, 2001). We expect that increase in income of households proxy by the household calorie intake per adult, is positively related to the demand for children (Schultz, 1981). Calorie per capita (CALPERCA) was highest in PA1, 4.5 kcal/ per person, followed by PA3, 0.83 kcal/ per person, and the lowest in PA2, 0.81; and the district average was 0.83 kcal/ per person.

Age of women (AGEWIFE): - As the age of wife increase the demand for children may increase or decrease depending on different situations. First an increase of age may result in increase in demand for children for old age security, and at the same time decrease the demand for children presumably due to couples adopt one or another method of birth control toward end of their child bearing year. It is believed that at on set of marriage households will not respond to control their fertility. So it is difficult to hypothesize the effect of age of wife on the demand for children a priori.

Distance to health services (DISTHEAL): This variable is also expected to have impact on the demand for children through better access to modern contraceptive and family planning. Distance of health was 2.76, 1.81 and 2.29 hours in one way walking in PA1, PA2 and PA3 respectively; and it was 2.23 for the district average.

3.3 RESULTS OF THE TOBIT ESTIMATES OF FERTILITY

The result of the Tobit estimation of fertility is presented in Table 3. According to these results the coefficient of the predicted number of children ever died (PNCED) was found to be negative and significant to determine household's decision on their fertility in both NEBCFY and NEBCTY specification.

Households' react to child mortality can be categorized as hoarding and replacement. Hoarding is the ex-ante response to expected mortality of offspring while replacement is the ex-post response to experienced mortality. Households respond to a sequential decision to fertility taking in to account both types of responses. It is also true that these effects of mortality risk relate to fertility. When the time gap of replacement, experienced child mortality of households to respond to fertility, is minimal (or nil) , the effect of mortality risk may not be significant though households respond to hoarding. However, in the NEBCTY and NEBCFY specifications, both the replacement and hoarding have enough time to respond to the fertility of households. Hence predicted mortality has significant effect on fertility in NEBCTY. It is effect is significant at (α <10%).

The possible reason for the negative relationship between child mortality and fertility might be the demand for children is price inelastic and associated to a desired to offset experienced or anticipated child mortality. Parents seem to respond to the an increase in child mortality by having more births, perhaps to some extent because of biological effect of an infant's death, which interrupts lactation and shortens the mother's sterility following a birth.

TABLE 3: TOBIT ESTIMATION OF HOUSEHOLD FERTILITY IN THE PAST TEN AND FIVE YEARS

Explanatory variables	NEBCTY	NEBCFY	Mean of X
Constant	12.54*** (2.26)	9.45*** (2.04)	
EDWF (dummy)=1 if literate	-0.98*** (0.37)	0.22 (0.34)	0.49E-01
DISTHEAL	-0.17 (0.10)	-0.86E-01 (0.93E-01)	2.23
PRCFOD	0.14 (0.16)	0.11 (0.14)	8.36
TMFRWOOD	-4.44*** (0.70)	-3.23*** (0.64)	1.95
DISTWTR	-3.19** (1.30)	-3.50** (1.17)	0.38
PNCED	-0.73* (0.39)	-0.83* (0.35)	0.63
CALPCAP	-2.41*** (0.76)	-1.46* (0.68)	0.82
AGWSC (dummy)=1 if age is 21-26	1.38*** (0.40)	0.73* (0.35)	0.21
AGWTHD (dummy)=1 if age is 27-32	1.90*** (0.43)	0.59 (0.38)	0.26
AGWFOR (dummy)=1 if age is33-38	1.29** (0.46)	0.33 (0.41)	0.23
AGEWIFIV (dummy)=1 if age is 39-44	1.22** (0.53)	0.27 (0.47)	0.16
AGEWSIXC (dummy)=1 if age is 45-49	0.52 (0.65)	-0.58 (0.60)	0.74E-01
ZAROT (dummy)=1 if PA1	2.87*** (0.44)	1.77*** (0.39)	0.26
MAHEB (dummy)=1 if PA3	-0.73*** (0.23)	-0.53** (0.21	0.36
Log likelihood function	-152.06	-136.95	
Number of observation	122	122	

*Note: ***Significant at 1% level, **significant at 5 % level, *significant at 10 % level*
The parentheses are the standard errors of the estimates.

The effect of calorie consumed per capita was also found to be highly significant (α < 1%) on the demand for children in ten years period specification. In five years specification, it is significant at a significant level of (α < 10%).

However, calorie intake per capita in both children ever born in the last ten years and in the last five year was negative related in this study. This might be related to the principal individual level strategy for copping with pasture shortage. In rural *Skota,* the copping strategy for pasture shortage is to move to other areas. This response to the pasture scarcity might have major consequences for the demographic behavior of the community. Livestock owners of the rural *Sekota* are more mobile in the season or years of pasture scarcity. Even though children's' are the main herder of the livestock for the normal period, adult male are the main herder in seasons or years of pasture scarcity. The community arranges groups from adults, mostly household heads, to herd the livestock of the community in areas where there is ample pasture in that season. Households having large herd will be more responsible for migrate/ move the livestock in different areas. It is expected that the household that have more livestock will have a probability of high calorie intake per adult.

In prolonged pasture scarcity, adults, probably household heads temporarily move their livestock to neighboring PA or even go to other districts or administrative zones that have ample pasture for this season. This coping mechanism of the community to pasture scarcity results separation of husband and wife in longer period, as a result reducing fertility will occur. So the possible reasons for the negative relationship between household calorie intake per adult and fertility might be related to migration of husbands in pasture deficit season's intern long abstinence of the couples.

However non-holder of livestock or those who have less number of livestock will not move in pasture deficit season. It is true that they migrate in food deficit seasons. The separation of the couples and the whole family in non-livestock owners is minimal for food deficit seasons (SERA, 2001).

The time required to collect firewood per bundle (proxy measure of fuel wood scarcity) was found to affect fertility negatively and highly significant (α < 1%) in both periods' specifications. This variable was found negatively related to the fertility of households within ten years and five years period specifications. The difference in the relative value of human time, particularly the opportunity costs of women's that commonly is thought to contribute a substantial share of the total cost of child rearing. This negative relation between fuel wood scarcity and fertility may be due to the division of labor in case of high scarcity. We have seen that as this resource become scarcer, adults' especially male adults were the main collectors of this good. We have also seen that the main collectors of fuel wood are female and male adults. High scarcity of this good is equivalent to say high shadow price of the good, increase the opportunity costs of women's time as long as women's are the main collectors of this good. Therefore, households have no incentive to have additional child on the assumption that children were not participate in the collection of fuel wood or the participation of children in fuel wood collection is minimal.

It is consistence with Nerlove (1991). He argues that a positive relation between resource degradation and fertility is more likely to be observed at low levels of resource degradation. According to him, with continued deterioration of the resource base, this relation ship must eventually turn from positive to negative. This would be due to highly degraded environments; the perceived costs of raising children may exceed the benefit they provide as producer goods. So demand for children will rise only if the increase in perceived benefits of children due to increase in resource scarcity is greater than the cost of additional child.

TABLE 4: PARTIAL DERIVATIVES OF THE EXPECTED VALUES OF THE DEPENDENT VARIABLES WITH RESPECT TO THE EXPLANATORY VARIABLES

Explanatory variables	NEBCTY	NEBCFY	Mean of X
EDWF (dummy)=1 if literate	-0.94*** (0.35)	NS	0.49E-01
DISTHEAL	NS	NS	2.23
PRCFOD	NS	NS	8.36
TMFRWOOD	-4.26*** (0.67)	-3.05*** (0.60)	1.95
DISTWTR	-3.02** (1.23)	-3.24** (1.08)	0.38
PNCED	-0.68* (0.36)	-0.75* (0.32)	0.63
CALPCAP	-2.31*** (0.73)	-1.32* (0.62)	0.82
AGWSC (dummy)=1 if age is 21-26	1.32*** (0.38)	0.66* (0.32)	0.21
AGWTHD (dummy)=1 if age is 27-32	1.82*** (0.41)	NS	0.26
AGWFOR (dummy)=1 if age is 33-38	1.22** (0.43)	NS	0.23
AGEWIFIV (dummy)=1 if age is 39-44	1.15** (0.50)	NS	0.16
AGEWSIXC (dummy)=1 if age is 45-49	NS	NS	0.74E-01
ZAROT (dummy)=1 if PA1	2.76*** (0.42)	1.67*** (0.37)	0.26
MAHEB (dummy)=1 if PA3	-0.70*** (0.22)	-0.49** (0.20)	0.36
Log likelihood function			
Number of observation			

*Note: ***Significant at 1% level, **significant at 5 % level, *significant at 10 % level*

The parentheses are the standard errors of the estimates.

Among environmental good variables, scarcity of water that has been proxy by distance to drinking water was also found significant at a significant level of α < 5% in both period specifications.

The sign of this variable was also negatively related to the fertility decisions of households This relation might be due to the same reason we have discussed in fuel wood scarcity.

As expected, education of women affects fertility negatively in NEBCTY specification and the relationship was significant at α < 1%. That is, certain level of women's education was found to decrease the observed fertility, other things held constant.

Age of women was also found significantly affect fertility for some age of women's category. Its effect was found positive and significant for the women's age category of 2, 3, 4 and 5 in the fertility of women in last ten years period specifications. It was significant for a significant level of α < 1%, α < 1%, α < 5% and α < 5%, respectively. While, it was not significant for the last women's age category and unobserved dummy /benchmark/ (women's age ranges between 15-20 years) in this specification. It was found that all of the women's age categories affect fertility positively, set unobserved dummy = 0 coefficients. As far as in NEBCFY specification is concerned, it was found significant only in the second women's age category (age =21-26) at a significant level of α < 10%.

The other explanatory variables that affect fertility were the clusters dummies, that is the specific fixed effect in the two PAs, those factors that are not identified and not included in the estimation of fertility, was highly significant (α < 1%). In Table 4 the marginal value of the explanatory variables are presented.

TABLE 5: POINT ELASTICITY

Explanatory variables	NEBCTY	NEBCFY	Mean of X
EDWF (dummy)=1 if literate	-0.016***	NS	0.49E-01
DISTHEAL	NS	NS	2.23
PRCFOD	NS	NS	8.36
TMFRWOOD	-2.94***	-3.96***	1.95
DISTWTR	-0.43**	-0.82**	0.38
PNCED	-0.15*	-0.31*	0.63
CALPCAP	-0.67***	-0.72*	0.82
AGWSC (dummy)=1 if age is 21-26	0.1***	0.09*	0.21
AGWTHD (dummy)=1 if age is 27-32	0.17***	NS	0.26
AGWFOR (dummy)=1 if age is 33-38	0.1**	NS	0.23
AGEWIFIV (dummy)=1 if age is 39-44	0.06**	NS	0.16
AGEWSIXC (dummy)=1 if age is 45-49	NS	NS	0.74E-01
ZAROT (dummy)=1 if PA1	0.25***	0.29***	0.26
MAHEB (dummy)=1 if PA3	-0.09***	-0.12**	0.36

It is calculated on mean of the explanatory variables and mean of NEBCTY=2.83 and NEBCTY=1.5

Table 5 summarizes the point elasticity of fertility with respect to the resource scarcity variables and some other explanatory variables that significantly affect the fertility estimates. The purpose here is to get a better perspective on the magnitude of impact of resource scarcity and other variables. As shown in the table, the point elasticity of the time required to collect bundle of firewood was around –2.94 at the sample mean level in ten years period specification. As compared to this, elasticity of education of women was found to be -0.016. While the elasticity of calorie intake per capita was -0.67, this means a 1% increase of time required to collect fuel wood per bundle on the average results decreases of 2.94 percent on the prevailing average fertility. Comparing to the other environmental goods, drinking water, and a 1% increase distance of drinking water results a decrease of the prevailing rate of fertility by 0.43%. While a 1% increases of the education status of the women will result in a decreases of 0.016% of the existing fertility level, and the same percentage increases of calorie per adult equivalent will result a decreases of fertility by 0.67%. Likewise a 1% increase of child mortality will result 0.15 decrease of the prevailing fertility rate.

It was found that the elasticity of fuel wood scarcity, TMFRWOOD, (2.94) is greater than almost four and half times the elasticity of predicted calorie intake per capita, CALPCAP (0.67). If we compare to water scarcity, the elasticity of TMFRWOOD is almost seven times greater than elasticity of water scarcity, DISTWTR, (0.43). It is also greater than almost twenty times the elasticity of predicted mortality, PNCED, (0.15). When we compare the elasticity of the women's age categories, it is highest in the third age category (27-32) of the women (0.17), followed by the second and fourth age category, each of which has an elasticity of 0.1. While the elasticity of the fifth women's age category has an elasticity of (0.06)

Look at another way; if the time taken to collect firewood decrease from the present level of around 1.95 hrs to 0.975 hrs, number of children ever born in the last ten years (NCEBTY) will increase from the present level of 2.83 children per women to 4.3 children per women. Similarly a 50% decrease of DISTWTRW, proxy for scarcity of drinking water, (that is from the present level of 0.38 hours to 0.19 hours), the present level of fertility increase from 2.83 to 3.045 children per woman. A decrease of predicted consumption from the present level of 0.82 to 0.41 (the same percentage decrease of firewood, 50%) will also result an increase of NCEBTY from the present level of 2.83 children per women to 3.165 children per women.

If the predicted number of children ever died (PNCED) decrease from the present level of 0.63 to 0.31, the expected fertility will decrease from the present level of 2.83 children per women to 2.755 children per women. The increase in women's education from the present level of 4.9% to 7.35% (50% changes in women's education) will result in the decrease of NEBCTY from the preset level of 2.83 children per women to only 2.807 children per women. This shows how the women's education is less responsible for the reduction of fertility for the rural *Sekota*.

If the existing proportion of women's age category increase or decrease, would result a change of the average total fertility rate per specific period. For example, if the existing proportion of the second women's age category, AGWSC, decreases from 21% to 10.5%, the level of fertility decreases from the present level of 2.83 to 2.69 children per woman. As compared to the other women's age category, the same percentage decrease of proportions women's age category, 23% to 11.5% for the fourth women's age category, AGWFOR, will result the same change to second age category. While the same proportional decrease of the third women's age category, AGWTHD, in the population (from 26% to 13%) will result a decrease of the present level 2.83 to 2.59 children per woman. Likewise, a 50% decrease of the proportion of the fifth women's age category, AGEWIFIV, from 16% to 8% will result a decrease of the existing women's fertility of 2.83 to 2.75 children per women.

4. SUMMARY AND CONCLUSION

In this study, the impact of environmental good scarcity on demand for children was analyzed. Resource scarcity is likely to affect on the production of child quality. In this study, the impact of fuel wood, water and pasture scarcity on fertility rate was examined using household data from rural *Sekota*. An individual choice model of fertility was estimated in which resource scarcity effect on the demand for children through its effect on child mortality and productivity of children as resource collectors. It was found that part of environmental goods, drinking water scarcity and fuel wood scarcity variables, have a negative and significant effect on fertility. The other variable, which has also directly or indirectly related to environmental good scarcity and that affects fertility, was risk of child mortality rate. Other variables, which have also affect fertility other than environmental goods, were calorie intake per capita, education of women and age of women categories.

As far as the women education is concerned, the result from our estimate indicated that it was negatively related to in NEBCTY specification. Although this variable is highly significant, the fertility reduction or the success of family planning will not responsive on the improvements of women's education in the future. This is due to the fact that, from the total sample households only 4.9% of the women are literate. For instance by some program or project if the women's education increases by 100%, say 9.8% of the women's were literate, then the existing fertility will only decrease by only 0.05 children per women in the population, that is from 2.83 to 2.78 children per women in ten years period of women's fertility. So from different angles, it is difficult to conclude that improvements in fertility decisions of women can be achieved solely from an increase of women's education.

Another ambiguous and unexpected result regarding to the fertility decisions of households in rural *Sekota* was that household consumption level affect fertility negatively. Further decrease of household consumption level as well as long migration for adult male for copping the pasture shortage might have a negative effect on human fertility and may indeed adversely affect the growth and survival of small children. The indirect and long term demographic consequences of the drought on degraded areas, such as rural *Sekota*, are therefore, probably much more important than any direct effect linked to temporary increases or reduction in fertility.

Among the explanatory variables that affect fertility decisions of households, scarcity of fuel wood, TMRFWOD, was found to be the major determinants in absolute value, 2.94, followed by household calorie intake per requirements, CALPCAP, 0.67and the third important determinant was drinking water scarcity, DISTWTR, 0.43.

Most of the family planning objective, whether it uses modern contraceptive or the natural infecundibility, is to control or minimize the fertility potential (fecundability) of women's. The elasticity of different women's age group dummy indicates the probability responsiveness of each woman's age category to fertility. So to achieve the objective efficiently, the family planning should emphasize on the middle age groups. But it doesn't mean that the first and last age group of women's left aside.

It is also true that, where family planning programs provided a service that few as yet wanted, they have expended resources to little effect. The NPP of Ethiopia has developed strategies and programs to get the objectives of the policy. The programs that launched in educational and health sectors has taken the participation of women in education and the health of the women as well as to expand reproductive health and family planning as the major strategies. However, from this case study, we have seen that distance to family planning, a proxy for access to health service, has no significant effect to fertility. It is also true that, the education level of women has significant effect on fertility; however, its responsiveness to fertility is minimal. So the NPP of Ethiopia has also taken in to alternative strategies to areas that have the same agro ecological and socio economic settings to rural *Sekota*. This does not mean that the program has no appropriate strategies at national level. This strategy might be suitable for other areas, though it is less appropriate for the study area. The following particular strategies should be taken in to account as components of the NPP of Ethiopia for areas like the rural *Sekota*.

1. Child health: - In this study, child mortality has a significant effect on the fertility of women in rural *Sekota*. It is not only significant but also the fourth important determinant of fertility.
2. Education of Child: - Environmental good scarcity, like scarcity of fuel wood and scarcity of drinking water, was found to be negatively related to fertility of households. These variables are the first and third most important determinants of fertility. The negative relation between resource degradation and fertility is more likely to be observed at highly deterioration of the resource base. This would be due to in highly degraded environments; the perceived costs of raising children may exceed the benefit they provide as producer goods. So demand for children will rise only if the increase in perceived benefits of children due to increase in resource scarcity is greater than the cost of additional child. So it is plausible to assume that households demand children in rural *Sekota* is for consumption only. Consumer demands for children have a diminishing tendency to reply parents' investments in terms of market goods and services. Thus the marginal (consumer) benefits to additional children might decline. Parents might want to school their children for more years, and achieving this goal might be viewed as a good substitute for having additional child. Parents will further decrease their demand for children in highly degraded areas provided that they have the opportunity and potential to teach their child.

In addition to the above policy options, the following research options should be considered as long as the fertility decisions of households in response to environmental good scarcity is concerned. These are: -

1. Use of panel data: - It is believed that the different specifications to control the endogenous effect may have some draw back on the results of the fertility estimation. Besides, the most series limitation to this study is the fact that the cross sectional data from a single year to examine what is essentially a dynamic response of households to the continually changing resource bases. A panel data set over a relatively longer period of time, say for ten years, or even longer, would be more appropriate for the purpose of the study.
2. Consider wider areas for the level of environmental good scarcity and socio economic settings: - It is also important to consider wider areas that cover a wide range of agro ecological zones to have different natural resource settings. This helps to have the resultant matrix of the explanatory variables, both socio economics and environmental good availability and scarcity levels, capture a wider range of values with respect to woman's fertility and child mortality rates.

5. REFERENCES

1. Aggarwal. R, S. Netanyahu, and C. Romano, 2001. "*Access to Natural Resource and Fertility Decision of Woman*": The Case of South Africa, Environmental and Resource Economics, 6 (2): 209-236.
2. BOPaED, 2004. "*Projection of the population of the Region from 1994 Housing and Population Census of Ethiopia*", *Amhara* Region Bureau of Planning and Economic Development, Working Paper Unpublished.
3. Boserup, E., 1990. "*Economic and Demographic Relationships in Development*", the Jouns Hopkins, University Press Ltd, London, England pp96.
4. Bromley, D., and M. Cernea, 1999. *"Management of Common Property Natural Resources*": Over View of Bank's experience, Innovations in Resource Management, Proceeding of the Ninth agricultural Sector Symposium, pp29-45, World Bank, Washington, DC USApp97.
5. Desgupta, P., 1993. *"Population, Resource, and Poverty, Special Issue Paper for Natural Resources and Development"*, Ambio, 21(1), Feb 1992:1-16.
6. Farina, P., G. Eshetu, H. Abdulahi, D., Mallifolie, 2001. *"Ferility and Family Change in Ethiopia, In depth Analysis for the 1994 Population and Housing of Ethiopia"*, Italian Multi-BiResearch Project ETH/92/pol and CSA, Addis Ababa, Ethiopia.pp69
7. Farooq, M.G, and S. D. DeGraff, 1988. "*Fertility and Development: An Introduction to Theory, Empirical Research and Policy Issues"*" Background Paper for Training in Population, Human Resources and Development Planning, Paper no.7 International Labor Office (ILO), Geneva, Switzerlandpp56
8. Filmer, D., and L. Pritchett, 1996. "*Environmental Degradation and demand for Children: Searching or the Vicious Circle*," http://www.Worldbank.org/research /peg/wps02/wps02.pdf
9. Green, W.H., 2000. *"Econometric Analysis"* Fourth Edition. Orentice-Hav, Inc. Upper Saddle River, New Jersey 07458, USApp546
10. Maddala, G. S., 1997. *"Limited Dependent and Qualitative Variables in Econometrics"*. Econometric Society Monographs No.3, Cambridge University Press, USApp456
11. MOA, 1998. *"Agro-ecological zones of Ethiopia"*. National Resource management and regulatory Department, MOA, Working paper, unpublished.
12. Muller, E., and R. Cohn, 1997. "*The relation of Fertility Decisions in Taiwan*". Economic Development and cultural Change, 25: 325-347 (2), The University of Chicago Press, USA.
13. Nerlove, M., 1991. *"Population and the environment: a farable of firewood and fther fales." American Journal. of Agricultural Economics,* 73: 1334-1347
14. Nerlove, M., 1993. *"Procreation, fishing and hunting: Renewable resources and dynamic planner systems". American Journal. of Agricultural Economics,* 75: 59-71
15. Schultz, P.T, 1981.*"Economics of Population"*. Addison-Wesley Publishing Company, Inc USApp269.
16. SERA, 2001. "*Vulnerability Profile of Sekota District of the Amhara Region"*, Disaster Prevention and Preparedness Commission of the ANRS, Working Paper, Unpublished.

REQUEST FOR FEEDBACK

Dear Readers

At the very outset, International Journal of Research in Commerce and Management (IJRCM) acknowledges & appreciates your efforts in showing interest in our present issue under your kind perusal.

I would like to request you to supply your critical comments and suggestions about the material published in this issue as well as on the journal as a whole, on our E-mail i.e. **infoijrcm@gmail.com** for further improvements in the interest of research.

If you have any queries please feel free to contact us on our E-mail infoijrcm@gmail.com.

I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward an appropriate consideration.

With sincere regards

Thanking you profoundly

Academically yours

Sd/-

Co-ordinator

ABOUT THE JOURNAL

In this age of Commerce, Economics, Computer, I.T. & Management and cut throat competition, a group of intellectuals felt the need to have some platform, where young and budding managers and academicians could express their views and discuss the problems among their peers. This journal was conceived with this noble intention in view. This journal has been introduced to give an opportunity for expressing refined and innovative ideas in this field. It is our humble endeavour to provide a springboard to the upcoming specialists and give a chance to know about the latest in the sphere of research and knowledge. We have taken a small step and we hope that with the active co-operation of like-minded scholars, we shall be able to serve the society with our humble efforts.

Our Other Journals