ADDIS ABABA UNIVERSITY
COLLEGE OF DEVELOPMENT STUDIES
INSTITUTE OF POPULATION STUDIES

FARMERS' AWARENESS AND RESPONSES TO THE EFFECTS OF POPULATION GROWTH ON THE ENVIRONMENT:

THE CASE OF TEHULEDERIE WOREDA, SOUTH WOLLO ZONE OF AMHARA REGION

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Farmers' Awareness and Responses to the Effects of Population Growth on the Environment:

The Case of *Tehulederie Woreda*, South *Wollo* Zone of *Amhara* Region

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Hiruy Mitiku

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By

Hiruy Mitiku Alef

Institute of Population Studies
College of Development Studies

Approved by the Examining Board

Dr. Terefe Degefa Chairman, Department Graduate Committee	Signature
Dr. Terefe Degef Advisor	Signature
Dr. Amare G/Egziabher External Examiner	Signature
Dr. A. Sathiya Susuman Internal Examiner	Signature

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Abstract

The main objective of the study is to examine the level of awareness and responses of farmers to the effects of population growth on the environment, with the case of ***Tehulederie Woreda*** of South ***Wollo*** Zone of Amhara Region. Primary data were gathered from four sample ***Kebeles*** on the basis of 400 randomly selected households through a survey questionnaire, focus group discussions and key informant interviews. The survey was conducted from March 29 – April 14, 2008.

Uni-variate analysis was made to assess the background characteristics of respondents. A bi-variate analysis was carried out to find the differential effects of demographic and socio-economic variables on the level of farmers awareness and their responses to mitigate forest depletion and agricultural land degradation. A multi-variate analysis (logistic regression) was conducted to assess the net effect of each predictor factor so as to best fit the model.

Among thirteen pertinent demographic and socioeconomic factors, the predictor variables that have influenced the level of awareness and responses of farmers in rehabilitating the environment and averting high birth rate are: participation of farmers in the environmental conservation activities, contacts to family planning and conservation agents, literacy status and size of landholding.

On the basis of the study findings, the following recommendations are made. Aggressive reproductive health programme to avert the high birth rate in ***Tehulederie Woreda*** should come top on the list of priority in the country's reproductive health programme intervention.

The irrigation scheme which is being utilized only for horticulture development, mainly ***Chat,*** should be averted though awareness creation radio programmes and inculcate into the minds of the farmers the benefits of mixed farming.

Increased "participation in environmental conservation activities" of farmers should be encouraged to draw maximum benefit out of the practices of terracing, afforestation, irrigation and intensification techniques.

ACRONYMS

AAU	Addis Ababa University
AM	Amete Mihret is the Ethiopic Calendar version just equivalent to AD
CSA	Central Statistical Agency
DPPC	Disaster Prevention and Preparedness Commission
DPPA	Disaster Prevention and Preparedness Agency
EPA	Environmental Protection Authority
FDG	Focus Group Discussion
FDRE	Federal Democratic Republic of Ethiopia
CDS	College of Development Studies
IPS	Institute of Population Studies
RRC	Relief and Rehabilitation Commission

CHAPTER ONE

INTRODUCTION

1.1. Background Information

In the contemporary world of ours, the change in the environment has become a global phenomenon. The rapture of the ozone layer and global warming are the least common factors. Nowadays a lot of information is obtained about some kind of strange phenomenon as global dimming. In the process of trying to create energy, there is always pollution containing ash, salt and carbon dioxide and resulting in global dimming. Global dimming is again blocking the sunlight, reducing the amount of evaporation and a drop in sunlight occurs; having a cooling effect in the atmosphere, which is contrary to that of global warming (Wikeipedia, The Free Encyclopedia). Even more is true with the depletion of forests and gradual decrease of underground water.

Increased stress, due to unprecedented human population growth on the limited resources of the earth made resources and population relationship studies one of the most important and urgent needs of many societies. Ethiopia at least before 1970s, in relative terms, was self–sufficient in food production; its natural environment, for example, forest, soil and water resources were in a better stable condition than the recent phenomena and population growth rate was not exceeding the rate of growth of the economy (Muluneh, 2000). But, since 1960, population growth rate started taking off, doubled by about three-fold, and followed by excessive consumption and over use of forest resources and the soil. Moreover, the northern highland regions of Ethiopia as a historical settlement and densely populated area; is too over cultivated and overgrazed to support the life of the people. The rugged topography is also accelerating environmental change (Constable, 1989).

The Northern Highland Regions as the seat of the Axumite Kingdom were inhabited for well over two millennia. Later on the capital cities were changing around the same regions

along with changes in leadership maintaining the feudal structure and form. Even before the birth of Christ and in the first millennium, ***Axum*** was the capital city of the kingdom until it was transferred to the city of ***Lalibela*** with the shift of power to the ***Zagwe Dynasty*** between the tenth and twelfth century. The ***Axumites*** regained power in 1270 and the seat of government was retuned back to the city of ***Axum***. Later on the city of ***Gondar*** became the Centre of government under Emperor ***Theodros in 1855,*** but only for brief period of time. The centre was moved from ***Gondar*** to the city of ***Mekelie*** under Emperor ***Yohannes*** (1872-1889) and then again to ***Ankober***, ***Shoa*** under Emperor ***Menilik***. Emperor ***Menilik*** actually moved his capital in 1892 to ***Addis Ababa***, where the capital city of the ***Ethiopian Government*** is located to date. This long process of historical settlement and the forces involved in the Northern Highlands of the country for a long time, together with the rugged topography of the area, has considerably contributed to the change in the environment of the regions (Bahru, 2002).

The population growth rate of Ethiopia was very low at 0.2% in 1900. It increased to 1% in 1925 and to 2% in 1950, which was yet below the replacement level. But after 1950 the population growth rate was increasing until it reached its peak of 3% in 1990, which was very high by all standards. Such a high rate of growth virtually doubled the size of population in 60 years for the first time in 1960. It took only 28 years to double the size for the second time in 1988 (CSA: 1994).

The historical settlement and the rugged topography of the Northern Highlands of Ethiopia are in the worst scenario of environmental change. To meet the basic needs of the ever-increasing population, extensive agricultural production was practiced. Agricultural land was extended into forest area and as the result, the forest coverage is depleted. Farming in the steep slopes would lead to accelerated soil erosion and eventually decrease the productivity of the land, whereby it becomes difficult and many a times impossible to meet the growing demand of high population growth. The recurrent drought is the manifestation of the change in environment, which was caused by the depletion of forests due to intensification of agricultural land, increasing utilization of firewood for fuel and construction of shelter with

forest products. The resultant effect of all these being shortage of moisture, which has remarkably affected the rain feed agricultural production. Successive regimes have exerted much effort to alleviate this problem by temporary relief activities. Yet the measures taken over the past forty years did not make any difference in the life of the people. Life is rather getting miserable, at times impossible; especially in the rural parts of the region where the majority of the population is located, and people are surviving mainly on food handout since 1974 (PASDEP, 2002).

The responses of the people at large and the farmers in particular, to the effects of population growth on the environment, are indeed decisive to the sustainability of resources. Peoples' awareness of what is happening to their environment (land, vegetation, water, wildlife and biodiversity in general) due to their growing numbers serves as a basis for any future intervention strategies. Moreover, achieving cooperation and local participation in population regulation and environmental rehabilitation requires the study and analysis of local people's beliefs, knowledge, attitudes, interests and awareness about their population size and physical surroundings. In the face of decreasing environmental resources both in quality and quantity caused by high population growth, peasants resort to a number of mechanisms that help them to overcome this problem. However, studies on public awareness and response to population growth effect on the environment are very few.

In light of the above observation, the study is intended to make some contributions to studies on local peoples' response to population growth effect on the environment in Ethiopia by taking the case of ***Tehulederie Woreda*** of ***South Wollo*** Zone, which is having the highest population density of 349.9 persons/km^2, in ***Amhara*** Region. It is also very much affected by the high population density in putting high pressure on the environment. The research findings of the thesis have made recommendations to contribute just a little to the efforts of the government.

Among 137 ***Woredas*** of the ***Amhara*** Region, 84 of them have population density of 123.3 persons/km^2 and more, which is above the regional average and 96 of them have population

density of 102.6 persons/km² and more, which is above the country's average. The highest population density in the Region and of course from the two Zones of North and South ***Wollo, Tehulederie Woreda*** with 349.9 persons/km² and followed by ***Dessie Zuria*** with 252.0 persons/km², and the lowest being 104.7 persons/km² in ***Bugna*** and 92.3 persons/km² in ***Kelala.*** The lowest population density remaining around the country's average put the two Zones to be categorized on the higher side (CSA, 2006).

1.2. Statement of the Problem

Despite the efforts exerted by the government, the situation remains aggravated. The Relief and Rehabilitation Commission (RRC), renamed later as the Disaster Prevention and Preparedness Commission (DPPC) and at present Disaster Prevention and Preparedness Agency (DPPA) in collaboration with the Ministry of Agriculture, have introduced afforestation programme and protection of soil erosion and designed conservation strategy and tried to implement. But all these activities were done in temporary campaign notions and even the environmental conservation policy of 1996 was not sustainable and therefore did not impact much on the process of environmental change (EPA, 1996).

It is worth mentioning, in this connection, the features of environmental change/degradation that are pertinent to the Northern and Central Highlands of Ethiopia. The physical, chemical and biological degradations are typical phenomena of the study area. The first type, the physical degradation refers to the deterioration of physical properties of the soil through the process of erosion, compaction and laterization. Water erosion, which comprises sheet, rill and gully erosion and which affects the different processes of soil degradation, is the dominant erosive agent in Ethiopia. The second type is known as chemical degradation, which is expressed by the state of the chemical composition of soils, which affect the availability of nutrients in the soils. The third type is biological degradation, which is also referred to as the reduction in soil organic matter and decrease in the activity and diversity of soil fauna. (Engdawork: 1997)

The Highland Regions are densely populated and mainly staying agrarian; are now suffering from environmental change resulting in food insecure, drought prone situation. While the lowland regions, not habitable in most cases except the thinly populated riversides and some grazing areas with 2.9 persons/km² in *Gog* and 3.8 persons/km² in *Jor* of *Gambella Region* and also 2.9 persons/km² in *Guba* and 3.8 persons/km² in *Yaso* of *Benishangul/Gumuz Region*, covering a vast cultivable land, are potentially rich (see table 1.1). (CSA, 2006)

Table 1.1 Population distribution of Ethiopia by region

Region	Area (km²)	Density Persons/km²	Population Size
Tigray	50,078.64	88.8	4,448,997
Afar	-	-	1,417,994
Amhara	159,173.66	123.3	19,624,008
Oromiya	353,006.81	77.3	27,303,994
Somali	-	-	4,443,998
Benishangul/Gumuz	49,289.46	13.0	640,000
SNNP	112,343.19	136.4	15,321,001
Gambela	25,802.01	9.8	253,000
Harari	311.25	652.2	203,000
Addis Ababa	530.14	5,770.2	3,059,000
Dire Dawa	1,213.20	339.6	412,000
Total	751,748.36	102.6	**77,127,000**

Source: CSA 2006.

The total projected population of Ethiopia for July 2007 is estimated to be 77,127,000 persons, of whom 64,438,000 are rural and 12,689,000 are urban. Oromiya Region has the highest population size of 27,303,994 followed by Amhara Region with a population size of 19,624,008, while Southern Nationalities Nations and Peoples Region (SNNP) stands third with a population size of 15,321,001 (see table 1.1). All the more, the highest population density is recorded in SNNP. The population density is simply estimated short of information

of the size of Afar and Somali. The fact that the data are not available for Afar and Somali, the total area is presented as reduced from the actual size of the country, which is 1.17 million km². In this case the average population density for the country would have declined down to 65.9 persons/ km².

The average population density of Ethiopia is actually, 102.6 persons/km², while the highest population density is ***1,120.8 persons/km² in Wonago***, followed by 746.4 persons/km² in ***Damot Galle*** and 704.8 persons/km² in ***Aleta Wondo*** of Southern Region. With a density of ***442.4 persons/km² in Haromaya***, 375.4 persons/km² in ***Meta*** and 375.0 persons/km² in ***Kersa*** of ***Oromiya*** Region; and ***349.9 persons/km² in Tehulederie*** (South ***Wollo*** Zone –the study area) and 343.7 persons/km² in ***Efratana Gidim*** of ***Amhara*** Region. A high population density of ***350.7 persons/km² in Ganta Afeshum*** of *Tigray* Region is also observed (CSA, 2006).

High population density is obviously putting pressure on natural resources since cultivation of food production to meet additional demand of the fast growing population would increase. This is of course without considering the extension of farmland into forest areas. The rate of deforestation was actually taking place at a rate of 200,000 hectares per annum and forest cover decreased from about 40% in 1900 to less than 3%. The rate of soil erosion is estimated to be between 1.5 to 1.9 billion tons every year from the highlands (Muluneh, 2000). Forest products are required for construction and fuel; deforestation of hilly and mountainous regions is considered disastrous because once the soils are devoid of their vegetation, the top soils are washed in a few years time and their productive potentials are irreversibly destroyed (Belay, 1991).

Although, the highest population density remains in the South, the added factors like the historical settlement and the rugged topography of the North might have intensified the problem. The rugged topography of the northern highlands is actually extending from a very high altitude (called ***dega*** in the local language) of 3000-3500 meters above sea level, to the

second level higher altitude (***woinadega***) ranging from 2500-3000 meters above sea level, then to the lower altitude (***kola***) up to 1500 meters above sea level (CSA 2006).

It has become customary of the highlanders, farming the steep slopes which are for sure leaving the region highly vulnerable to environmental deterioration by soil erosion. The average soil loss rate for the whole of the country was predicted to be 12 tons per annum while the absolute total yearly loss was estimated at 1.5 billion tons (Muluneh, 2000). The ecological changes as the outcome of environmental deterioration are giving way to desertification and characterizing the region as a "critical drought zone". This has resulted in steady impoverishment of many farming families and in some areas, in their more or less complete dependence on food aid (EPA, 1996).

It is unfortunate for the people of the northern highland area to live under a temporary relief aid, but for a long time. It is important to know as to how the rural communities are operating for their survival in such a precarious situation. The problem of ecological degradation and food production shortfalls that have persisted in the last two decades will continue for some time to come (Markos, 1997). Therefore, to ask about what the peasant responses to these crisis situations is imperative which this study intends to address.

1.3. Objectives of the Study

The general objective of the Study is to examine the level of awareness and responses of farmers to the effect of population growth on the environment. The specific objectives are:

1. to identify some demographic factors that affect environmental change due to population growth, which in turn influence the level of awareness; and

2. to assess the responses of farmers, triggered by environmental change due to population growth, towards environmental rehabilitation and conservation of resources.

1.4. The Study Hypotheses

i. Literacy status of the head of the household has a strong positive relationship with the level of awareness of farmers in the realization of environmental problems.
ii. The responses of farmers to emerging environmental problems are higher among those who are participating in environmental conservation activities.
iii. Contacts with family planning and conservation agents, increases farmers' awareness on environmental degradation and the tendency in limiting the size of the household.
iv. The responses of farmers to environmental change, is high among farmers who have large household size.
v. The size of landholding has its positive relationship with the responses of farmers towards environment conservation.

1.5. Theoretical and Conceptual Framework

1.5.1. Theoretical Basis

It is true that the population-environment nexus is very challenging to understand and controversial to discuss. There is also a lack of solid scientific analysis which could lead to conclusion. Therefore, the situation is calling for more researches to be undertaken to resolve the uncertainties in the population-environment nexus. All the more, the Malthusian and the Bőserupian perspectives are actually representing the two dominant though historically opposite viewpoints on population-environment nexus.

Malthus postulated that human population has a tendency to grow geometrically; while food production grows only arithmetically. By the same token, population growth tends to outstrip the productive capabilities of land resources. The results of which is "positive" checks, such as famine and increased mortality, or preventive checks, such as postponement of marriage and limitation of family size, which again works to reduce population growth back to zero. In more general terms, the Malthusian viewpoint suggests that limited natural

resources place a restriction on population growth. This viewpoint had been a benchmark for much of the popular discourse on population-environment relations. While on the other hand, Bőserup explicitly takes into account technological change which Malthus did not. Moreover, **Bőserup suggests that in some cases population growth and the resulting increased population density might induce technological changes that allow food production to keep pace with population growth.** Julian Simmon (1981 and 1990) went further to suggest that population induces sufficient technological change to expand food output faster than population. The dominance of either Malthusian or Bőserupian thought in the discussion of population-environment relationships has led to the opposing views of "limits to growth" and the "cornucopian" (Hagan, 1992a).

The population-environment relationship is based on the fundamental factors of land and food production vis-à-vis that of population, in as far as Malthusian and Bőserupian thinking is concerned. But this thinking implies a linear relationship between population and environment. While the non-linear way of thinking considers the "multiplicative" effects between population and other factors as consumption and technology in producing environmental impacts or the "mediating" effects that other factors like socio-economic, institutional and cultural factors may have on population and the environment relationships. Along these lines of thinking, Markos, (1997) has categorized them into three groups as the Malthusian and Bőserupian Perspectives, the Multiplicative Perspectives and the Mediating Perspectives. The Malthusian/ Bőserupian perspectives imply direct relationship between population and environment; while the Multiplicative perspectives view that population (size, growth, density and distribution) interacts in a multiplicative way with other factors, such as levels of consumption and technology, to have impacts on the environment. It is in this connection the most frequently used multiplier, "I=PAT" equation is applied. The third perspectives, the Mediating Perspectives emphasize on social, cultural and institutional factors as playing a mediating role in determining population and environmental relationships. Therefore, the factors to be considered, so as to see the interrelationship between population and environment would be the following. Socio-economic factors like: land, agricultural

production, consumption, institution, culture, technology; and demographic factors like: age, sex, size of household and migration.

1.5.2. Literature Review

The very term "Environment" could be understood as considering the land and its level of fertility, the soil and its nutrients, the underground and surface water potential, the forest and the natural vegetation, the wild life contained in it, and in general the ecosystem including the weather condition reflecting it. This ecosystem is greatly affected, as there is a high population growth. Population growth has contributed and is contributing to a variety of environmental changes. Some but not all, of these changes would be classified as ailments or degradations. These undoubtedly include the destruction of forests, especially tropical forests; soil erosion and degradation in certain major regions, especially within sub-Saharan Africa: and the loss of species of plants and animals (Preston, 1994).

Environmental degradation is the stress on resources caused by the growth of population, the requirement of forest products for construction and fuel, the considerable increase in the demand for water, the impact of mechanization (including irrigation, fertilizers, insecticides, energy production) and the impact of human activities have introduced changes to the environment (Belay, 1991).

The major approaches used to analyze environmental deterioration in tropical areas of the developing world can be classified into three major paradigms: Neo-Malthusian; neoclassical economic/ technological; and dependency. The environmental issues that are raised, the specific questions that are asked, the factors and variables that are defined as relevant, and the proposed solutions to environmental problems vary with each perspective. Population growth and increase in population density, is seen to generate land scarcity, which in turn results in the increasing intensive use of land already in agricultural production and in the expansion of agriculture into marginal areas (Susan 1989).

The biophysical system is less dependent on resources and on the state of technology, in which case output from a given area can increase far more from the adoption of more intensive production systems (i.e. through increased inputs from labor or innovations in technology) (Bőserup, 1965). Others have diverse perspectives that environmental problems have their basis in the structure of rural poverty rather than population increase, like the decision to have children is a rational response to existing economic conditions.

The Neoclassical economic model is the second type of paradigm for understanding environmental deterioration. It shares the neoclassical assumptions that well-functioning markets are always the best means of allocating natural resources and that competition necessarily leads to appropriate management, which rationally manage resources to their best advantage in order to remain competitive within the market. In the tropics, environmental degradation is often attributed around the use of common property resources and "irrational", "traditional" land use decision of small producers. The solutions are based on modifying the internal organization of production through the privatization of landholdings, or "appropriate" interventions of "modern" technologies (Susan, 1989).

The third type of paradigm is the Dependency perspective, which focuses on the external factors that alter production systems and thereby induce environmental decline. The most relevant being the export production for the global market and the imposition of inappropriate management practices and technologies by international corporations (Susan, 1989).

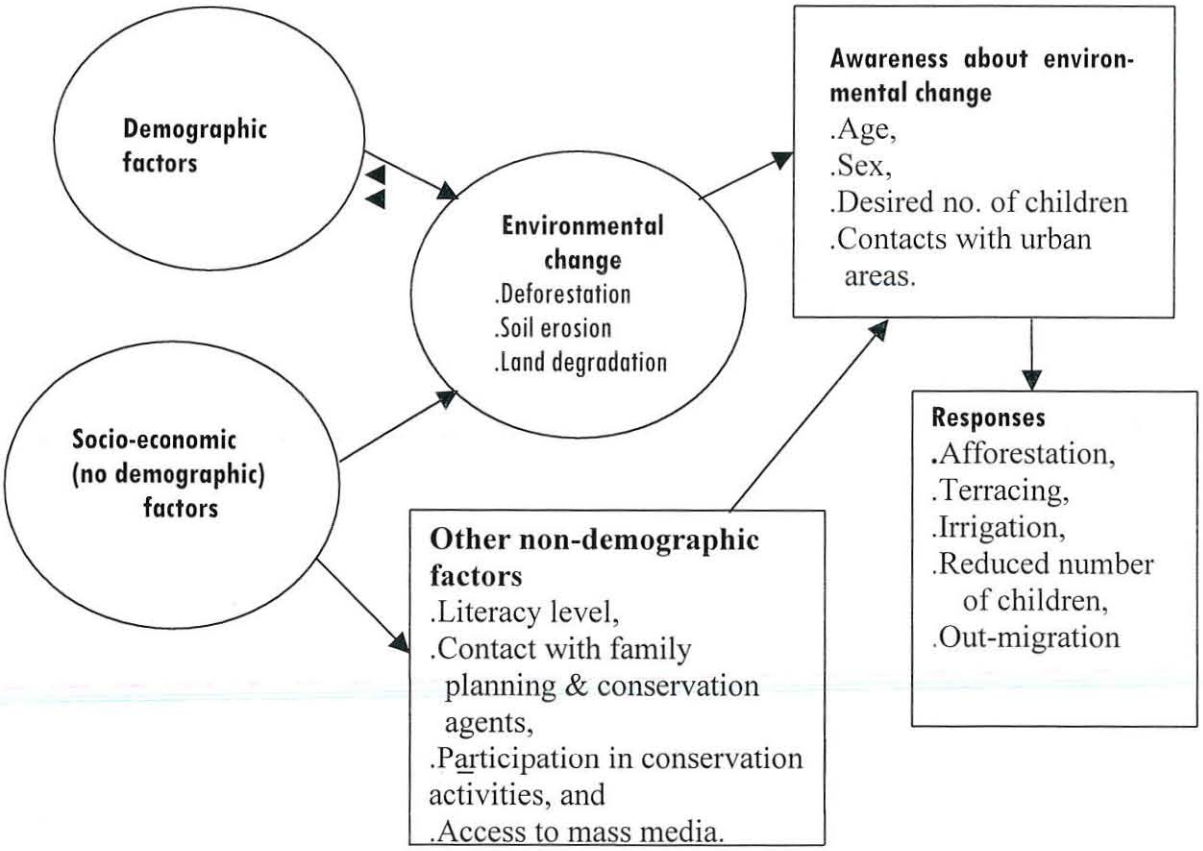
Various studies conducted on the recurrent drought and famine in Ethiopia; seem to be sharing the neo-Malthusian view, in that they put much of the blame on structural problems. The fundamental causes of the Ethiopian famine would be the socio-economic disorganization and political irresponsibility (Mesfin, 1984). The seasonally adverse factors of Ethiopia's climate interact and reinforce each other in such a way that they cannot be ignored as a basic cause of the retardation of rural development (Kurt, Michael and Penrose, 1987).

1.5.3. Conceptual Framework

The conceptual framework of this study consists of three major parts. (i) the "awareness" and "responses" of farmers, the dependant variables; (ii) the effects of population growth on forest depletion and agricultural land degradation, the intermediate variables and (iii) the demographic (age, sex, size of household and contacts with urban areas –out-migration; and socio-economic factors (contacts with family planning and conservation agents, participation in environmental conservation activities, participation in social organization, size of landholding, literacy and access to mass media, the independent variables as influencing the intermediate variables and ultimately predicting the dependent variables.

Before going into analyzing the responses of farmers, it is quite essential to assess the level of awareness in the realization of the effects of population growth on the environment, like deforestation, soil erosion and agricultural land degradation. After having assessed the level of awareness it is only possible to link the responses of farmers. The "responses of farmers" to the effect of population growth on the environment could be studied by exploring the availability and access to grazing lands, forest resources, fuel wood resources, productivity of farmlands, mass media, and participation in conservation activities, with the increasing problem of land scarcity or fragmentation, in terms of agricultural technology, employment, and demographic behavior. The other basic concept is the effect of "population growth", which could also be examined from the point of view of high population density, household size; the demand for adequate farmland (landholding), fuel wood. Finally, the "environment", is being affected by the pressure put on the natural resources in terms of deforestation for fuel wood and construction of houses and to extend farmland into forest areas.

Figure 1.1 Conceptual Framework



Source: Developed by the author on the basis of the literatures reviewed, 2008

Farmers' awareness and responses to environmental change due to the growing number of population is affected by demographic and socio-economic factors. The demographic factors include household size, age and sex of head of the household and contacts with urban areas through out-migration. The socio-economic factors also include literacy status, size of landholding, participation in social organization, participation in environmental conservation activities, contact with family planning and conservation agents and access to mass media are important economic and socio-cultural factors influencing awareness level. Awareness leads

to some kind of response to mitigate changes in the environment. Although there could be other factors, which may have positive or negative effects on the response the respondents made, these are the variables which are incorporated in this study.

1.5.4. Definition of Concepts and Local Terms

Presented below are contextual definitions of concepts and local terms used in the study.

Awareness: refers to having knowledge or perception on the realization of the situation or fact.

Dega: refers to high altitude from 3000 to 3500 meters above sea level with an average temperature of 10° centigrade.

Edir: refers to a social organization, mainly involved in mourning events and condolence.

Environment: the surrounding or conditions in which a person, animal or plant lives or operates.

Equb: refers to a social organization, specifically applying to economic activities, like forced saving.

Kebele Administration: refers to the fifth tier of government administrative unit, which is also referred to as sub-national government and could be equated to sub-district administration.

Kola: refers to low altitude ranging up to 1500 meters above sea level and with an average temperature of 30° centigrade.

Population density: refers to the number of people per unit of land area, such as per square kilometer or per square mile of a region's or country's total land area.

Population growth: refers to the rate at which a population is increasing or decreasing in a given year due to both natural increase and net migration.

Qerie: refers to similar activities like ***Edir***. This is the local reference, specific to ***Wollo.***

Response: refers to any behavior of a living organism which results from stimulation. It is an answer or reply, whether in words, in some action, etc.

Woinadega: refers to an altitude of 2500-3000 meters above sea level with an average temperature of 20° centigrade.

Woreda Administration: refers to the fourth tier of government administrative unit; this is also referred to as sub-national government and could be equated to district administration.

1.6. Justifications of the Study

The highlands are particularly important in Ethiopia, since they comprise 40% of the land area and contain as much as 81% of the population (ILRI, 2006). The long period of historical settlement, high population density, high population growth rate registered over the past 60 years, topography, depletion of the forest lands, soil erosion by reducing the fertility of farmlands, have all resulted in the intermittent drought and famine in the region. Nowadays, drought and famine seem to have escalated all over the country.

Over the past 40 years the farmer in the northern highland area has lived on relief aid although the institution that was put in place is expected to combine relief and rehabilitation activities so as to alleviate the problem. Hardly any of the programmes implemented so far to alleviate

the prevailing situation have made a difference in the life of farmers. The farmer in particular and the population of the region at large are living in abject poverty, hunger and malnutrition. Living on food handout under safety net programme is a clear indication of extreme poverty (Constable, 1989).

The present DPPA along with its relief partners has tried to mitigate the problem by implementing afforestation programme, land and soil protection and environmental conservation activities. But, all these problem solving mechanisms are done in quite unplanned manner and could not bring about the required change and get the people out of the quagmire of poverty. It deemed necessary, therefore, to get back to the farmers and see their level of awareness and learn how they are responding to the problems faced. By learning the culture of the rural farmers and closely studying the indigenous knowledge, practical and workable intervention could be made. It is not only necessary but also indispensable to get to the farmers and listen to and learn from them in order to have a clear knowledge of the problem. It is against this fact that this study was concerned and undertaken.

1.7. Significance of the Study

Environmental change/degradation is the major problem that Ethiopia is currently facing. For the implementation, management and coordination of development activities, population and environmental issues are not only necessary but also vital. Population growth is one of the major factors, which causes and aggravates environmental degradation. In Ethiopia degradation rate of ecology outpaced the rate of conservation measures made so far (Mohammed, 1999). Among the different factors which influence the implementation of population programme and environmental conservation measures, demographic and socio-economic characteristics of farmers is crucial for it is the farmer who adopts, implements, and takes care of conservation measures for sustainability (EPA, 1996).

Demographic and socio-economic factors affect farmer's awareness and responses to the effect of population growth on environment. However, local studies that deal with the

measurement of public awareness levels are very rare in Ethiopia. Therefore, this study, which focuses on farmers' responses of population growth to the effects on the environment may help government and non-government organizations in their planning and implementation programmes to alleviate the alarming and ever increasing problem of environmental change in Ethiopia. The results of this study might contribute ideas to policy makers and be utilized as a source of information for interested researchers who need to conduct further studies in this area.

1.8. Limitations of the Study

The study is actually expected to show full picture of farmer's awareness and responses to population growth effects on the environment. This study by its very nature would require long period of time and a reasonable sum of budget, which would enable it increase the sample size and the coverage in area. In this case the findings would be inferable to the Highland Regions of Ethiopia. But in the case study of ***Tehulederie Woreda,*** the findings would be inferable to the ***Woreda*** or utmost to South ***Wollo*** Zone of the highland areas. Due to the aforementioned constraints, the candidate may be limited to only four rural ***Kebele*** administrations from ***Tehulederie Woreda*** and 403 sample households. Six FGDs were proposed and three were conducted and only three key informants' interviews were possible for the same reason, while a lot more was intended in the initial plan.

1.9. Organization of the Thesis

The thesis consists of eight chapters. Chapter One provides with background information and identifies the problem in earnest. It has attempted to justify that the problem deserves thorough attention. The theoretical basis to explain the relationship between population and environment is browsed, relevant literatures were also reviewed and a conceptual framework is designed upon.

In Chapter Two, the data requirements were set and the instruments of data collection were properly identified and also discussed as to how they were utilized. The sample size is also determined by the famous Cochran Model. With the application of statistical sampling techniques and in general with the use of survey methodology, the study was designed and made use of.

Chapter Three, deals with the background characteristics of the respondents by using descriptive statistics. Chapter Four and Five, make assessment by cross-tabulating into the differential possible association of each of the demographic and socio-economic independent variables vis-a-vis the dependent variables with the use of bi-variate analysis.

Chapter Six and Seven analyze with the use of regression model the net effects of each of the predictor factors in determining the level of awareness in the realization and responses in mitigation of the environmental problems. Finally in Chapter Eight, summary of the thesis is given and the study findings are presented. Some concluding remarks are made and upon which recommendations were also made and provided for policy consideration.

CHAPTER TWO

SOURCES OF DATA AND METHODOLOGY

2.1. The Study Area

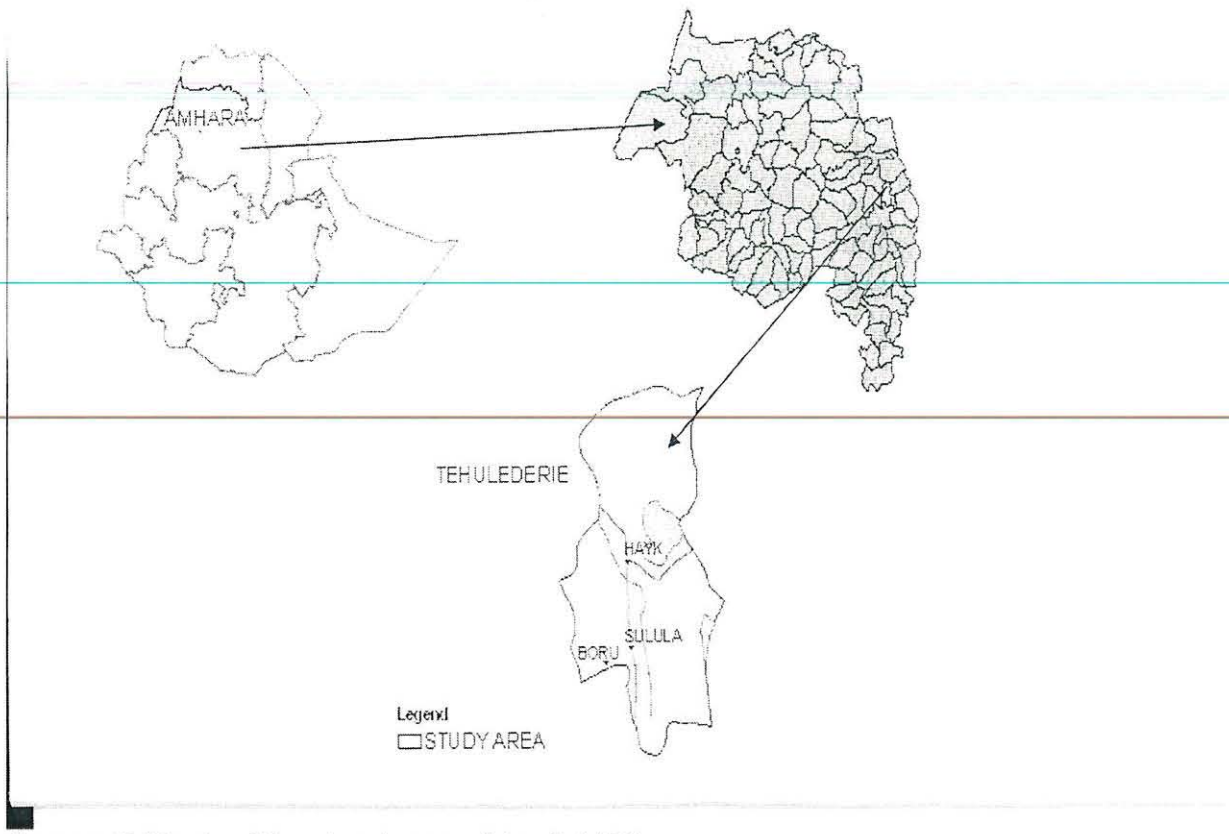
The study area, ***Tehulederie Woreda*** of South ***Wollo*** Zone, is located in ***Amhara*** **Region,** in the north eastern part of Ethiopia. Out of 137 ***Woredas*** of ***Amhara*** Region, ***Tehulederie*** is having the highest population density of 349.9 persons/km^2 with a total population size of 169,579 and covering 484.69 km^2 land area (CSA, 2006).

High population density being one of the determinant factors that are influencing environmental changes, ***Tehulederie Woreda*** is selected for this study. According to the information obtained from the administration office, ***Tehulederie Woreda*** (District Administration) has nineteen rural ***Kebele*** administrations (sub-district administration) and four urban *Kebele* administrations, which makes a total of twenty three ***Kebeles*** and 305 smaller villages like hamlets. With a population size of 152,891(the discrepancy /16,688 populations/ is the difference between CSA, 2006 estimation and that of the regional statistics office), the ***Woreda*** covers 45,800 hectares of land, which gets to an average landholding of 0.5 hectare. Out of which 26.4% is mountainous, 48% is sloppy, 13.3% is plain and 12.3% is escarpment. There are about 86,097 working forces that can be employed in production, while 96.5% is living in agriculture. The type of soil in the ***Woreda*** can be classified as black cotton soil 25%, non-black cotton soil 10%, red soil 15%, brown soil 40%, and gray soil 10%. Having an average rainfall of 500-1,200, there are 229 cricks flowing all through the year. There are also 8 rivers that are rich in their water contents and flowing through out the year, having good potential for irrigation. The 10th larger lake, Lake ***Haiq***, is also found in the study area.

As regards to the social services of the ***Woreda***, the education service coverage has reached 93%, while the health reached 64.4%. There is one health centre in service, while 6 are under construction; and 10 health posts in service, while 5 are under construction. There is only one sports centre. Although it is predominantly a Muslim culture, with 37 mosques, there are also 19 parishes of the Ethiopian Orthodox ***Tewahido*** church and one of the holy places in Ethiopia, a monastery known as ***Haiq Estifanos*** established by His Holiness Bishop Eyesus Moa in 1653.

The study is focusing on farmers that are residing in the rural areas and fully employed in agricultural economy. Therefore, the sample for the study was selected from among the rural ***Kebele*** administrations.

Figure 2.1. Locational Map of the Study Area



Source: Ethiopian Mapping Agency, March 2000

2.2. Types and Sources of Data

The thesis relied on both qualitative and quantitative data in order to prove/disprove the hypothesis and thereby arrive at valid and reliable conclusions. In the case of qualitative data generation, Focus Group Discussions (FGD) and Key Informants Interviews (KII) were conducted. While in the case of quantitative data generation, both primary and secondary sources of information are used.

The primary sources include, data generated by survey questionnaire completed by 400 sample households from among four ***Kebeles*** that were purposefully selected with the aid of the ***Woreda*** officials on the basis of population distribution. The 403 sample size was initially distributed according to probability proportionate to size (PPS) technique among the sample ***Kebeles***. Lists of farmers' households were obtained from ***Kebele*** Administrations for the purpose of designing the sample frame and randomly select sample households. As regards to secondary sources, authentic and relevant literatures are reviewed. Published and unpublished books, reports and working papers by EPA, DPPA and the Ministry of Agriculture were also used.

Both quantitative and qualitative research methods are employed and information and data were gathered from primary and secondary sources. Primary data were gathered through questionnaires, bearing structured and semi-structured questions. The structured questionnaire was used for the data completed by 400 head of rural households, while the semi-structured questionnaire was used for the information gathered from the three FGDs and three KII. Secondary data were also gathered from the Ministry of Agriculture, DPPA, EPA, Amhara Region Environmental Protection and Land Use and Administration Authority. The Federal and ***Amhara*** Regional Environmental Protection Proclamations are also utilized intensively.

2.3. The Study Design

Since the study is focusing on the awareness and responses of farmers to the effects of population growth on environment and assessing the case in ***Tehulederie Woreda***, South ***Wollo*** Zone of the ***Amhara*** Region, a case study method is employed to gather data related to the problem. Four different lists of farmers' households were made available by the ***Kebele*** Chief Administrators. With these lists of farmers' households; 1,417 for Kebele -01, 1,547 for 05, 1,170 for 08 and 1,105 for 013, the sample frame was designed and the class interval (K) was determined to be 13 as shown in table 2.1. Every 13th household was selected randomly from which the data were collected. The head of each household was responsible to respond to the questions so as to complete the questionnaire. Four sample Kebeles namely; Bededo –Kebele 01, Kettie-Kebele 05, Hittecha-Kebele 08 and Jarie-Kebele 13 were selected. Three ***Focus Group Discussions*** (FDG) were conducted and three ***Key Informants' Interviews*** (KII) were made.

Table 2.1 Distribution of respondents among sample Kebeles, Tehulederie Woreda, 2008.

Sample Kebele		Farmers' Household Size	Sample Size	Percentage Share
Bededo	Kebele 01	1,417	109	27
Kettie	Kebele 05	1,547	119	29.8
Hittecha	Kebele 08	1,170	90	22.2
Jarie	Kebele 013	1,105	85	21
TOTAL		**5,239**	**403**	**100**

Source: Field Survey

2.4. Data Collection Methods

Different data collection tools were employed to generate relevant information for the study. Household survey, focus group discussions (FGD) and key informant interview (KII). Questionnaire was employed to collect and better secure information about opinions and views in a short period of time. It also helped minimizing the cost of sampling respondents over a wide geographical area. Moreover, focus group discussions were conducted among elders (FGD-1), ***Woreda*** Women's Affaires Office (FGD-2), Youth Group drown from four of the sample ***Kebeles*** (FGD-3) and key informant interviews with the ***Woreda*** Administrator (KII-1), a retired agricultural expert (KII-2) and an elderly 90 years old (KII-3) were made and enabled to investigate the why and how of awareness and responses issues. The information obtained has provided explanation and supported quantitative results. This method has actually helped in having an in-depth understanding of the level of awareness and responses of farmers to the change in the environment. Seven data collectors and two supervisors were recruited, trained and deployed to collect data. Data collection was started on the 29th of March, 2008 (Megabit 20, 2000 A.M) and completed on the 14th of April, 2008 (Miyazia 5, 2000 A.M) with 400 questionnaires filled and only 3 non-responses, having a response rate of 99.3%.

2.5. Sampling Techniques

Out of 137 ***Woredas*** of ***Amahara*** Region, ***Tehulederie*** is having the highest population density of 349.9 persons/km^2 with a total population size of 169,579 and covering 484.69 km^2 land area. High population density being one of the determinant factors influencing environmental changes, ***Tehulederie Woreda*** is selected to be the study area. Among the twenty three ***Kebele*** administrations of ***Tehulederie Woreda*** only four rural ***Kebeles*** are identified purposefully on the bases of high population density and this was done in collaboration with the local ***Woreda*** officials. Each rural ***Kebele*** administration has a

proportionate sample size assigned from among 403 total sample size determined for the ***Woreda***. Therefore, probability proportionate to size (PPS) method was employed.

The sample size for the study is determined by using the formula: Cochran (1977)

$$\mathbf{N} = \frac{\mathbf{(Z\alpha/2)^2 \times P(1-P)}}{\mathbf{e^2}}$$

N is the sample size,

P is the proportion of farmers to respond = 50%, which is the same as 0.5,

1-P = 1-0.5= 0.5

$Z\alpha/2 = 1.96$

e^2 is the level of error to be tolerated

$$\mathbf{N} = \frac{(Z\alpha/2)^2 \times P(1-P)}{e^2}$$

$$\mathbf{N} = \frac{(1.96)^2 \times (0.5)(0.5)}{(0.05)^2}$$

N = 384.16 (plus contingency of 5%, which is = 19)

Sample size will be 384 + 19 = **403**

2.6. Pre-testing Survey Instruments

Two sets of survey instruments were developed, namely structured survey questionnaire and checklist. The two sets of survey instruments were pre-tested outside of the study ***Kebeles*** before actual data collection. Pre-test was carried out from March 19-24, 2008 (Magabit 10-15, 2000 A.M.) in the same ***Woreda***, but in non-sample ***Kebeles***. Out of 59 questions of the survey questionnaire, 14 of them were restructured and all possible corrections were made on the basis of the feedback obtained from the pilot survey. There was actually no change to be made on the checklists. The instruments were finalized by incorporating the feedback from the pilot survey and were made available for data collection.

2.7. Analysis of Data

First of all the data collected from the field were manually edited to ensure that they have the required quality. Open-ended questions were reviewed and recoded. The following work done was the data entry on SPSS for processing and further analysis. Data cleaning and verification were done before organizing and tabulating the data. The data were then tabulated and cross-tabulated to allow the start of data analysis. In analyzing the data appropriate statistical tools were selected like descriptive, bi-variate and multi-variate techniques on the basis of the nature of the data. Moreover, logistic regression was obviously employed for estimating the effect of independent variables on the dependent variables- awareness and response. Tables, graphs and charts are also used for presenting statistical results.

CHAPTER THREE

BACKGROUD CHARACTERISTICS OF THE RESPONDENTS

The background characteristics of the respondents were described by the use of uni-variate analysis with the aid of 4 demographic and 9 socio-economic pertinent factors. The respondents, who are 400 in number, are also heads of rural farmer's households. This chapter discusses the background characteristics of 400 farmers households with thirteen demographic and socio-economic variables related to the respondents who are in one way or another influence their actions and reactions.

3.1. Age and Sex Structure

Data disaggregated by sex as shown in table 3.1, reveal that female headed households constitute 19.7%, while male headed make up for 81.3%, (1:4 ratio) of the respondents. This shows that it is a male dominated society. As the great majority of the households are headed by males, it is also very likely to say that males are having control over land and the products of the soil. So it is the males that are influencing the decision making process in the society.

On the other hand, the age distribution of the respondents' shows that age group ≤30 is the lowest with 17.5%, while age group 31-64 is the highest with 59% and age group 65 and above falls in the middle with 23.5%.

Table 3.1 Percentage distribution of age of the respondents by sex, Tehulederie Woreda, 2008

Age of Respondents	Male	Female	**Total**
≤30	54(77.3)	16(22.7)	70(17.5)
31 – 64	195(82.6)	41(17.4)	236(59)
≥ 65	75(80.3)	19(19.7)	94(23.5)
Total	**325(81.3)**	**75(18.8)**	**400(100)**

Source: Field Survey

**Figures in parenthesis are in percent*

3.2. Household Size

Table 3.2 shows, 26% of the respondents have 1-3 persons in a household, 53.5% have 4-6 persons, while 20.5% have 7 and more persons in a household. Respondents having 4-6 persons in a household, falling a little over the national average, which is 4.58 persons according to the 1994 census (CSA, 1994); seems to be acceptable as the average household size of the study area. In the case of female respondents, the average household size falls below the national average, which is between1-3 persons residing in each household. This can be explained as 85% of female headed households are living out of wedlock relationship, which might have checked the number of children from increasing and is very likely to have smaller families.

Table 3.2 Percentage distribution of respondents by household size, Tehulederie Woreda, 2008

Household Size	Male	Female	**Total**
1 – 3	60.6	39.4	100.0
4 – 6	86.0	14.0	100.0
≥7	95.1	4.9	100.0
Total	**81.3**	**18.8**	**100.0**

Source: Field Survey

3.3. Contacts with Urban Areas

To establish whether there is any contact with the urban area, an interview question is raised to the respondents if there was an out-migrant relative in urban area. About 74.74% of the respondents do have such relatives, while 25.25% have responded negatively. (See table 3.3). It looks that there is a substantial out-migration. Then again, the ***Woreda*** capital ***Haiq*** itself is 20 minutes walking distance to ***Kettie*** and ***Jarie*** and not more than 40 minutes to ***Bededo*** and

Hittecha. Dessie, one of the biggest urban centres in Ethiopia is only 30 Kms away from the study area. Any rural farmer can walk all the way to ***Dessie*** if need be.

In response to the enquiry as to how often urban relatives visited in the past one year. Out of 200 respondents to this question, 37.9% of them responded "once a year", 19.7% "twice a year", 16.2% "more than two times a year, and 26.5% responded as "they are not visiting them at all". All the more, considering proximity and accessibility of the urban centres to the survey area, it can be concluded that there is a close contact with urban areas.

Table 3.3 Percentage distribution of out-migrants residing in urban areas by number of visits made to families over the past year, Tehulederie Woreda, 2008

Out-migrants Residing in Urban Areas	How often visit families				**Total**
	Once a year	Twice a year	More than two times a year	They do not visit at all	
Yes	37.3	16.66	15.15	5.55	**74.74**
No	0.5	3.0	1.0	20.7	**25.25**
Total	**37.9**	**19.7**	**16.2**	**26.3**	**100.0**

Source: Field Survey

3.4. Marital Status

Marital status (see table 3.4) among respondents is described by the following five conventional categories as never married 3.5%, currently married 78%, divorced 6.7%, widowed 5%, and separated 6.5%.

Sex disaggregation of the data shows that 81% of the respondents are male while 19% is made up of the female. Among the male population 93% are under wedlock, and it is only 7% who are living out of wedlock. The picture shows quite the opposite among the female population in the study area. The majority, 85% are living out of wedlock while a small proportion of 15% are living within wedlock.

Table3.4 Percentage distribution of respondents' marital status by Sex, Tehulederie Woreda, 2008

Marital status	Male	Female	Total
Never married	78.6	21.4	100.0
Currently married	96.5	3.5	100.0
Divorced	33.3	66.7	100.0
Widowed	10.0	90.0	100.0
Separated	7.7	92.3	100.0
Total	**81.5**	**18.5**	**100.0**

Source: Field Survey

3.5. Religion and Ethnicity

This study area is dominated by Muslim believers (97%) and the Ethiopian Orthodox constituted 3% of the respondents. All respondents claim to be ***Amhara***, (100%).

Table 3.5 Percentage distribution of religious affiliation and ethnicity of respondents by sex, Tehulederie Woreda, 2008

Religion & Ethnicity of Respondents	Male	Female	Total
Orthodox	2.75	0.25	3.0
Muslim	78.5	18.5	97.0
Total	**81.25**	**18.75**	**100.0**
Ethnicity **Amhara**	**81.2**	**18.8**	**100.0**

Source: Field Survey

3.6. Literacy

With all consideration of the reality on the ground, the numbers of people that are able to read and write are taken to be educated or literate, while those who do not read and write are taken illiterate. This is not a good parameter by any standard. Even then the data has shown that (see table 3.3) only 29% are able to read and write, which is made up of 93% male and 7% female; while 71% are illiterate with 76.7% male and 23.3% female. In other words, among females, 89% are illiterate and it is only 11% females who are able to read write, literate. Among those who are able to read and write, the highest completed grade is nine. Most respondents have not registered any thing on the highest completed grade column. This is only an indication of a low formal educational performance among respondents.

Table 3.6. Percentage distribution of respondents, who are able to read and write, Tehulederie Woreda, 2008

Able to read and write	Male	Female	Total
Yes	93.0	7.0	100.0
No	76.7	23.3	100.0
Total	**81.4**	**18.6**	**100.0**

Source: Field Survey

3.7. Participation in Environmental Conservation Activities

The socio-economic factor, "participation in environmental conservation activities" is basically an action oriented variable, which would give additional impetus to respond to mitigating environmental degradation. Three types of conservation activities are included in the study, like general conservation activities – environmental hygiene and sanitation, afforestation programmes and terracing. Out of 394 respondents 69.5% have participated in general conservation activities, 80.5% in afforestation programmes and 78.9% in terracing. Non-participation rate could conversely be explained. In any case it is between 20-30%,

which is very low in proportion. Although, a very high rate of participation is observed in conservation activities, the sustainability question is a case in point. Because of the nature of participation in environmental conservation activities which are mainly conducted on the bases of campaigns organized for specific purposes under Ad-hoc structures. However, the average rate of participation in environmental conservation activities is 79%, which is on the higher side.

Table 3.7 Participation of respondents in environmental conservation activities, Tehulederie Woreda, 2008

Participation in Environmental Conservation Activities	Yes	No	Total
Community Environmental Conservation	**274(69.5)**	120(30.5)	394(100)*
Tree Plantation (Afforestation)	**317(80.5)**	77(19.5)	394(100)*
Terracing	**311(78.9)**	83(21.1)	394(100)*

Source: Field Survey

**Figures in parenthesis are percentage*

3.8. Participation in Social Organization

There is a high participation in social organization, especially in ***Edir*** (mainly mourning events and condolences) and religious meetings. In ***Edir,*** participation in social organization, there is a very high turn out (98%), while the non-participation rate is minimal (2%). On the other hand, ***Equb*** (an economic saving activity), the rate of participation is as low as 10%. Since it involves financial contribution during a specific period of time, most people fail to do so and are excluded. In religious meetings, there is 70% participation (see table 3.8). By

linking participation in social organization, an important question is posed. It is to know whether respondents discuss population and environmental issues in their meetings. It is found that 64.1% of the respondents confirmed that they discuss this subject (see table 3.9).

Table 3.8. Percentage distribution of respondents' participation in social organization, Tehulederie Woreda, 2008

Participation in Social Organization	Respondents	Rate of Discussion in percent
Edir		
Yes	393	**98**
No	7	2
Equb		
Yes	41	10
No	358	90
Religious Org.		
Yes	279	70
No	119	30

Source: Field Survey

Table 3.9. Percentage distribution of respondents, by discussion of environmental issues in meetings Tehulederie Woreda, 2008

Discussion of Environmental issues in meetings	Respondents	Rate of discussion In percent
Yes	255	64.1
No	143	35.9
Total	**398**	**100.0**

Source: Field Survey

3.9. Contacts with Family Planning and Conservation Agents

Increased "contacts with family planning and conservation agents" would help raise the level of awareness of farmers' to the realization of population growth effects on the environment. It would also help them to learn as to how to respond to the problem faced. A direct question was posed, like; do you have any contact with family planning and conservation agents? About 79.6% have responded positive, while 12.6% negative and 7.8% reacted as they do not know any thing about it (see table 3.10). Since, the majority of the respondents (about 80%) are having "contacts with family planning and conservation agents", the likelihood is that the level of awareness of farmers would increase and they tend to respond to limiting their family size and participate in environmental conservation activities.

Table 3.10 Respondents contact with family planning and conservation agents, Tehulederie Woreda, 2008

Contacts with Family Planning & Conservation Agent	Respondents	Percent
Yes	317	79.6
No	50	12.6
Do not Know	31	7.8
Total	**398**	**100.0**

Source: Field Survey

3.10. Access to Mass Media

Respondents were asked to confirm whether they have access to information about population growth and environmental degradation through the mass media? About 65.4% have responded positive, while 34.6% negative. In any case, mass media has some contributions to

enhance the level of awareness of farmers and would provide impetus to respond to the effects of population growth on environmental degradation (see table 3.11).

The mass media in Ethiopia mainly include printed media, containing newspaper and magazine; and electronic media, radio, television and audiovisual. Bearing in mind the literacy level of the study area, newspaper doesn't seem to serve much. Because of the lack of infrastructural development and the issue of affordability, television medium has not penetrated into the study area, especially the rural part. Therefore, it is the radio medium which is serving the rural farmers most in providing information about population growth and environmental change.

Table 3.11. Percentage distribution of respondents by access to mass media, Tehulederie Woreda, 2008

Access to Mass Media	Respondents	Percent
Yes	255	65.4
No	135	34.6
Total	**390**	**100.0**

Source: Field Survey

3.11. Size of Landholding

The "size of landholding" is declared by 378 respondents, out of whom 59.8% have below one hectare, while 40.2% have above one hectare. The ***Woreda's*** average size of landholding is 0.5 hectare (***Woreda*** administration, 2008). Therefore, it is 32% of the respondents that fall below the average, while 68% of the respondents have their landholding above the average (see table 3.12).

3.12. Percentage distribution of respondents by size of landholding, Tehulederie Woreda, 2008

Size of Landholding (in ha)	Number of Respondents	Percent
≤ 0.5	121	32
0.51 – 1.00	105	27.8
> 1.00	152	40.2
Total	**378**	**100.0**

Source: Field Survey

As it is described in section 2.1., ***Tehulederie Woreda*** has 45,800 hectares of land, of which 26.4% is mountainous, 48% sloppy, 12.3% escarpment and only 13.3% plain; i.e. about 6,091.4 hectares of land which is suitable for crop cultivation. But the researcher has observed that parts of the mountainous and sloppy areas are cultivated with agricultural produces, which looks that farmers must have cleared the forest cover of the past few decades and exposed them for erosion and land degradation.

On the other hand, there are 86,097 working forces that can be employed in production as far as the ***Woreda*** administration is concerned. A simple average land distribution curve of cultivable land will get us to 0.07 ha, which is very small piece of land and way below the actual ***Woreda*** average landholding (0.5 ha). The land fragmentation issue that was created due to the high population density can easily be felt here.

The other perspective of the landholding issue in the ***Woreda*** is that: According to FGD -3, the young people, who claim to be landless, stand for land redistribution; while the old people, who are having adequate landholding, are very much satisfied with the prevailing situation and of course are against the idea of land redistribution. Yet, FGD -3 is utterly demanding of its right of agricultural land use accommodated through land redistribution.

CHAPTER FOUR

DIFFERENTIALS IN AWARENESS OF FARMERS' ABOUT THE EFFECTS OF POPULATION GROWTH ON FOREST AND AGRICULTURAL LAND

This chapter has attempted to assess the possible association of the independent variables with the dependent variable, i.e. the awareness of farmers'. The awareness of farmers' about the problem of environmental degradation varies depending on respondents demographic and socio-economic characteristics. These differences in awareness of farmers' about the effects of population growth on forest resources and agricultural land are explained as follows.

The bi-variate analysis show significant relationship between the dependent variable (awareness) and the background variables: age of head of the household, participation in social organizations, contacts with urban areas, contacts with family planning and conservation agents, size of landholding and access to mass media, to the effects of population growth on forest depletion and agricultural land degradation. Literacy (able to read and write) has shown its significance in relationship with the dependent variable only in terms of the effect of population growth on agricultural land degradation. Among nine intermediate variables cross tabulated to assess their effects on the level of awareness of farmers' to population growth effect on forest depletion and agricultural land degradation, six of them have revealed significant relationship (see table 4.1).

The analysis made by cross tabulation of the independent variables with the dependent variable showed that farmers in general have a high level of awareness about the effect of population growth on agricultural land and forest resource. Two questions were raised in this regard. In the first question farmers were asked as to whether they feel population growth has its effects on forest depletion and agricultural land degradation. About 84% of the respondents have replied positive, while only 16% were negative. Therefore, there is very high awareness among the farmers about the effects of population growth on forest and agricultural land. For the second question which was raised on how this effect could be

explained; 60% responded to the effect of the magnitude of land fragmentation. The effect of each demographic or socio-economic explanatory factor on the dependent (awareness) variable is shown in table 4.1.

Out of 398 respondents who are well aware of the fact that the adverse effect of population growth on forest resources can be explained as deforestation to be the root cause of soil erosion at the rate of 97.5%. Population growth can also be explained as a factor causing drought by 98%. Population growth can likewise be explained as a factor causing shortage of firewood due to deforestation with the rate of 79%.

Table 4.1. Chi-square significance test of farmers' awareness to the effect of population growth on the environment

Background Variables	Awareness					
	Population on Forest Land		Chi-square Sig. P Value	Population on Agricultural Land		Chi-square Sig. P Value
	Number	%		Number	%	
Participation in Social Organization						
Yes	232	78		393	98	
No	64	22	**.004***	7	2	**.003***
Contacts to Urban Areas						
Yes	225	78		153	39	
No	63	22	**.005***	239	61	**.000***
Contacts with Conservation Agents						
Yes	215	73		317	80	
No	79	27	**.000***	81	20	**.000***
Size of landholding						
≤ 1	83	31		100	27	
> 1	184	69	**.000***	269	73	**.000***
Size of Household						
1 – 3	92	31		104	26	
4 – 6	155	52		214	54	
≥7	49	17	.411	82	20	.975
Age of Head of HH						
≤30	47	83		60	86	
31 – 64	137	82		205	87	
≥65	48	68	**.04****	71	76	**.037****
Access to Mass Media						
Yes	232	79		255	65	
No	61	21	**.000***	135	35	**.000***
Sex of Head of HH						
Male	240	81		325	81	
Female	56	19	.139	75	19	.485
Literacy						
Yes	232	78		334	84	
No	64	22	.334	64	16	**.030****

Source: Field Survey.

- *Level of Significance at 0.01 (*)*
- *Level of Significance at 0.05 (**).*

In general, the level of awareness of farmers' is very high. Therefore, an attempt is made to analyze the effect of each background variable on the level of awareness of farmers about the effect of population growth on the environment.

4.1. Age and Awareness

The level of awareness of the first category age group is assessed to be the highest (94%), followed by the second category (81%) and then the ageing (73%). The survey findings have shown statistically significant relationship between age and awareness in this specific situation (see table 4.1).

Age, in general does not have a direct effect to influence awareness, unless otherwise it is substantiated by socio-economic factors like literacy, access to mass media, size of landholding, contacts with family planning and conservation agents and participation in social organization.

4.2. Sex and Awareness

Among 296 respondents who were asked for the sake of assessing the relationship between "sex" and "awareness", 81% are males and 19% are females. Among the males 77% are well aware of the effects of population growth on the environment, while among the females 86% are having awareness. However, there is no statistically significant relationship observed between the two variables. Sex by itself does not have a direct effect on level of awareness and needs to be substantiated by some other factors like literacy status of females and their participation in socio-economic development activities.

4.3. Household Size and Awareness

The level of awareness is the highest among the small household size (83%), followed by the large household size (80%) and in the third place the average household size (75%). There is no statistically significant relationship revealed between the background variable, "household size" and the dependent, "awareness" as shown in table 4.1. However, in smaller families (households) there is no much competition for the available resources as it is always the case in larger families. The competition for resource utilization is one of the main factors enhancing the level of awareness.

4.4. Contacts with Urban Areas and Awareness

It is believed that "contacts with urban areas" would help acquire very many information to broaden the mind. As urban areas are market places for exchange of information in every sphere as well contacts with urban areas would enhance the level of awareness of farmers. The other and most important point in conjunction to "contacts with urban areas and awareness" is the Pull Effect of the urban areas to absorb rural surplus labor force. On the other hand, the Push Effect of the rural agricultural land as there are shortages due to fragmentation is responded by out-migration. The survey result has actually shown a statistically significant relationship between the dependent – awareness - and the independent (expressed here as background variable), contacts with urban areas, at P value 0.005 and 0.000 for forest resources and agricultural land.

4.5. Participation in Social Organization and Awareness

The effect of "participation in social organization" to enhance the level of "awareness" of farmers was tested on 296 respondents. Among the respondents, 98% are participating in social organizations, and 79% are well aware of the effects of population growth on the

environment. It is to be recalled that participants in social organizations are also having discussions on the interrelationship between population growth and environment. The discussions on the issue at hand would help acquire adequate knowledge on the cause and effect of population growth and environmental change. The survey findings have also shown statistically significant relationship between the background and dependent variables at P value of 0.004 and 0.003 levels for forest and agricultural lands respectively.

4.6. Contacts with Family Planning and Environmental Conservation Agents and Awareness

Respondents were asked on their "contacts with family planning and conservation agents". The findings show that there were contacts with family planning and conservation agents in relation to forest land (73%) and agricultural land (80%). The Chi-square tests for both show statistical significant relationship. A higher proportion of respondents who have contacts with family planning and conservation agents (73%) show better level of awareness about the effects of population growth on the environment, while for those who do not have contacts, the awareness level goes as low as 27% and 20% for forest and agricultural lands respectively. These findings are similar to that of Abiy (2002), Mulugeta (1992) and Teshome (1994).

4.7. Size of Landholding and Awareness

Among 267 respondents who responded to the question on the interplay of "size of landholding" and "awareness", 31% have small landholdings with a size of ≤1 (equal or less than one) hectare, while 69% have >1 (more than one) hectare. Among the small landholders, 95% are well aware of the effects of population growth on the environment, while 74% of the big landholders are aware of the issue at stake. Since the small landholders do their level best to keep the family alive, whatever change on the environment might affect them most. So the level of awareness of such farmers to the effects of population growth on the environment is higher of necessity. This relationship is tested true and statistically significant.

4.8. Literacy and Awareness

Among 296 respondents, 78% have replied positive for the effect of population growth on forest land; while from among 398 who have responded the question on the effect of population growth on agricultural land, 84% were positive. Despite low level of literacy in the survey area, it is portrayed here that the farmers have very high level of awareness to the effects of population growth on environment. However, the Chi-square test shows that there is no significant contribution being made by the literacy status of the study area to enhance the level of awareness of farmers. Therefore, there is no significant relationship between the two variables. As discussed in chapter 3, it is only 29% of the respondents that can read and write, the level of literacy is so low, and might have no direct contribution to enhancing the level of awareness. Among the farmers who realize the effect of population growth on environment 75% are illiterate, while only 25% literate. Therefore, the level of awareness in this specific case can not be explained in terms of the contribution from educational attainment.

4.9. Access to Mass Media and Awareness

Among 293 respondents on the effect of population growth on forest resources, 79% have responded positive, while 21% negative; and on the other question of the effect of population growth on agricultural land, 65% have responded positive, while 35% are negative. Access to mass media would help increase the level of awareness of farmers in the realization of the effects of population growth on environmental change. Table 4.1 has shown statistically significant relationship between "access to mass media" and "awareness" at P value of .000 levels in both cases.

CHAPTER FIVE

DIFFERENTIALS IN RESPONSES OF FARMERS TO THE EFFECTS OF POPULATION GROWTH ON FOREST AND AGRICULTURAL LAND

This chapter also has attempted to assess the possible association between the demographic and socioeconomic independent (background) variables with the dependent variable, the responses of farmers'.

In the previous chapter an attempt was made to analyze the differential relationship between the background variables, like participation in social organization, contacts with urban areas, contacts with family planning and conservation agents, size of landholding, size of household, age and sex of heads of households, access to mass media and literacy, and the dependent variable, "awareness" of the respondents.

By cross tabulating each background variable with the dependent variable, six were found to be statistically significant and one of them have partial association, while two have no significance in terms of their relationship with awareness of farmers as discussed in chapter four. On the basis of the Chi-square tests and on the responses obtained, findings have shown that the level of awareness of the respondents about the effects of population growth on environment has increased markedly. Now that the level of awareness on the realization of the problem has increased, what is that the respondents are doing to mitigate these problems of population growth and environmental degradation? This chapter thus, has attempted to analyze the responses made and the strategies adopted to resolve the problems.

Respondents were asked to identify a number of listed strategies, the ones they have adopted to mitigate the effects of population growth on environmental degradation. About 63% have responded to the problems of population growth and environmental degradation; while among females, 70% are responding to the issue at stake. In aggregation, almost two third of the respondents are responding with the use of different environmental conservation activities and

family planning methods. Then, some of these methods are considered in this study and focused upon as the demographic responses of farmers which include contraceptive methods and migration. Likewise, socio-economic responses like environmental conservation and intensification techniques are also treated in the following manner.

On the basis of table 5.1, first demographic responses are treated followed by the socio-economic responses. As far as the relationship between "contacts to urban areas and responses" is concerned, it could be explained in the following manner. Out of 392 respondents to this question, 39% have responded positive. The greater proportion (61%) is with no contacts to urban areas. The number of migrant relatives residing in the urban areas is low. This demographic response is either to decrease the burden on agricultural land or to look for better opportunities that members of farmers' households out-migrate to the next nearby urban area first and to the next where opportunities by far are open for the better.

Regarding the use of contraceptive methods; 41% of the respondents are users. The rate of response towards the use of contraception is found to be much higher than the country's CPR, which is about 25% (DHS, 2005). All the same contraception is much higher among both men (41%) and women (43%). By taking into consideration the high population density of the ***Woreda,*** one can expect a very high impact in couple's year protection (CYP) in the short run.

The socio-economic responses like environmental conservation methods (both traditional and modern) are practiced as follows. The rate of response to mitigate the effects of forest depletion and agricultural land degradation is as low as 48% and 49% for traditional and modern methods respectively. Other types of responses like application of different inputs, expansion of agricultural land, afforestation and change in source of energy are: 50.3%, 39%, 47% and 53% respectively. The study area in general is endowed of water resources. Irrigation scheme is developed and 64% of the respondents are making use of. As described in chapter three, the ***Woreda*** has 8 rivers that are flowing all the year through and having high

potential for irrigation. According to KII-2, this resource can still be developed further and should be utilized wisely, so as to ensure food self sufficiency.

The recent development in horticulture has given a chance for farmers to be engaged in cash crop, ***Chat.*** Farmers engaged in '***Chat'*** farming have benefited a lot in the last decade. But the sad story associated to it is that, horticulture development mainly '***Chat'*** is pushing out food crop from production all along irrigated farmlands. Farmers nowadays have started queuing to procure their own food crops. This would entail a disastrous effect in the long run, where there would be no food crop producers, but all buyers.

Table 5.1. Percentage distribution of responses to mitigate the adverse effects of population growth on environment, ***Tehuledrie Woreda****, 2008*

Type of Response	Number of Respondents	Percent
Out-migrant to urban areas		
Yes	153	39
No	239	61
Use of contraceptives		
Yes	165	41
No	234	59
Use of traditional conservation method		
Yes	192	48
No	207	52
Use of modern conservation method		
Yes	197	49
No	202	51
Application of different inputs		
Yes	200	50.3
No	198	49.7
Expansion of agricultural land		
Yes	157	39
No	242	61
Practicing afforestation activities		
Yes	187	47
No	212	53
Change in source of energy		
Yes	212	53
No	187	47
Irrigation		
Yes	252	64
No	143	36

Source: Field Survey

The demographic response to mitigate and cope with the problem of population growth with its effects on the environment was to limit family size and temporarily migrate out of the locality. For example, about 41% of the respondents' use contraceptives for limiting births, 39% used out-migration as a response. However, 48% traditional forest and agricultural land conservation method, 49% modern conservation method, 50% application of agricultural inputs, 39% expansion of agricultural land, 47% participation in afforestation programmes/campaigns, 53% adopted in change of source of energy and 64% use irrigation (see table 5.1). However these aggregate results hide differentials by socio-cultural and demographic factors. Therefore, attempt is made to show the variation in response by different socio-cultural and demographic factors.

Table 5.2. Type of Responses of Farmers by background characteristics, Tehulederie Woreda, 2008

Background Variables		Types of Response*	
		Use of Contraceptives in Number (%)	Out Migration
Participation in Conservation Activities			
	Yes	150 (48)	138 (45)
	No	5 (71)	72 (83)
Participation in Social Organization			
	Yes	163 (42)	151 (39)
	No	5 (71)	5 (71)
Contacts with Conservation Agents			
	Yes	154 (49)	146 (47)
	No	40 (80)	44 (90)
Contacts to Urban Areas			
	Yes	88 (58)	137 (93)
	No	166 (70)	-
Age	≤30	10 (45)	8 (36)
	31- 64	92 (47)	74 (39)
	≥65	-	71 (39)
Sex			
	Male	133 (41)	132 (41)
	Female	32 (43)	21 (29)
Household size	1-3	35 (34)	18 (18)
	4-6	95 (44)	85 (41)
	≥ 7	35 (43)	50 (61)
Size of Landholding (ha)			
	≤1	30 (30)	30 (32)
	>1	133 (49)	117 (44)
Literacy			
	Yes	59 (51)	49 (43)
	No	178 (63)	174 (63)

Source: Field Survey

** Figures in parenthesis are in percent*

Table 5.3. Chi-square significance test of farmers' response to the effects of population growth on the environment, Tehulederie Woreda, 2008

Background Variables	Responses					
	Population on Forest Land		Chi-square Sig. P Value	Population on Agricultural Land		Chi-square Sig. P Value
	Number	Percent		Number	Percent	
Participation in conservation activities						
Yes	205	94		295	95	
No	51	65	**.000***	47	53	**.000***
Participation in social organization						
Yes	231	79		333	85	
No	4	80	**.001***	4	57	**.003***
Contacts with conservation agents						
Yes	204	95		305	96	
No	25	51	**.000***	22	44	**.000***
Contacts with urban areas						
Yes	61	92		144	94	
No	58	26	**.001***	54	23	**.000***
Age						
≤30	16	94		21	96	
31 – 64	117	81		168	86	
≥ 65	99	73	.074	147	80	.097
Sex						
Male	184	77		271	83	
Female	48	86	.139	65	87	.485
Household Size						
1 – 3	76	83		88	85	
4 – 6	117	75		179	84	
≥7	39	80	.411	69	84	.975
Size of landholding (in hectare)						
≤ 1	157	85		203	90	
> 1	66	73.3	**.022****	126	83	**.049****
Literacy						
Yes	60	83		106	92	
No	52	23	.240	55	19	**.004***
Access to mass media						
Yes	60	83		242	95	
No	52	23	.240	47	35	**.000***

Source: Field Survey

** Significance level ≤ 0.01*

***Significance level ≤ 0.05*

5.1 Age and Response

The response of farmers to the effect of population growth on the environment is the highest among the age group ≤ 30, with 94% on forest land and 96% on agricultural land. This is followed by the age group 31-64 with 81% on forest land and 86% on agricultural land. In the third place is the age group ≥ 65 and above with 73% on forest land and 80% on agricultural land.

The proportion of demographic responses to mitigating the problem is higher among the age group 31-64, 47% use of contraceptives and 39% out-migration. The age group ≤ 30 is following second on the list, 45% use of contraceptives and 36% out-migration. The age group 65 and above is the least in responding, since they are less in number and are deteriorating in their health cannot make full participation. As far as the environmental conservation and use of intensification techniques are concerned, age group ≤ 30 comes to the first place with 68%, age group 31-64 second place with 52% and age group ≥ 65 and above with 46% comes to be the lowest. Therefore, the reaction of the old age towards mitigating the effect of population growth on the environment is lower. Nonetheless, the Chi-square test does not prove any significant relationship between the two variables.

5.2. Sex and Response

Farmers' response to the effect of population growth on environment is higher among females, in that 86% on forest land and 87% on agricultural land is registered; while it is 77% on forest land and 83% on agricultural land among males. The demographic responses to mitigating the environmental damage, the females are using contraceptives with a proportion of 43% and out-migrate by 29%; while the males in the study area use contraceptives 41% and out-migrate by 41%. This shows a higher proportion of contraceptives use among females and males change their place of residence to curb the problem at stake. In any case no significant relationship is portrayed in this specific situation.

5.3. Household Size and Response

Although the Chi-square test has not revealed significant relationship between the two variables, it is obvious that there is competition among members of family for the limited resources. On the other side, the smaller the household size the optimal is resource distribution. The size of the household is virtually influencing the change in environment. It is the human interaction that is putting too much pressure on resource and the environment and inducing ailment. The survey findings have apparently depicted that the smaller the household size the greater is the response to the effect of population growth on environment. The household size with 1-3 persons is having higher proportion of response 83% on forest land and 85% on agricultural land. The bigger household size with 7 persons and above also have a proportion in response with 80% on forest land and 84% on agricultural land; while the household size with 4-6 persons has the proportion of response 75% on forest land and 84% on agricultural land.

On the other hand, the demographic response to the effect of population growth on environment is higher in proportion among bigger household size. Household size with 4-6 persons have 44% contraceptives use, while household size with 7 persons and above tend to change their place of residence in a proportion of 61% and the smaller household size with 1-3 persons tend to responding in the environmental conservation and intensification techniques by 64%.

5.4. Contacts with Urban Areas and Response

The rate of response is being very high in association with the contacts made to urban areas, i.e., population on forest land 92% and population on agricultural land 94%. While the corresponding figures among farmers who do not have contacts with urban areas is 26% and 23%, respectively.

The demographic responses towards mitigating the effect of population growth on environment, 70% for the use of contraceptives, 82% for out-migration among farmers who do not have contacts with urban areas; while 58% use of contraceptives, 93% out-migration among farmers who have contacts with urban areas. So much so that the level of awareness is very high, demographic responses are reflecting this established fact earlier. The Chi-square test shows, P value of 0.001 for forest resources and 0.000 for agricultural land, which are reflecting statistically significant relationship between the independent and the dependent variables.

5.5. Participation in Conservation Activities and Response

This section attempts to assess if there is some kind of association between these two factors as "participation in the environmental conservation activities", an independent variable and "response", as dependent variable. Is the response of farmers to the effects of population growth on environment, dependent upon the participation of farmers in the environmental conservation activities, the influential factor as an independent variable? The participation of farmers in the environmental conservation activities and their response to mitigate the adverse effects of population growth on the environment is having a strong relationship. Of course, table 5.3 has shown that there is a tendency of reducing the effects of population growth on forest land (94%) and agricultural land (95%) by those who are participating in environmental conservation activities, while there is only (65%) proportion of response on forest land and (53%) on agricultural land among the non-participating in conservation activities. Quite a big difference is reflected between those who are participating and not participating in the environmental conservation activities. In both cases, however, there exists strong statistically significant relationship.

Demographic responses to mitigate the problem of population growth effects on environment have also shown significant difference between those who participate and not participating.

5.6. Participation in Social Organization and Response

In this section also an attempt is made to assess the effect of participation in social organizations on responses of farmers to the problems of agricultural land degradation and forest depletion. As depicted in table 5.3., farmers participating in social organization have responded to the effect of population growth on forest land by 79% and agricultural land by 85%; while the corresponding figures are 80% and 57%. In general those who are participating in social organization have better response to the effect of population growth on the environment.

As shown in table 5.2., the demographic responses are better with those who are not participating in social organization. No matter to the rate of participation in social organization, it has been established in the previous section that farmers have reached very high level of awareness to the realization of the problem at stake. Therefore, the difference in response among the participants and non-participants could not be out of participation in social organization. All the more, the association between "participation in social organization" and "responses", the two variables, were found to be statistically significant at P value 0.001 and 0.003 levels.

5.7. Contacts with Family Planning and Conservation Agents and Response

The response made to the effect of population growth on environment is very high among those who have contacts with conservation agents by 95% on afforestation and by 96% on agricultural land rehabilitation. The corresponding figure among those who do not have contacts with conservation agents is 51% for afforestation and 44% for agricultural land rehabilitation. The very big gap revealed between the two components, is that there is a lot of chance of acquiring knowledge about conserving the environment by having closer contact with the conservation agents.

The demographic response to the effects of population growth on environment, for those who are having contacts with development workers are registered 49% use of contraceptives and 47% out migration as the responses to mitigating the problem. Nonetheless, the relationship between the two variables has shown statistical significance of P value 0.000 levels for both components.

5.8. Size of Landholding and Response

The size of landholding has statistically significant relationship with the responses to the effect of population growth on the environment. Farmers with less than one hectare of land response is having higher proportion like 95% on forest land and 98% on agricultural land, while the corresponding figure for size of landholding with one hectare and above is, 74% on forest land and 83% on agricultural land.

The demographic response is higher among those with one hectare and above, in the proportion of 49% use of contraceptives to economize between resource and the number of people depending on it, and 44% out-migration to reduce the burden on agricultural land. Farmers with less than one hectare respond to the effect of population growth on forest land by 30% and agricultural land by32%; while the tendency is higher with a proportion of 75% to conserve the environment and to apply intensification techniques among the small land holders. The relationship between the background variable, size of landholding and the dependent variable, response is statistically significant at P value of 0.000 levels for both components.

5.9. Literacy and Response

The response to reduce the effect of population growth on the environment is higher among the literate farmers with 83% on forest land and 92% on agricultural land. The corresponding figures for the illiterate farmers are 23% on forest land and 19% on agricultural land. All the more, it is a partial significance in terms of the relationship towards reducing the effect of population growth on agricultural land at P value of 0.004 levels.

5.10. Access to Mass Media and Response

Farmers with "access to mass media" tend to respond more than those who do not have the access. The comparative figures show that, those with access to mass media respond to reduce the effects of population growth on forest land by 83% and on agricultural land by 95%; while those without access to mass media respond to forest depletion by 23% and agricultural land degradation by 35%, which is very low level response to the problem. There is a wide gap created between those who have access and those who do not. In this case access to mass media and response to agricultural land rehabilitation have statistically significant relationship at P value of 0.000 level, while the relationship between the effect on forest land and response is not significant as shown in table 5.3.

CHAPTER SIX

DETERMINANTS OF FARMERS AWARENESS ABOUT THE EFFECTS OF POPULATION GROWTH ON FOREST AND AGRICULTURAL LAND

In the preceding chapters, differential awareness levels and responses among respondents due to variations in their demographic and socio-economic characteristics were assessed on the basis of bi-variate analysis. Chi-square test was also used to examine the possible association of each independent variable with the dependent variable and came out with the following findings. The demographic factors, age, sex and household size do not have statistically significant relationship with the dependent variables, awareness and response. But, contacts with urban areas, element of migration have significant relationship with both dependent variables. The socio-economic factors, on the other hand, have shown significant relationship between the independent variables and the dependent variables. It is only one social variable, literacy that has passed a partial Chi-square test, showing partial relationship with the dependent variables.

All the more, these relationships might change their impact when confounding effects are controlled in the multi-variate analysis, vis-a-vis the net effect of each independent variable on awareness to population growth effect on environment. In this chapter, therefore, the factors determining respondents' awareness to the effects of population growth on environment are examined using logistic regression model. The model is employed to assess the net effects of each of the independent variables on the dependent variable "awareness".

Before running the logistic regression model, the reference category and the cut off point of the significant level were determined. In this study, the reference category for each variable was set to be the first category, but in the case of the variable "size of landholding" the last category is considered. By default, the values of the reference category are given a regression estimate of 1.00 by which the results of other remaining categories will either be higher or

lower than the reference category. The P-value of 0.05 was used as the level of significance of the regression model or the cutoff point for rejection or accepting the null hypothesis.

In logistic regression model, the coefficient β represents the increase or decrease in the log odds of occurrence of an event (awareness and response in this study) associated with a unit change in the independent variable controlling for the possible confounding effects of all the other variables.

On table 6.1 the only background variable which turned out to be significant predictor of awareness about the effects of population growth on agricultural and forest land in the logistic regression analysis is "contacts with family planning and conservation agents". However, six relevant demographic and socio-economic factors were entered into the logistic regression model to examine the net effect of each of the variables on farmers' awareness to population growth effect on the agricultural land and forest resource. The socio-economic factors, participation in social organization, sex of head of the household and access to mass media had to be taken out of the model for they have shown a very high standard error and distorted the effect of the most important predictor, contacts with family planning and conservation agents. Therefore, the remaining six variables were fit into the model and only "contacts with family planning and conservation agents" was found to be significant predictor of "awareness" about the effects of population growth on environmental degradation.

Table 6.1 Results of multivariate logistic regression for demographic and socio-economic determinants of awareness of farmers to the effects of population growth on agricultural and forest land,

Background Variables	Population on Agricultural Land				Population on Forest Land			
	B	*S.E*	*Sig.*	*Exp.(β)*	*β*	*S.E*	*Sig.*	*Exp.(β)*
Household Size								
1-3 (RC)	0.000	-	0.218	1.000	0.000	-	0.029	1.000
4-6	-0.953	0.547	0.081	0.386	-1.484	.560	0.008	0.227
≥7	-0.767	0.674	0.255	0.464	-0.799	.717	0.265	0.450
Size of landholding								
≤1.00	1.152	0.446	**0.010***	3.166	0.664	.449	0.139	1.943
>1.00(RC)	0.000	-	-	1.000	0.000	-	-	1.000
Contacts with Urban Areas								
Yes (RC)	0.000	-	-	1.000	0.000	-	-	1.000
No	-0.220	0.550	0.689	0.802	-0.751	.679	0.269	0.472
Literacy								
Yes (RC)	0.000	-	-	1.000	0.000	-	-	1.000
No	-1.507	0.668	**0.024****	0.222	-0.436	.608	0.473	0.646
Contacts with Conservation Agents								
Yes (RC)	0.000	-	-	1.000	0.000	-	-	1.000
No	-3.906	0.503	**0.000***	0.020	-3.749	.479	**0.000***	0.024
Age of Head of HHD								
≤30 (RC)	0.000	-	0.587	1.000	0.000	-	0.936	1.000
31-64	-0.575	0.742	0.439	0.563	-0.165	.756	0.827	0.848
≥65	0.133	0.477	0.781	1.142	0.076	.516	0.883	1.079

* *Significant at ≤ 0.0001*

** *Significant at ≤ 0.05*

6.1. Age and Awareness

Neither the logistic regression model nor the bi-variate analyses have shown any significant association between the independent variable "age" and the dependent variable "awareness". As it has been dealt in the previous chapters, age by itself does not influence the level of awareness of farmers to population growth effect on environmental degradation. In any case age should be substantiated by some other socio-economic factors so as to influence the level of awareness of farmers.

FGD-3 has also confirmed this fact, in that the youth and the newly married are landless in most cases and are demanding for their constitutional right of land redistribution so as to be able to contribute towards the development of the country.

6.2. Household Size and Awareness

In the logistic regression model, no significant relationship is revealed between the demographic factor "household size" and the dependent variable "awareness" of farmers'. The same result was obtained in the bi-variate analysis also. Therefore, the independent variable does not have any kind of possible association with the dependent variable as far as the bi-variate analysis is concerned; and does not have its net individual effect as far as the logistic regression model is concerned. The tendency in mitigating environmental degradation through conservation measures and intensification techniques by smaller families, rather than taking demographic measures to the reduction of the number of children as desired would not have determined the effect in the level of awareness of the respondents.

6.3. Contacts with Urban Areas and Awareness

The bi-variate analysis has revealed a possible association between the independent variable "contacts with urban areas" and the dependent variable "awareness" of farmers'. However the logistic regression model does not show any kind of individual net effect of the independent variable to determine the level of awareness of farmers to population growth effect on environmental degradation. The reason being the confounding effect of the factor "contacts with urban areas" is controlled by the model to be seen as to whether it has any relative effect on the level of awareness. Therefore, it was found to have no individual net effect to determine the level of awareness of farmers.

6.4. Contacts with Family Planning and Conservation Agents and Awareness

Significant and positive relationship is observed between the independent and dependent variables in the model. The relationship between the two variables can be explained as those farmers who do not have contacts with family planning and conservation agents are less likely by 22% than those who have contacts to be aware of the fact that there is an adverse effect of population growth on environment. The level of significance is 0.000 for agricultural land degradation and for forest depletion.

6.5. Size of Landholding and Awareness

The model has shown no significant relationship between "size of landholding" and "awareness" of farmers'. However the bi-variate analysis has shown possible association between the independent and the dependent variables. Since the confounding effect of the factor "size of landholding" is controlled in the logistic regression model, it was only able to show its net effect in determining the "awareness" of farmers to population growth effect on agricultural land degradation, but not on forest depletion as shown on table 6.1.

6.6. Literacy and Awareness

The logistic regression model has shown a significant relationship between "literacy" and "awareness" of farmers' to the effect of population growth on agricultural land degradation at P-value of 0.024 levels, while no significant relationship was revealed on forest depletion. This could be due to the high agricultural land degradation of 84% and its effect on the drought by 97.8% as discussed in chapter four. Therefore, hypothesis (i) is accepted on the ground that literacy status has positive effect on the enhancement of the level of awareness of farmers.

CHAPTER SEVEN

DETERMINANTS OF FARMERS' RESPONSES TO THE EFFECTS OF POPULATION GROWTH ON FOREST AND AGRICULTURAL LAND

Initially ten demographic and socio-economic variables were entered into the logistic regression model. However, the socio-economic variables: participation in social organization and literacy have shown very high standard error (could be because of very low sample size), which were not tolerable and had to be taken out to control their confounding effects over the other predictor factors. Thus eight demographic and socio-economic factors were taken for the goodness of fit of the model as shown in table 7.1.

In the logistic regression model the socio-economic factors: "participation in environmental conservation activities" and "contacts with family planning and conservation agents" have appeared to be significant predictors. These socio-economic factors have appeared to be determinant variables for the responses of farmers to mitigating the effects of population growth on environmental degradation.

Table 7.1. Results of logistic regression for demographic and socio-economic determinants of response to the effects of population growth on the environment

Independent Variables	***The Dependent Variable, Response***			
	B	***S.E***	***Sig.***	***Exp.(β)***
Access to Mass Media				
Yes(RC)	0.000	-		1.000
No	-0.545	0.347	0.116	0.580
Household Size				
1-3 (RC)	0.000	-		1.000
4-6	-0.452	0.431	0.294	0.636
≥7	-1.224	0.511	0.017	0.294
Participation in Conservation Activities				
No (RC)	0.000	-		1.000
Yes	1.292	0.436	**0.003***	3.641
Contacts with Urban Areas				
Yes (RC)	0.000	-		1.000
No	0.152	0.321	0.637	1.164
Size of landholding				
≤1.0 (RC)	0.000	-	-	1.000
>.1.0	-0.490	0.297	0.099	0.612
Sex of Head of Household				
Male (RC)	0.000	-	-	1.000
Female	-0.247	0.398	0.536	0.781
Age of Head of Household				
≤30 (RC)	0.689	0.538	0.200	1.993
31-64	-0.118	0.355	0.739	0.888
≥65	0.000	-	-	1.000
Contacts with family planning &conservation agents				
Yes (RC)	*0.000*			1.000
No	-2.440	0.530	**0.000***	0.087

Source: Field Survey

7.1. Age and Sex of the Head of Household and Responses

By controlling the effects of other variables the association between farmers' age and sex with response to the effect of population growth on the environment, was examined through the logistic regression model. The model clearly revealed the existence of negative and significant association between age and sex with response. The odds of responding to the problem of population growth effect on environmental degradation are 44% less than the reference category.

7.2. Size of Household and Responses

The logistic regression result revealed differences in response to the effect of population growth on the environment. Those households with 4-6 persons are likely to respond by 30% less than the reference point. By the same token those households with 7 and more persons are less likely to respond by 68% to the problem at stake. Unlike the general consensus, the smaller the household size the higher is the tendency to respond to population growth effect on environmental degradation. The reason being the smaller household size use greater proportion (64%) of agricultural intensification techniques. In any case, no significant relationship is observed between the independent variable "size of household" and the dependent variable "responses" of farmers to population growth effects on environmental degradation.

7.3. Contacts with Urban Areas and Responses

Farmers with no contacts to urban areas are 19% less likely to respond to the effects of population growth on environment, than those who have contacts with urban areas. This could possibly be because of the availability of information of all kinds in the urban areas; that people residing out of their place of origin are very much exposed to the pull effect and

labour market in urban centres. This could also reduce the burden of agricultural land deficiency in the rural areas.

7.4. Contacts with Family Planning and Conservation Agents and Responses

This variable is among the important ones entered into the logistic regression model. By controlling the confounding effects of all other variables, the logistic regression model has shown positive and significant association with the dependent variable, i.e. the likelihood of responding to the problem of population growth and environmental degradation among those who have contacts with family planning and conservation agents have shown relative significant association at P-value 0.000 level.

The result is consistent with the general findings that farmers who have contacts with family planning and conservation agents are 13 times better in response to environmental degradation problem than those who do not have contacts. The response made to the effect of population growth on environment is very high among those who have contacts with conservation agents by 95% on afforestation and by 96% on agricultural land rehabilitation. The corresponding figure among those who do not have contacts with conservation agents is 51% for afforestation and 44% for agricultural land rehabilitation. The very big gap revealed between the two components, is that there is a lot of chance of acquiring knowledge about conserving the environment by having closer contact with the conservation agents.

The demographic response to the effects of population growth on environment, for those who are having contacts with development workers are registered to be 49% use of contraceptives and 47% out migration as the responses to mitigating the problem. Therefore, hypothesis (iii) is accepted.

7.5. Participation in Environmental Conservation Activities and Responses

This independent socio-economic variable is among the important variables entered into the logistic regression model. By controlling the confounding effects of all other variables, the logistic regression model has shown positive and significant association with the dependent variable, i.e. the likelihood of responding to the problem of population growth and environmental degradation among those who are participating in the environmental conservation activities shown significant association at P-value 0.003 level.

The result is consistent with the general findings that farmers who are participating in environmental conservation activities are better in response to environmental degradation problem, i.e. 3.641 times better than those who are not participating. Therefore, hypothesis (ii) is accepted.

7.6. Size of landholding and Responses

Analysis of the effect of size of landholding on farmers' response to population growth effect on the environment has shown no statistically significant association. The data on table 7.1 indicated that controlling for the possible effect of the other confounding variables; farmers with relatively larger size of landholding were 55% and 61% less likely to respond to the effect of population growth on the environment.

Those with smaller landholding tend to respond more to conserve the land with afforestation, terracing and increase their production by using irrigation. According to the FGD-1 optimal utilization of the smaller plots of landholding in their ***Kebele*** was possible with the introduction of irrigation. FGD-3 is also in concurrence with the quantitative results and

demanding for land redistribution so as to accommodate the young and newly married families and contribute in their own way to the development of the country.

7.7. Access to Mass Media and Responses

The level of significance is at P-value 0.003 with the responses of farmers to the effects of population growth on environmental degradation. Those farmers who do not have access to mass media are 61% less likely to respond to the problem of environmental degradation. Radio having the highest audience among the rural community, is the best channel to get the message across. Due to high level of illiteracy, newspaper is not reaching the rural community. Since television is an expensive medium and also requiring infrastructure, it is not accessible. Therefore, the media of the future is not contributing much in mobilizing the farmers to preserve their environment.

CHAPTER EIGHT

SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Summary

The effects of global warming and global dimming are diametrically opposed to one another. Yet the global community is sharing them in common at this point in time.

The high population growth rate in Ethiopia has taken off from 1960 and manifested itself by decreasing the population doubling period from 60 years in the first instance to 28 years for the second time in 1988 and it is projected to double itself for the third time in 2011, which is only 23 years apart.

The historical human settlement and the rugged topography of the northern highlands of Ethiopia have apparently accelerated the rate with which the environment is deteriorating. The highlands in Ethiopia are important for they are covering 40% of the land mass and carry 81% of the population. The effects of population growth on environmental degradation, was very much felt in the Ethiopian highlands since 1973, during the period of "The Hidden Hunger".

Environmental degradation has its disastrous effect as being the major cause of drought and famine. Since the period of "The Hidden Hunger", the period of recurrence has declined from 10 to 7 years in 1973, from 7 to 5 years in 1983 and from 5 to 3 years gap in 1993.

The study area, bearing the highest population density in ***Amhara*** Region, has always been affected by the recurrent drought and famine. It is against this fact the thesis was developed to analyze the awareness and response of farmers' to the effects of population growth on the environment, as an essential element in the implementation, management and coordination of

development activities. It is the farmers, therefore, who have major role in translating the plan of harmonization of population size with resource capacity. Enhancing the level of awareness of farmers and responding to the effects of population growth on the environment, is indispensable in the attempt to bring about sustainable development.

This study has endeavored to find out the demographic and socio-economic characteristics of farmers that are determinant factors for their awareness and responses to the effects of population growth on the environment.

The study is based on household level field survey with 400 sample size. It has employed uni-variate, bi-variate and multi-variate (logistic) regression models for data analysis. First of all, background characteristics of respondents (head of households) were described on the basis of thirteen demographic and socio-economic pertinent variables. In the second place the bi-variate analysis was done to assess the possible association between the independent and the dependent variables. Finally, the multivariate analysis was conducted and logistic regression model fittings were undertaken to find out the net effect of each independent variable on the dependent variable in determining the level of awareness and its responses to mitigating the problem of population growth effects on environmental degradation. By controlling the confounding effects of the other predictor variables, the net effect of each determinant variable was revealed.

As such "contacts with family planning and conservation agents" is the only socio-economic variable that has shown its net effect in determining the level of awareness of farmers in the realization of population growth effects on environmental degradation. As "participation in environmental conservation activities" and "contacts with family planning and conservation agents" are determining the responses of farmers in mitigating the problem of population growth effects on environmental degradation through afforestation, terracing and irrigation in the main. The demographic responses of increasing contraceptives prevalent rate to limiting the size of the households and out-migrating to release the burden of rural land fragmentation

were observed through maintaining the contacts with family planning and conservation agents.

The data were gathered through the questionnaire completed by 400 respondents, representing their households in their capacity as heads of households. Demographic variables such as sex and age have shown disparity in leadership and concentration of power in the age cohorts. As the male headed households comprise 81% of the respondents, it looks that males are having control over land and the products of the soil. As regards to age, it looks the working age cohort (15-64) comprising 49%, is managing and controlling the agricultural economy in the study area. However, both bi-variate and multi-variate analysis do not show any significant association between the independent variables, age and sex, with the dependent variables, awareness and response of farmers. Apparently, age and sex by themselves do not have any effect in determining the level of awareness of farmers to the realization of the problem. It is only when they are substantiated by other socio-economic factors like literacy status and ownership of agricultural land that they can influence the level of awareness of farmers and the likelihood of responding to mitigate the problem of population growth effect on environmental degradation.

As regards to household size, it is the medium household size having 4-6 persons that has the greater proportion (53.5%) of the study population. This is a little over the average household size of the country, i.e. 4.58 persons, which is a clear indication of high population growth rate in the study area. However, uni-variate, bi-variate and multi-variate analyses do not show any significant association between the independent and the dependent variables. The tendency here is in mitigating environmental degradation through conservation measures and intensification techniques by smaller families, rather than taking demographic measures to the reduction of the number of children as desired by larger size households, which would not have determinant effect in the level of awareness of the respondents.

The survey, having 29% of the head of the household, who are able to read and write, looks to be dominated by illiterate farmers. The distribution is skewed in favour of females for having

89% proportion that are able to read and write. The bi-variate analysis has shown possible association between "literacy" and "response of farmers", while the logistic regression has shown relative association of the independent variables in determining the level of awareness of farmers to the realization of population growth effect on agricultural land degradation (84%) and its resultant effect of drought (97.8%).

The marital status of the study area shows that 78% of farmers' households are under wedlock relation, while 6.7%, 6.5%, 5% and 3.5% are divorced, separated, widowed and never married, respectively.

The study area is predominantly Muslim with 97% and the remaining 3% are with the Ethiopian Orthodox ***Tewahido*** Church.

The "contact with urban areas" is manifested by out-migration from the place of origin. Despite the proximity of ***Haiq*** (the ***Woreda*** administration centre) and Dessie (one of the biggest urban centres in the country) there is only 39% out-migration to respond to the effects of population growth on the environment.

As far as the multivariate analysis (logistic regression model) is concerned, the confounding effect of the factor was controlled and no individual net effect was revealed between the demographic factor "contacts with urban areas" and the dependent variables, to determine the level of awareness and found out to be less likely to respond to out-migration; to release the burden of high demand for agricultural land.

The bi-variate analysis has shown as significant relationship between "contacts with urban areas" and "awareness of farmers" to the effects of population growth on forest depletion and agricultural land degradation respectively. The demographic responses towards mitigating the effects of population growth on environment (70%) for the use of contraceptives, is to limit the number of children and 82% for out-migration. All the more, there is significant

relationship between "contacts with urban areas" and "response of farmers" for afforestation and agricultural land rehabilitation respectively.

The finding from the uni-variate analysis shows that some 78% of the farmers are participating in environmental conservation activities, in which very high proportion is taking part in afforestation (80%) and terracing (79%). Likewise, there is a tendency of reducing the adverse effects of population growth on forest resources (94%) and agricultural land (95%) by those who are participating in environmental conservation activities. Here again a positive significant association between the independent and the dependent variables is revealed.

Finally, by controlling the confounding effects of the other predictor factors (the independent variables) the individual net effect of "participation in environmental conservation activities" on the "response of farmers" to mitigate the environmental problems, through afforestation and terracing, has shown significant and positive relationship at P-value 0.003.

"Participation in social organization" is very high among ***Edir*** with 98%; and discussion on population and environmental issues on the meetings is done by 64% of the participants. In the bi-variate analysis, the independent variable "participation in social organization" has shown a possible association to have significant relationship with "awareness" at P-value 0.004 level for forest resource and 0.003 for agricultural land.

Likewise, the positive and significant association was revealed to mitigate the environment at P-value of 0.001 level for afforestation and 0.003 level for agricultural and rehabilitation. In the logistic regression, however, the socio-economic variable "participation in social organization" had to be taken out of the model, to control its confounding effect over the other predictors.

The "contacts with family planning and conservation agents" is higher among the farmers with 80%, which may be expected to give enough chance to enhance the level of awareness in

the environmental conservation activities and limiting the size of households. As far as the bi-variate analysis is concerned, the "contacts with family planning and conservation agents" shows a statistically significant positive relationship with the enhancement of awareness at P-value of 0.000 levels to the effects of population growth on agricultural and forest resources. On the other hand, similar significant relationship between the independent and the dependent variables at P-value 0.000 levels were observed to mitigate the problems of environmental degradation and population explosion.

The independent socio-economic variable, "contacts with family planning and conservation agents" has shown relative net effect in determining the level of awareness of farmers' to population growth effect on environment. A positive significant association between the independent and the dependent variables at P-value 0.000 levels to the effect of population growth on agricultural land and forest resources was observed. On the other hand those farmers' having "contacts with family planning and conservation agents" are better responding to mitigate environmental degradation problems and significant positive relationship is revealed between the same independent and dependent variables at P-value 0.000. Contraceptives prevalence rate has reached 49%, which would help to limit the size of household and in effect reduce the high population growth rate to bring about a decline in population density. The out-migration rate of 47% would also help release the agricultural land burden.

"Access to mass media" - The bi-variate analysis has shown a possible association between the socio-economic independent factor "access to mass media" and "awareness of farmers" at P-value 0.000 levels. On the other hand, those farmers with "access to the mass media" tend to respond to agricultural land rehabilitation at P-value 0.000 level. The multi-variate (logistic) regression has not shown significant association between "access to mass media" and "awareness of farmers", while those farmers with "access to mass media" tend to respond to mitigating environmental degradation at P-value 0.003 level.

significant relationship with "farmers' awareness" at P-value 0.000 level. The relationship of the dependent variable, "response of farmers" is quite significant with the independent variable "size of landholding" at P-value 0.000 level. The small landholders tend to conserve the environment and to apply agricultural intensification techniques more than the large landholders.

The multi-variate analysis has shown significant relationship between the independent and dependent variables at P-value 0.041 and 0.010 for medium and large agricultural landholding respectively.

8.2 Conclusion

In the bi-variate analyses all the socio-economic variables: participation in social organization, contacts with family planning and conservation agents, size of landholding, access to mass media and literacy plus one demographic variable –contacts with urban areas (which explains out-migration from origin) have shown their differential effects towards enhancing the level of awareness to population growth effect on environment. On the other hand, the remaining demographic variables: age, sex and household size (which explain the number of children in each household) have not shown any significance in terms of influencing the level of awareness.

In the multi-variate analyses, among six variables that were fit into the regression model "contacts with family planning and conservation agents" is having its net individual effect in determining the level of awareness of farmers to population growth effect on environment.

Two socio-economic variables: "size of landholding" and "literacy" have shown partial effect in determining the level of awareness of farmers to the realization of population growth effect on agricultural land degradation. The remaining three variables have not shown any significant relationship with the dependent variable - awareness of farmers.

On the basis of the results of the study, the following conclusions could be drawn.

- The level of awareness is higher among farmers who have contacts with family planning and conservation agents.

- "Literacy status" and "size of landholding" have direct and positive influence on the enhancement of the level of awareness of farmers to population growth effect on agricultural land degradation.

As regards to the differential and determinant effects of the independent variables on the dependent variable (responses of farmers') to mitigate environmental problems, the following bi-variate and multi-variate analyses were conducted and Chi-square tests were also made.

In the bi-variate analyses, all the socio-economic variables: participation in environmental conservation activities, participation in social organizations, contacts with family planning and conservation agents, size of landholding, literacy and access to mass media; and plus the demographic variable, contacts with urban areas (which explains out-migration from origin) have their differential effects in responding to mitigate the problem of environmental degradation. The demographic variables: age, sex and household size (which explain the number of children in each household) have not shown any significant relationship with the dependent variable, responses of farmers to population growth effect on environmental degradation.

In the multi-variate analyses, ten demographic and socio-economic variables were entered into the regression model and two were to be taken out for their confounding effects on the other predictor factors and to best fit the model. Eight demographic and socio-economic

variables were run in the model and the following socio-economic variables: participation in environmental conservation activities and contacts with family planning and conservation agents, each of which were found to have their net individual determinant effects in responding to mitigate the problem of environmental degradation. All the demographic variables: age, sex, contacts with urban areas (which explains out-migration from origin) and household size (which explains the number of children in each household) were found to have no significant relationship with the dependent variable, responses of farmers to mitigating population growth effects on environmental degradation problems.

Among eight variables that were run into the logistic regression model: "contacts with family planning and conservation agents" and "participation in environmental conservation activities" were having significant net effects in determining the responses of farmers, i.e., the likelihood of responding to the problem of population growth and environmental degradation is high among those who participate in environmental conservation activities and those who have contacts with family planning and conservation agents. Those who have contacts with family planning and conservation agents tend to respond to limiting the size of the household with increasing CPR and to release the rural agricultural land burden with out-migration from the point of origin. Those who participate in conservation activities tend to respond to mitigating the problem of environmental degradation through afforestation, terracing and irrigation.

On the basis of the results of the study the following conclusions are drawn.

- Farmers' participation in environmental conservation activities tend to respond 3.641 times better to mitigating the problem of environmental degradation through afforestation, terracing and irrigation.
- Farmers having contacts with family planning and conservation agents are more likely to respond to limiting the family size with increased use of contraceptives and release the rural agricultural land burden with out-migration from the point of origin.
- The smaller the size of landholding the higher is the likelihood to preserve the environment with the practice of terracing, irrigation and afforestation.

8.3. Recommendations

On the basis of the findings of the study, the following key issues are forwarded for policy consideration.

Although the level of awareness and the tendency to use contraceptives is higher among farmers who have "contacts with family planning and conservation agents", ***Tehulederie Woreda*** is still having the highest population density in ***Amhara*** Region, which is made up of a very high birth rate. Aggressive reproductive health programme is recommended to avert the high birth rate in the ***Woreda.*** Therefore, increased access to reproductive health services and counseling, adequate supply of commodities to ensure informed choice of methods is of paramount importance. ***Tehulederie Woreda*** should come top on the list of priority in the country's reproductive health programme intervention.

One of the most important undertakings in the study area is the development of irrigation scheme. Contrary to the objective of the programme, the irrigation scheme is being utilized fully for horticulture development, mainly ***Chat*** and vegetables. The scheme should not be left alone just for ***Chat*** as it stands today. Regional bureau of agriculture and all its collaborators should think of averting this misguided initiative and design an awareness creation programme, which makes use of the regional radio channel and some pictorial magazines to inculcate into the minds of the farmers the benefits of mixed farming, agricultural intensification techniques and environmental conservation activities to increase the yield and to preserve agricultural land.

"Participation in environmental conservation activities" of farmers, has its significant effects and making them 3.641 times better to respond to mitigating the problem of environmental degradation through the practices of terracing, afforestation, irrigation and intensification techniques.

In order to increase farmers' participation in such kind of important undertaking, organizations like the Ministry of Agriculture and Environmental Protection Agency should envision a participatory and accountable development process in their programmes. Since it is the farmers who are adopting, implementing and give due care to conservation activities. It can easily be observed that farmers do understand and realize the adverse effect of high population growth on the environment. The government is also conducting environmental conservation campaigns in unplanned manner. Therefore, it is essential to ensure sustainability of the various campaign activities by establishing an appropriate institution or strengthen and extend the role of EPA to be governed by long term plans.

The smaller the size of landholding the higher is the likelihood to preserve the environment with the practices of terracing, afforastation, irrigation. Thus land redistribution will have a multiplier effect on these practices. Land redistribution will also accommodate the demands of the youth, the newly married and the landless in general; and will give them a chance to enjoy their constitutional rights.

Farmers with access to mass media spccifically to radio are benefiting quite a lot and more likely to respond to mitigating the problem of environmental degradation. Therefore, public mobilization to conserve the environment and reproductive health programmes to avert high birth rate should be integrated into the national radio programme at least in four major local languages.

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Appendix 1

Survey Instruments

I: Household Composition, Activities and Demographic Characteristics
II: Emerging Problems
III: Focus Group Discussions
IV: Key Informants Interview

By
Hiruy Mitiku
GSR/1933/99

For the Thesis on
Farmers' Awareness and Responses to the Effects of Population Growth On the Environment

Institute of Population Studies
College of Development Studies
Addis Ababa University
July 2008
Addis Ababa

I. Household composition, activities and Demographic Characteristics

Line No.	Usual Residents and Visitors	Relationship to head of Household	Sex	Age	Religion	Ethnic Group	Educational status (For members aged five and above)		Marital Status (For those aged 19 years and above)		Children Ever Born (Only for female 15-49 years old)		
	Name of persons who usually live in this household and stayed here last night; start with the head of the household	0=Head 1=Husband 2=Wife 3=Daughter 4=Son 5=Brother 6=Sister 7=Adopted Child 8=Parent 9=Other relative	1= M 2= F		1=Orthodox 2=Protestant 3=Catholic 4=Muslim 5=Other	1=Amhara 2=Oromo 3=Tigray 4=Gurage 5=Other	Read and Write? 1=Yes 2=No	What is the highest grade completed?	1=Never married 2=Currently married 3=Divorced 4=Widowed 5=Separated	Age at first marriage (only for those ever married)	Have you ever given birth to a child? 1=Yes 2=No	For how many children have you given birth	
												Male	Female
1	2	3	4	5	6	7	8	9	10	11	12	13	14
01													
02													
03													
04													
05													
06													
07													
08													
09													
10													
11													
12													
13													
14													
15													

II. Emerging Problems

1. Do you own land?

Yes = 1 No = 2 [ ]

2. If yes, please give the following details

Plot No.	Size in Hectare	When did you Obtain it?	How did you Obtain it? (a)	Type of land (Code (b))	Location of Land (code (c))
01					
02					
03					
04					
05					
Total					

How Land was obtained (Code (a)

Own land, as per the constitution	1
Rented for crop sharing	2
Rented for fixed land rent	3
Other	4

Type of Land (Code (b)

Fertile ("lem")	1
Semi-fertile ("lem-teff")	2
Infertile	3

Location of Land (Code (c)

Plain (Medda)	1
Inclined (Dagethama)	2
Sloppy (Geddel)	3

3. How do you plough your plots?

Using own oxen	1
Using ox pairing with other(s)	2
Using human labour	3
Exchanging labour for oxen	4
Leasing land for crop sharing	5
Other (specify)_____	6

[ ]

4. In your *Kebele* (community), is land redistribution employed to provide land for new households?

Yes = 1 No = 2 [ ]

5. How many times (since 1991) has land been redistributed in your *Kebele* (community)?

[ ]

6. Do larger households get more land than smaller households?

Yes = 1 No = 2 DK = 3

[ ]

7. In your opinion, are larger households better rewarded than smaller households in terms of land ownership?

Yes = 1 No = 2 DK = 3

[ ]

8. In general, are you in favour or against the practice of land redistribution?

In-favour = 1 Neutral = 2 against = 3

[ ]

9. Would you like to have "private property ownership right" on your land so that here will be no more redistribution?

Yes = 1 No = 2

[ ]

10. If you are in-favour of private ownership of land what would you provide your children and grandchildren when they are ready to form new households?

.Distribute my land among them = 1
.Live together in one household = 2
.Involve in non-farm business = 3
.Prepare to relieve them from farm work = 4
.Take steps to control the birth of more children = 5
.Other (specify) _____ = 6

[ ]

11. Comparing your present land holding with that of 20 years ago, 15 years ago, 10 years ago, and 5 years ago, how do you rate it?

Much bigger than present = 1
Same as present = 2
Much smaller than present = 3

20 years ago	15 years ago	10 years ago	5 years ago

12. Does the household have access to grazing land other than the plots mentioned in question no. 2?

Yes = 1 No = 2

13. What is the source of grazing land?

Yes = 1 No = 2

Land owned by *Kebele* (general communal land) = 1
Land from relatives/friends within the *Kebele* = 2
Land from relatives/friends in other *Kebele* = 3
Land rented in other *Kebele* = 4
Other (specify) _____ = 5

14. Do you think the community has a problem of grazing land?

Yes = 1 No = 2

15. If yes, what do you think should be done to solve the problem?

1. Reduce farm lands to allow grazing lands
2. Abandon reforestation and enclosure of areas
3. Introduce selected breeds of cows to reduce livestock pop.
4. Don't know

16. Do you think land is becoming scarce or is it still abundant in your Kebele?

I feel it is scarce = 1

I feel it is still abundant = 2

17. If you feel land is becoming scarce, why do you think it is so?

1. _____
2. _____
3. _____

18. Do you like to move to other areas where there is abundant land and be resettled there?

Yes = 1 No = 2

19. How much is the annual grain requirement of your household for food consumption?

20. How much do you produce from your farm plots during good, bad and normal harvest years?

	Quintals
Good harvest seasons	
Normal harvest seasons	
Bad harvest seasons	

21. How do you consider your crop output from your farm plots in the last 10 years?

Increasing = 1 constant = 2 decreasing = 3

22. If you feel that the general trend in crop production is declining, what do you think are the reasons?

If the respondent cannot provide reasons, interviewer must probe by mentioning:

- Failure of rains at appropriate times
- Land degradation/soil erosion
- Small farm plots due to redistribution
- Drought in general
- Lack of fertilizers
- Cannot fallow land due to shortage/over cultivation
- Too many cattle livestock/overgrazing
- Less labour in the household to work on farm
- Other (specific)

23. What is your main source of drinking water?

1. Spring 2. Stream/river 3. Well 4. Pond/ditch/dam
5. Piped system 6. Lake 7. Other (specify)

24. How long does it take to get there?

At present	
About ten years ago	

25. Who fetches water from its source?

1. Adult females only 2. Adult males only 3. Children only
4. Adult female and children 5. Any member 6. Other

26. What are the most commonly used types of fuel?

Yes = 1 No = 2

1. wood
2. shrubs and leaves
3. crop residue
4. animal dung
5. charcoal
6. other (specify)

27. What is your main source of fuel wood?

1. Private trees
2. Natural forest
3. Community wood lots
4. Market
5. Other (specify)

28. How long does it take to get to the main fuel wood source?

At present	
About ten years ago	

29. Do you consider fuel wood to be a problem in your area?

Yes =1 No = 2

30. If yes, what are the reasons?

Reasons for shortage of fuel wood (probing)

Yes = 1 No = 2

1. trees deforested for charcoal production
2. trees deforested for sale of construction poles
3. trees deforested for land clearing
4. trees deforested for construction of houses
5. no natural forest ever
6. deforestation due to over grazing
7. deforestation due to soil erosion and land degradation
8. cutting for fire wood is not allowed
9. other (specify)

31. If deforestation is a major problem, what are the causes?

Yes =1 No = 2

1. Clearing land for cultivation and settlement
2. Wild fire
3. Deliberate burning for grass and grazing
4. Cutting trees to get rid of wild animals
5. Cutting trees for fire wood and charcoal production
6. Other _____

32. What are the disadvantages of deforestation?

Yes =1 No = 2

1. Soil erosion
2. Drought
3. Shortage of firewood
4. Other _____

33. In the household has environmental degradation ever been discussed as a problem?

Yes =1 No = 2

34. If yes, in what form?

_____

_____

_____

_____

35. In the household do you have any other means (other than farming) to support the family?

1. receive remittance
2. relief aid
3. sale goods like charcoal, firewood, food staff and local beer/Tela

36. Do you feel that the population in your area is increasing?

Yes = 1 No = 2 Do not know = 3 No response = 4

37. Do you think population growth would affect agricultural land?

Yes =1 No = 2 Do not know = 3 No response = 4

38. If yes, how do you see the effect?

Reduces fallowing period = 1

It causes land fragmentation = 2

Over cultivation = 3

Overgrazing = 4

Other = 5

39. Are you responding to this problem?

Yes = 1 No = 2 Do not know = 3 No response = 4

40. What are the manifestations of agricultural land degradation?

Decline in soil fertility = 1

Reduction in crop production = 2

Forest depletion = 3

□ Drought = 4

Other (specify) _____ = 5

41. Do you think there is a shortage of land in your area?

Yes = 1 No = 2 Do not know = 3 No response = 4

42. If yes for the previous question, would you like to move to other area where land is abundant?

Yes = 1 No = 2

43. Do you think that population growth affect forest resource?

Yes = 1 No = 2 Do not know = 3

44. If yes for the previous question, are you responding to the effect of population growth on forest resource?

Yes = 1 No = 2 Do not know = 3 No response = 4

45. In your area deforestation is …

Increasing = 1

☐ No change = 2

Decreasing = 3

46. In you opinion, what are the disadvantages of deforestation?

Yes = 1 No = 2

Drought

Soil erosion

Shortage of firewood

☐ Loss of biodiversity

Other (specify)

47. If yes for Q# 40 and 43, how are you trying to solve the problem?

Yes = 1 No = 2

- By taking traditional conservation measures
- Application of different modern/traditional inputs to increase productivity of the land
- Expansion of agricultural land
- Practicing aforestation activities
- Use of contraceptive methods
- Out migration
- Other (specify)

48. Population growth should be controlled to alleviate en[illegible]gradation?

Yes = 1 No =2 Do not know = 3

49. What is your desired family size?

Less than five = 1

Six to eight = 2

Nine to twelve = 3

More than twelve = 4

50. Do you want to limit the number of children?

Yes = 1 No = 2 Do not know = 3

51. Can the existing environmental degradation be reversed?

Yes = 1 No = 2 Do not know =3

52. What should the farmer, the government and the community do?

Farmer _____

Government _____

Community _____

53. Do you have any contact with family planning and conservation service agents?

Yes = 1 No = 2 Do not know = 3

54. Do you participate in social organizations like 'edir' and 'ikub'?

Yes = 1 No = 2

55. Do you discuss population and environmental issues in your meetings?

Yes = 1 No = 2 Do not know = 3

56. Do you have migrant relatives living in the urban areas?

Yes = 1 No = 2

57. How often did they visit you over the past year?

Once = 1 Twice = 2 More than twice = 3 [ ]

58. Have you ever participated in environmental conservation activities?

Yes = 1 No = 2

[ ]

59. If you have participated in conservation activities, what were the reasons for your participation?

Yes = 1 No = 2

To collect grain	[ ]
Money given by food for work program	[ ]
□To conserve the environment of your community	[ ]
To plant trees□□	[ ]
To do terracing□	[ ]
(specify)Other	[ ]

Focus Group Discussions :III

1. Discussion on population and environment nexus
2. Discussion on environmental degradation
    a. Agricultural land degradation
    b. Forest depletion
3. Discussion on land fragmentation
4. Discussion on environmental rehabilitation
    a. Afforestation
    b. Terracing
    c. Irrigation

Key Informants Interview :IV

1. Historical background of forest resources
2. The issue of land tenure system in the various government structures
3. The effect of land tenure system on the protection of natural resources
4. The issue of sustainability in the environmental conservation activities

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Declaration

The thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Hirut Mitiku — Student

Signature

June, 2008 — Date

I confirm that this thesis has been submitted with my approval as the supervisor of the same.

Tenfe Degefa — Advisor

Signature

07 July 2008 — Date